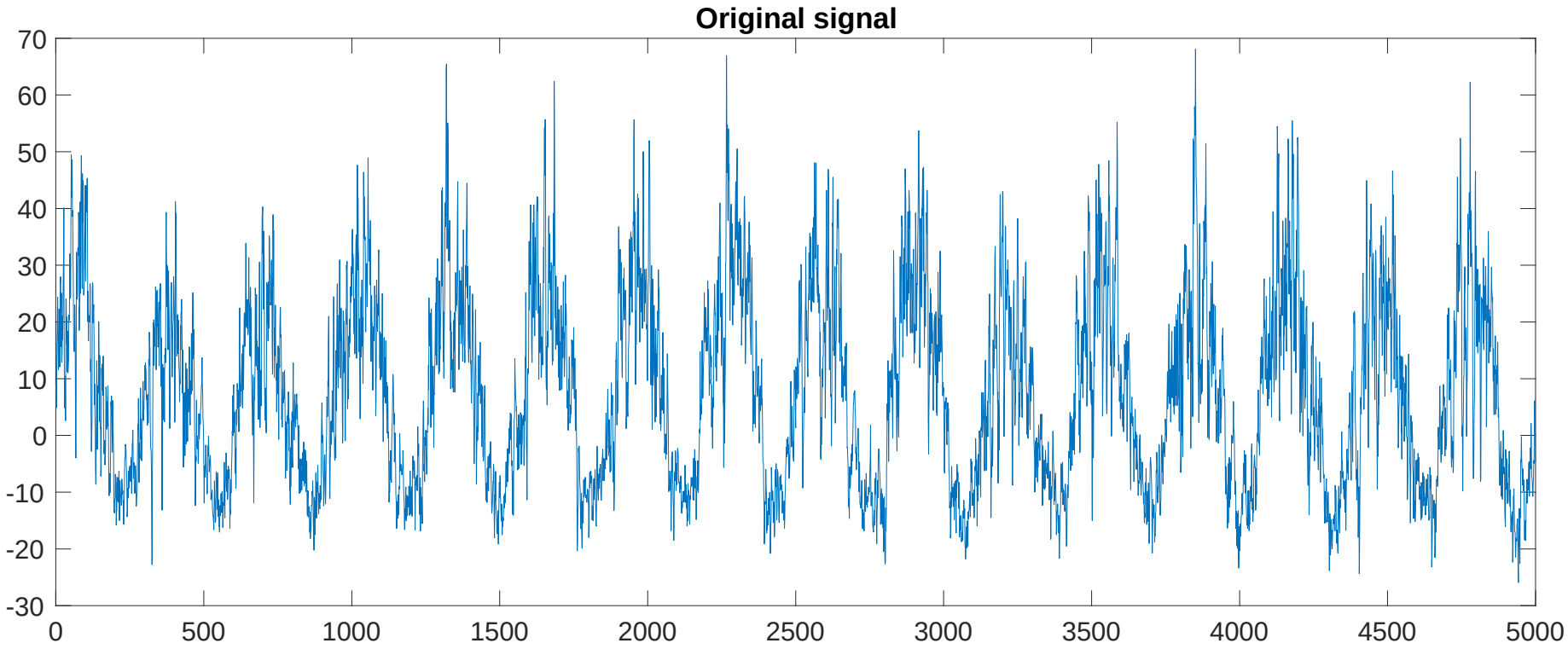
Water Resources Engineering and Management

Exercises Lecture 6: Time series analysis

24/03/2025

Exercise 1: time series diagnostic



Consider the non-stationary time series in the figure above.

