ESTP: Introduction to seasonal adjustment

Allocation of Pre-adjustment effects and Forecasting

Anna Smyk (Insee) - Daniel Ollech (Deutsche Bundesbank)

Summary of the main steps

- Reg-Arima modelling
  - computes calendar effects (cal)
  - computes outliers effects (out)
  - computes external regressors effects (reg)
  - computes linearized series (y_{lin})

(On the "model-span")

- Forecasting of linearized and raw series (taking into account calendar effects and outliers/ regressors which have values in the model span as well as in the future)
- Decomposition of the linearized series

$$y_{lin} = S_{lin} + T_{lin} + I_{lin}$$

- Allocation of pre-treatment effects and construction of final components (S, T, I)
- Computation of final SA series $y_{sa} = y - S = T + I$ or $y_{sa} = y/S = T * I$

Detailling pre-adjustment effects

Reg-Arima

$$Y_t = \sum \hat{\alpha}_i O_{it} + \sum \hat{\beta}_j C_{jt} + \sum \hat{\gamma}_k Reg_{kt} + y_{lin_t}$$

(equation in log if the multiplicative case,final effects are multiplied)

- $cal = tde + ee + omhe$
- $out = out_i + out_t + out_s$
- $reg = reg_i + reg_t + reg_s$
- $det = cal + out + reg$
- $y = y_{lin} + cal + out + reg$
- $y = y_{lin} + det$

(same notations here as in GUI)

Building final components

$$S = S_{lin} + out_s + reg_s + cal$$

$$T = T_{lin} + out_t + reg_t$$

$$I = I_{lin} + out_i + reg_i$$

$$Y_{lin} = S_{lin} + T_{lin} + I_{lin}$$

$$Y = S + T + I$$

(in the additive case)

Forecasting of raw series, linearized series

Forecasting of raw series (y_f) is done in the Reg-Arima part

- where trend and seasonality where temporarily removed by differencing
- calendar effects, outliers effects and any other regressor effects are estimated on the "Model Span" (can be shorter as series span)
- decomposition step is not used for forecasting the raw series (the values obtained at the end of pre-adjustment are not changed)
- in X11 forecasted seasonal factors are computed via Moving averages (with asymmetric filters) on forecasted linearized series
- final seasonal factors contain calendar effects $S = S_{lin} + out_s + reg_s + C$
- final forecasted seasonal factors contain forecasted calendar effects $S_f = S_{lin_f} + C_f$

(In GUI, $D10 = S_{lin} + out_s + reg_s = S_{lin}$ (in 99% of the cases))

Labels used in JDemetra+

see current documentation

https://jdemetradocumentation.github.io/JDemetra-documentation/

(similar names in GUI and R)