Prof. Dr. Kai Carstensen Professor of Econometrics

Home Assignment - Time Series Econometrics

Summer Term 2024

Deadline: 30 June 2024

Preliminary remarks:

1. Please read these instructions carefully!
2. This is a **voluntary** exercise.
3. You can earn up to six points that are valid for both examination periods of the SS2024 and will be added to the points that you obtain in your exam.
4. Use Matlab as software packages.
5. You are allowed to work in groups (up to 5 participants).
6. Create all necessary outputs by Matlab commands and answer open questions as comments (% in Matlab).
7. Please submit one `m.script-file` with answers via email until **June 30th, 11:59pm** to: l.tran@stat-econ.uni-kiel.de
8. Write name, enrolment and stu-numbers of each group member as a comment at the top of your `m.script-file`!
9. Please name your files `HA_EconII_Name.m` with the surname of the participant responsible for submitting them.

Good luck!

The datafile `HAdata.xlsx` contains two variables of the US: `GDP` (real GDP, seasonally adjusted) and `SPREAD` (the term spread between the 10-year and 3-month interest rates). The variables are quarterly spanning over the period from 1985Q1 to 2024Q1. The dataset is collected from Federal Reserve Economic Data (FRED).

Questions

1. Import the dataset. Plot the time series of `GDP and SPREAD` in one figure. *Hint:* use the functions `subplot` or `tiledlayout`.

2. Perform an ADF test for all variables. Based on the figure, discuss the appropriate ADF hypotheses (with/out intercept and trend) for each time series. Which of them contains a unit root?

3. Let ΔY be the first difference of `log(GDP)`. Consider the ADL(p,q) model.

$$\Delta Y_t = \mu + \sum_{i=1}^{p} \alpha_i \Delta Y_{t-i} + \sum_{j=0}^{q} \beta_j SPREAD_{t-j} + e_t \tag{1}$$

   Assume p=q. Use the information criteria, i.e., AIC and BIC, to determine p and q.

4. Consider the ADL(1,1) model.

$$\Delta Y_t = \mu + \alpha_1 \Delta Y_{t-1} + \beta_0 SPREAD_t + \beta_1 SPREAD_{t-1} + e_t \tag{2}$$

   a) Estimate equation (2) **using OLS**. Plot the autocorrelogram of the residual. Does the residual look serially correlated? Use an autocorrelation test to re-affirm your conclusion.

   b) Assume the residual is autocorrelated. Re-estimate (2) and report the Newey-West variance estimator. Perform Wald test with the null hypothesis, $H0 : \beta_0 = \beta_1 = 0$. *Hint:* use the function `waldtest`.