PS7
Time Series

Problem 1

We will work with Argentina's industrial production growth rate. The series IP was genereted as a log-difference multiplied by 100. Source: IADB. The series is seasonally adjusted according to the source.

1. Open the Eviews file "argipm.wf1" and analyze stationarity of "IP".
2. Generate de demeaned series for IP and estimate an AR(4) by OLS.
3. Estimate an AR(4) by means of a state-space representation. (Read Eviews Guide (chapter "State Space Models and the Kalman Filter") for further details)

Problem 2

We will work with an adaptation of an exercise obtained from "Econometric Modelling with Time Series". The model is based on Fama and Gibbons (1982):

1. Using the data contained in the file named *exante.wf1* generate an ex-post real interest rate and call it "epr". Compute the ex post real interest rate as $y_t = i_t - 1200 * (\log p_t - \log p_{t-12})$
2. Estimate a state space model where the state variable is the ex-ante real interest rate and the signal variable is the ex-post real interest rate. Assume the state variable follows an AR(1) process. Use as initial values $\phi_0 = 0{,}5$, $\mu_0 = 2{,}17$, $\sigma^2_{v0} = 16$, $\sigma^2_{w0} = 1$.
3. Compare the unconditional mean and variance of the ex ante real rate with the sample mean and variance of the ex post real rate

Problem 3

Excercise based on "Econometric Modelling with Time Series". Use the *"byclicle.wf1"* file. Many researchers are interested in analyzing the state of the business cycle. To this end, the US Department of Commerce publishes a coincident index. Stock and Watson (1991) developed a model in which the comovements of various macroeconomic variables have a common element that can be captured by a single latent variable. That is, using the Kalman Filter, they created their own coincident index, which could be compare with DOC's index. We will be working with data from Australia: GDP, Unemployment (un), Employment (em), Sales, Income (inc)and Production($prod$). We shall use the model

$$\varsigma_{t+1} = \phi_1 \varsigma_t + \phi_2 \varsigma_{t-1} + v_t \qquad v_t \sim N(0,1)$$
$$y_{it} = \theta_i \varsigma_t + w_{it} \qquad v_t \sim N(0, \sigma_i^2) \qquad i = 1, .., 6$$

Note that $y_{it} = 100(\log(x_{i,t}) - \log(x_{i,t-12}))$ and were demeaned. Estimate the model above. Estimate the business cycle using the smoothed conditional mean $\varsigma_{t|T}$ and the alternative based on the coincident index ($bc_t = 100(log(coin_t) - log(coin_{t-12}))$). Compare the turnings points given by both estimators.
HINT: rescale $\varsigma_{t|T}$ to have the same sample variance as bc_t by multiplying $\varsigma_{t|T}$ by the ratio of the standard deviation of bc_t to the standard deviation of $\varsigma_{t|T}$

Problem 4

The file *datanew.wf1* contains US data for the period 1960q1 - 2018q1 . Use it to estimate the following equation

$$\log(\frac{m_t}{p_t y_t}) = \alpha_0 + \alpha_t i_t + \varepsilon_t$$
$$\alpha_t = \mu + \phi \alpha_{t-1} + u_t$$

Where α_t is the semi-elasticity of the demand for money which is assumed to be a time-varying parameter that follows an AR process.

1. Write the system as an State-Space with our usual notation.
2. Estimate the parameters and α_t using the Kalman Filter
3. Based on your results, comment on the stability of the semi elasticity of the demand for money.