**Tutorial 3 - Exercises**

1. Consider the following MA(1) model: $y_t = 10 + \varepsilon_t + 0.7\varepsilon_{t-1}$ where $\varepsilon \overset{iid}{\sim} \mathcal{N}(0,1)$.

   (a) State the theoretical ACF for the given model.

   Using R, simulate n = 120 sample values with the given model (*Hint: use the arima.sim function*).

   (b) Plot the data and interpret the plot as we did in class. (*Hint: Stationarity*)

   (c) Plot the sample ACF and interpret the resulting graph. What does the plot tell you about the underlying model?

2. Consider the MA(2) model $y_t = 10 + \varepsilon_t + 0.5\varepsilon_{t-1} + 0.3\varepsilon_{t-2}$, where $\varepsilon_t \overset{iid}{\sim} \mathcal{N}(0,1)$.

   (a) Please state the theoretical ACF for all lags that are nonzero.

   Using R, simulate n = 150 sample values with the given model.

   (b) Plot the data and interpret the plot as we did in class. (*Hint: Stationarity*)

   (c) Plot the sample ACF and interpret the resulting graph. What does the plot tell you about the underlying model?

3. Use the *quake* dataset from Tutorial 2. Plot the ACF and the PACF and interpret the respective graphs. Which model would you suggest based on this plot?

4. Load the *FB.csv* dataset, which includes Facebook daily stock data. Consider the adjusted closing price as a time series.

   (a) Plot the series, its ACF and PACF, and discuss its properties. Which model do you think fits here?

   (b) First difference this series and repeat. Which model fits the differences time series?

5. Figure 1 shows a set of time series on the left side, and sample ACFs on the right side. The order however is random. Please find the correct autocorrelation for each time series and state your thoughts about why you think they match?
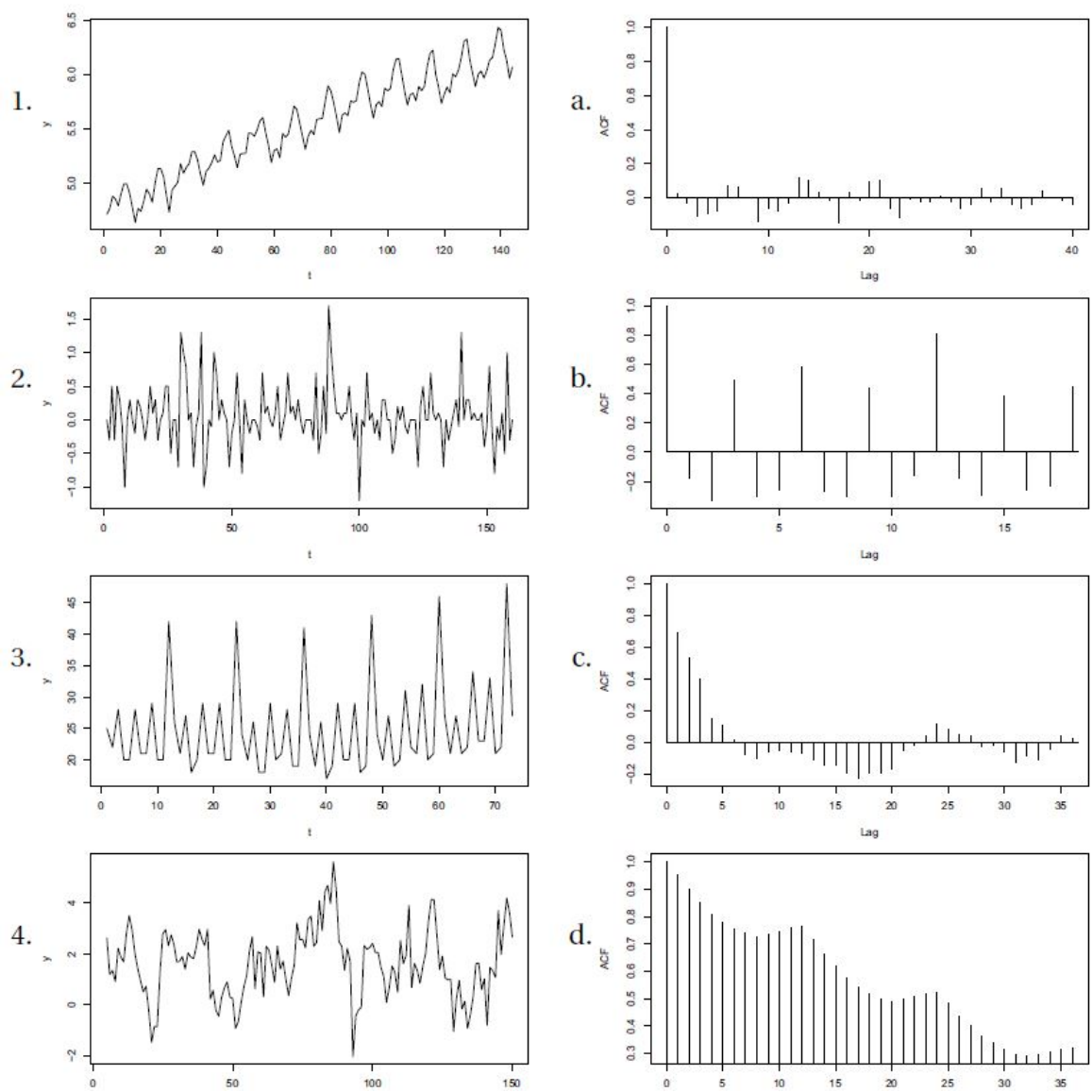
Figure 1: Time series and autocorrelations