Final Project: ARIMAX Model for Real Case Proposed Series

Date of delivery: January 11th 2023; groups of two people.

Send via Atenea:

- **File with the report (.doc, .html o .pdf)**
- **R Script (.r or .Rmd) with the code**

This project aims to apply the Box-Jenkins ARIMA methodology, including extensions for treatment of calendar effects and outliers, to the analysis and prediction of a chosen "real time series".

The student must choose one of the proposed real time series, (or propose a particular one) to use in this final project.

In this final project, the following aspects must be addressed:

1. Identification:
   a) Determine the needed transformations to make the series stationary. Justify the transformations carried out using graphical and numerical results.
   b) Analyze the ACF and PACF of the stationary series to identify at least two plausible models. Reason about what features of the correlograms you use to identify these models.
2. Estimation:
   a) Use R to estimate the identified models.
3. Validation:
   a) Perform the complete analysis of residuals, justifying all assumptions made. Use the corresponding tests and graphical results.
   b) Include analysis of the expressions of the AR and MA infinite models, discuss if they are causal and/or invertible and report some adequacy measures.
   c) Check the stability of the proposed models and evaluate their capability of prediction, reserving the last 12 observations.
   d)) Select the best model for forecasting.
4. Predictions:
   a) Obtain long term forecasts for the twelve months following the last observation available; provide also confidence intervals.
5. Outlier Treatment:
   a) First, analyze whether the Calendar Effects are significant.
   b) For the last selected model, apply the automatic detection of outliers and its treatment. Try to give the interpretation of detected outliers
   c) Once the series has been linearized, free of calendar and outliers' effects, perform forecasting. Compare forecasts results for the original series: classical ARIMA vs ARIMA extension (by using the linearized models).

You must submit a report with all steps and justified decisions.

Reminder: This is a report (index, intro,...) and thus you should not limit yourself to present a commented Rmarkdown file.