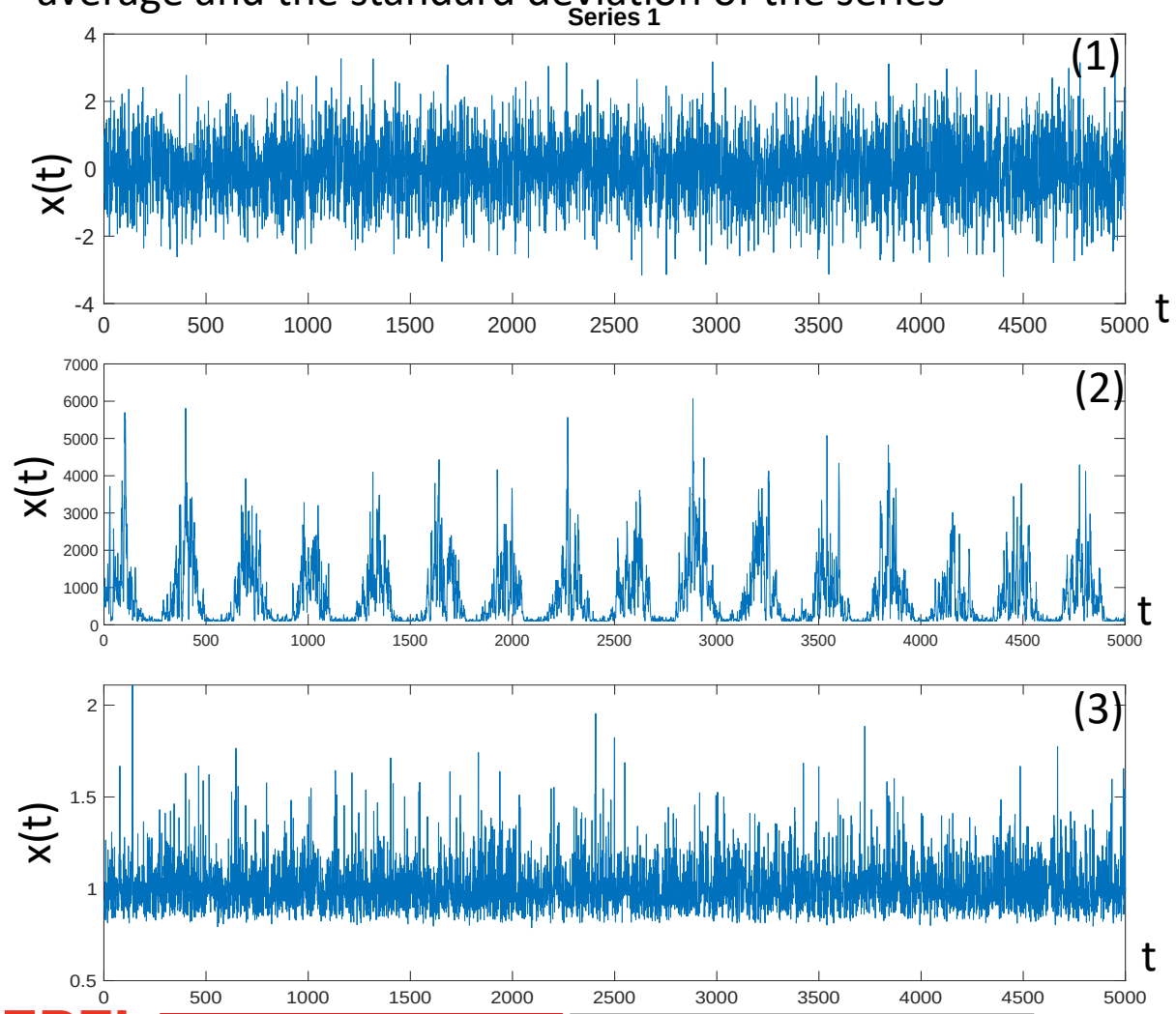
a) Describe all features that may characterize the system underlying dynamics;

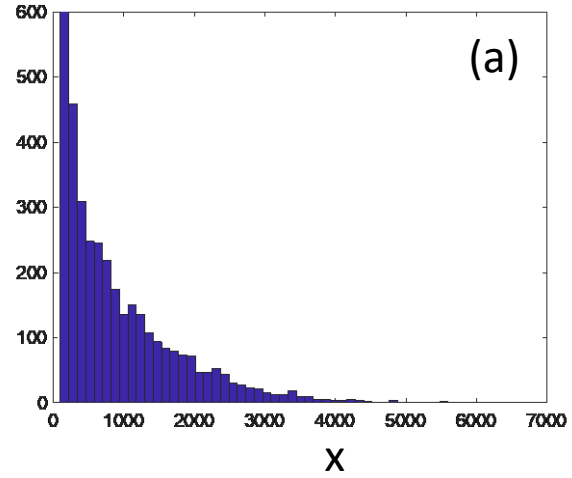
b) Illustrate the steps that should be done in order to obtain a stationary time series;

