Note: these assignments are planned to be solved by the teacher in the class

Assignment 1

A stationary time series of length 121 produced sample partial autocorrelation of $\hat{\phi}_{11} = 0.8$, $\hat{\phi}_{22} = -0.6$, $\hat{\phi}_{33} = 0.08$ and $\hat{\phi}_{44} = 0.01$. Based on this information alone, what model would we tentatively specify for the series?

Assignment 2

From a given time series, the following sample autocorrelations were computed: $\rho(1) = 0.8, \rho(2) = 0.5$, and the sample variance was equal to 5. Assuming that AR(2) model is appropriate, estimate the coefficients of this model and the error variance by using the method of moments (Yule-Walker equations).

Assignment 3

Consider an MA(1) process for which it is known that the process mean is zero. Based on a series of length *n* = 3, we observe $x_1 = 0, x_2 = -1, x_3 = 0.5$.
a) Find the conditional least square estimate of the model parameter.
b) Find an estimate of the noise variance.

Assignment 4

Assume that the fitted AR(1) model have the following estimated parameters: $\phi = -0.5, \mu = 10, \sigma_w^2 = 1$. Assuming also that $x_n = 12$, compute the following forecasts:

a) x_{n+1}^n
b) $\tilde{x}_{n+2}^n$
c) A prediction interval for $\tilde{x}_{n+2}^n$

Assignment 5

Identify the following model as a certain multiplicative seasonal ARIMA:

$$x_t = 0.5x_{t-1} + x_{t-4} - 0.5x_{t-5} + w_t - 0.2w_{t-1}$$

Assignment 6

Compute $\rho(h)$ for the following model by using general homogeneous equations:

$$x_t + 1.6x_{t-1} + 0.64x_{t-2} = w_t$$

Assignment 7

Write down a general equation for the following multiplicative seasonal ARIMA

$$ARIMA(0,1,2)\times(1,1,0)_3$$

Assignment 8

AR(2) model was estimated from a time series of length $n = 100$ and the estimated coefficients were $\phi_1 = -0.3$ and $\phi_2 = 0.1$. Autocovariances were estimated as $\gamma(0) = 0.8$ and $\gamma(1) = 0.4$ and $\sigma_w^2 = 1$. Compute a confidence interval for $\phi_1$by using the asymptotic parameter distribution.