Lab 3: Forecasting with exponential smoothing models

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1 Grid search for simple exponential smoothing

For the chosen value of the smoothing parameter α ($0 \leq \alpha \leq 1$), use the exponential weighted form of the SES model:

$$\hat{y}_{T+1|T} = \alpha y_T + (1-\alpha)\hat{y}_{T|T-1} \tag{1}$$

to generate T values of SES time series. For simplicity, assume that $l_0 = y_1$. Use the mean squared error to find α for which the fit to the training data is the best. Compare the obtained value with that returned by the statsmodels. Perform the calculations for the Algerian export data presented during the lecture.

2 Time series forecasting workflow

Use the posted pdf to get familiar with the forecasting workflow.

3 Holt's method : double exponential smoothing

From the Yahoo's finance website, download the IBM stock *daily* data (1962-1965).

- Import dataset.
- Select part of the time series for which the long-term linear trend is apparent.
- Set the frequency of the time series to business days.
- Why do you find nans in the modified dataframe?
- Use forward fill to remove nans.
- Use Holt function to perform forecasting with a double exponential smoothing model.
- Compare the forecasting accuracy of SES and Holt's method.