Lab 6: ARIMA models

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1 Correlations in MA models

A moving average model of order q is defined as

$$y_t = c + \epsilon_t + \theta_1 \epsilon_{t-1} + \theta_2 \epsilon_{t-2} + ... + \theta_q \epsilon_{t-q}, \tag{1}$$

where ϵ is normally distributed white noise with mean zero and variance one.

Perform the following tasks:

- Write a function that calculates the values of MA(q) model. The function must have a parameter *burnin* that determines how many initial values are discarded.
- Calculate $n = 5000$ values of MA(1) model $y_t = 20 + \epsilon_t + 0.8\epsilon_{t-1}$.
- Calculate the autocorrelation (ACF) and partial autocorrelation (PACF) function for this time series.
- Repeat the calculations for MA(2) model $y_t = \epsilon_t - \epsilon_{t-1} + 0.8\epsilon_{t-2}$.
- Compare the structure of ACF/PACFs for AR and MA models. Use the AR results from the previous lab.

2 ARIMA forecasting

Find the best ARIMA(p,1,q) model that predicts Real Manufacturing and Trade Inventories. For calculations, use 1997-2018 data. Use the last 12 time series elements to test the forecasting accuracy. Difference that data and verify that the resulting time series is stationary. Use ARIMA function from statsmodels.tsa.arima.model.