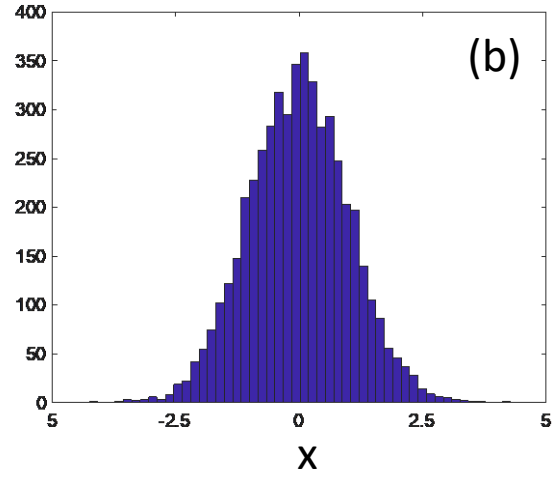
c) Explain and write how should one proceed in order to check if the stationary series of the residuals is pure noise or not

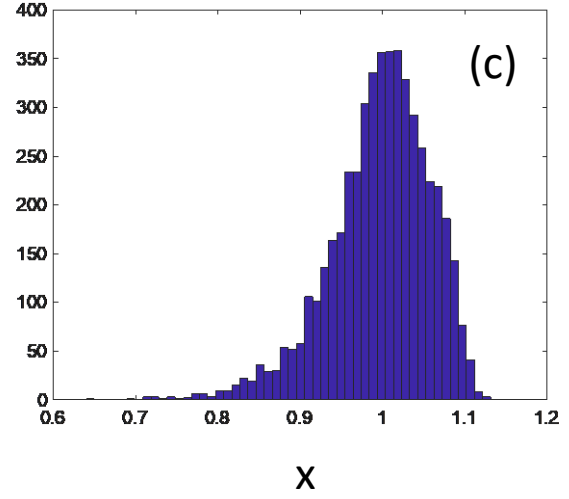
Exercise 2: time series distribution function

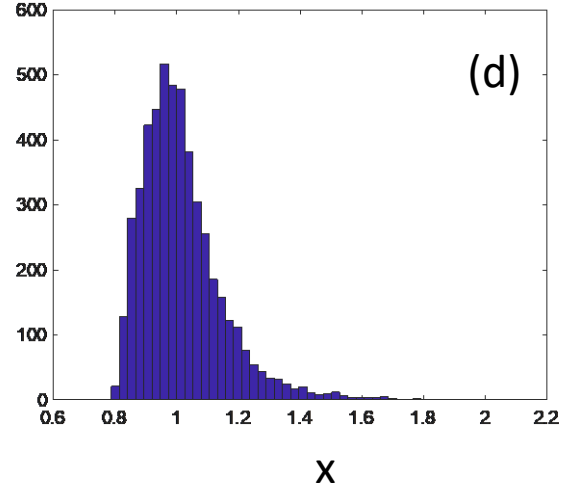
Consider the three time series (1-3) and the histograms (a-d). Recognize i) which time series corresponds to which histogram, and ii) assess whether the skewness coefficient is negative, null or positive; iii) Use the histograms to assess the average and the standard deviation of the series











Exercise 3. time series analysis

Consider the given time series of daily streamflow Q(t). Use Matlab, Python or Excel or whatever software and try to smooth the series by using both the moving average and the exponential smoothing technique.

- Try different averaging windows and smoothing parameters (α) and draw your conclusions. What effects do you observe on the filtered series?
- How large should be the moving window to approximate the signal with a smoothed line that follows the lower signal trend (e.g., green line)?

Is this at all possible?