

## **IE 360 Statistical Forecasting and Time Series**

### **Homework 4 and 5, Due July 2, 2021**

The aim of this homework is to help you develop alternative forecasting strategies for your project. You can work with your group. Note that each member should submit the homework on the progress journals.

#### **Tasks**

1. Analyze the seasonality of the sales for each product. Decompose the consumption series at different levels (daily, weekly, monthly and etc.) and comment on your findings (both in terms of trend and seasonal component).
2. Based on your findings in the first part, propose ARIMA models and comment on performance in terms of the period you used for learning the model.
3. Check for possible regressors that can improve your model. This requires descriptive analysis with the additional information in the data (such as favorite count and etc.). Due to the dirty nature of the data, some variables may not be useful. This is perfectly fine as long as you mention about the potential problems with the variable.
4. Use the potential regressors in the selected ARIMA models (i.e. ARIMA with external regressors) in the third part to see if they provide any performance improvement over the existing model. Please use a week of test period (i.e. last seven days) to assess the performance of the model. Comment on your findings.

#### **Instructions:**

Please solve the exercises using R (<http://www.r-project.org/>) or Python (<https://www.python.org/>). You are expected to use GitHub Classroom and present your work as an html file (i.e. web page) on your progress journals. There are alternative ways to generate an html page for you work:

- A Jupyter Notebook including your codes and comments. This works for R and Python, to enable using R scripts in notebooks, please check:
  - <https://docs.anaconda.com/anaconda/navigator/tutorials/r-lang/>
  - <https://medium.com/@kyleake/how-to-install-r-in-jupyter-with-irkernel-in-3-steps917519326e41>

Things are little easier if you install Anaconda (<https://www.anaconda.com/>). Please export your work to an html file. Please provide your \*.ipynb file in your repository and a link to this file in your html report will help us a lot.

- A Markdown html document. This can be created using RMarkdown for R and Python. Markdown for Python

Note that html pages are just to describe how you approach to the exercises in the homework. They should include your codes. You are also required to provide your R/Python codes separately in the repository so that anybody can run it with minimal change in the code. This can be presented as the script file itself or your notebook file (the one with \*.ipynb file extension).

The last and the most important thing to mention is that academic integrity is expected! Do not share your code (except the one in your progress journals). You are always free to discuss about tasks but your work must be implemented by yourself. As a fundamental principle for any educational institution, academic integrity is highly valued and seriously regarded at Boğaziçi University