6th set of assignments Time Series Analysis

1. Estimate a suitable ARIMA(p,d,q) model for the seasonally adjusted consumer price index (variable `pcqsa` in the dataset `svar.wf1`).

   - First, take the logarithm and conduct a unit root test to check if differencing the series is necessary.
   - Choose your specification of the ARMA(p,q) model by looking at the correlogram and checking the information criteria for different orders of p and q (up to ARMA(2,2)).
   - For estimation, use the sample up to the first quarter of the year 2000.
   - Then, forecast the consumer price index (in levels) from 2000:2 to 2002:1.
   - Save the forecast values and their standard errors in order to compute a 95% confidence interval.
   - Finally, plot your result.

2. Use an ARIMA$(0,1,1)(0,1,1)_4$ model to estimate and forecast the nominal GDP (variable `bipn` in the dataset `svar.wf1`). The above notation reads as follows (see Enders (1995) pp. 111-118 for details):

   ARIMA$(p,d,q)(P,D,Q)_s$, where

   $$\begin{aligned} p \text{ and } q &= \text{the nonseasonal ARMA coefficients} \\ d &= \text{number of nonseasonal differences} \\ P &= \text{number of multiplicative autoregressive coefficients} \\ D &= \text{number of seasonal differences} \\ Q &= \text{number of multiplicative moving average coefficients} \\ s &= \text{seasonal period} \end{aligned}$$

   In algebraic terms, the model looks like:

   $$(1-L)(1-L^4)Y_t = (1-\theta_1 L)(1-\theta_4 L^4)\varepsilon_t$$

   - For estimation, use the sample up to the first quarter of the year 1997
   - In order to forecast the level of the series, use `d(log(bipn)-log(bipn(-4)))` as the dependent variable in the equation (forecast horizon: 1997:2-2002:1).
   - Save the forecast values and their standard errors in order to compute a 95% confidence interval.
   - Finally, plot your result.