Time Series Management

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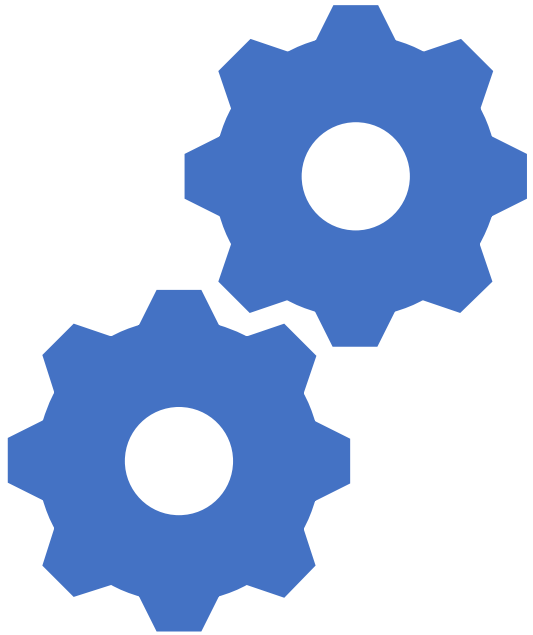
TD



Model selection and forecasting

TS Analysis in Python

- SciPy
- NumPy;
- Matplotlib;
- Pandas;

statsmodels

https://www.statsmodels.org/stable/index.html
https://github.com/statsmodels/statsmodels/)

ACF and PACF

Import the data in a Pandas DataFrame

- from pandas import read_excel
- series = read_excel([filename], sheet_name='MAdata',)

https://pandas.pydata.org/docs/reference/api/pandas.read_excel.html

ACF and PACF

Import functions to plot ACF and PACF

- from statsmodels.graphics.tsaplots import plot_acf, plot_pacf
- from statsmodels.tsa.tsatools import detrend

- plot_acf([series], title='', lags=xx)
- plot_pacf([series], title='', lags=xx)

https://www.statsmodels.org/stable/generated/statsmodels.graphics.tsaplots.plot_acf.html#statsmodels.graphics.tsaplots.plot_acf

ARIMA MODEL

Compute ARIMA MODEL

```
from statsmodels.tsa.arima.model import ARIMA.
model = ARIMA([series], order=(p, d, q)),
```

where p, d, and q represent the parameters of the model

https://www.statsmodels.org/stable/generated/statsmodels.tsa.arima.model.ARIMA.html

https://www.statsmodels.org/stable/dev/generated/statsmodels.base.model.GenericLikelihoodModelResults.aic.html#statsmodels.base.model.GenericLikelihoodModelResults.aic

TD - Consignes

- Givent the file **priceData.xlsx**

- Write a Python program to **compute the ACF and PACF** (test several lags) of the time series contained in **priceData.xlsx. Pay attention to TS trend. Try to use the detrend function to remove TS trend (statsmodels.tsa.tsatools) What you can say? What is the difference compared to simple integration?**

- Write a Python program to **estimate and compute the best ARIMA** model of the time series in **priceData.xlsx, based on AIC criterion.**

- **Which kind of model is choosen (ARIMA orders) ?**

  You can write your solution directly in Colab. Here an example, where to start:
  https://colab.research.google.com/drive/182kwm9aT2Wn179DiI1nPMJ8qEEj0vLq4?usp=sharing

References

- Andrew V. Metcalfe, **Paul S.P. Cowpertwait, Introductory Time Series with R** (2009).

- Aileen Nielsen, **Practical Time Series Analysis: Prediction with Statistics and Machine Learning** (2019).

- Changquan Huang , Alla Petukhina, **Applied Time Series Analysis and Forecasting with Python** (2022)
- Peter J. Brockwell, Richard A. Davis, **Introduction to Time Series and Forecasting** (2022)