Macroeconometrics 5364 SS22

Exercise 3

Due: 01.06.2022 23.59

Estimation and Identification of VARs (10 points)

You may use R as statistical software for solving the exercise.[1] Please make sure that you clearly and precisely document what you have done such that a fellow student is able to reproduce your results without problems. Please be prepared to present your solution in next week's class.

1. Download the following macro time series from the FRED database.[2]: Real GDP (`GDPC1`), GDP Deflator (`GDPDEF`), and the effective Federal Funds rate (`FEDFUNDS`) as indicator of *economic activity*, *prices*, and *short-term interest rates*, respectively. Use 1955Q1 to 2020Q4 as time span.

2. Compute year-on-year growth rates for real GDP and the GDP Deflator. Multiply the growth rates times 100 to get percentage points. Plot each of the series.

3. Inspect the series and test for stationarity.[3] In case the series is not stationary take further differences.

4. Write down a VAR(p) process in its general form. Transform the VAR(p) process to a SVAR(p) process with the according transformation. Elaborate on the *recursive identification* of monetary policy. What is the idea and how is it usually implemented?

5. **Frequentist VAR**: Use the **vars** package to estimate and identify the VAR *recursively* in order to get an identified monetary policy shock. Plot the impulse responses of the three variables in the system to the monetary policy shock. Interpret them: In particular, answer the following questions:

   - How do you decide on the number of lags in the VAR?
   - What is the unit of measurement on each of the y-axes?
   - What is the dynamic impulse response of each of the variables to a monetary policy shock?
   - Is this in accordance with what we would expect from theory?

6. **Robustness**: Provide robustness along two dimensions: choice of variables and sample period.

   - Exchange one variable at a time and re-do the analsis in 5). In particular, find another variable depicting *economic activity*, *prices*, or *short-term interest rates*. Argue for the choice of the variable and discuss any differences in the impulse responses.

[1] In case of troubles with R, the tutor, Jakob Zellmann, `jakob.zellmann@wu.ac.at` will provide assistance.

[2] Link: https://fred.stlouisfed.org. You may want to consider the R package **fredr** (https://cran.r-project.org/web/packages/fredr/).

[3] You may want to consider the `adf.test` command from the **tseries** package. It executes the augmented Dickey-Fuller test.

- Elaborate on a suitable sample split. Which time point makes sense? Critically discuss. Re-do the analysis for the constrained sample. Discuss the stability of the findings with respect to the sample under consideration.

Bonus: Bayesian VARs (3 points)

1. **Bayesian VAR**: Use the **BVAR** package to estimate and identify the VAR *recursively* in order to get an identified monetary policy shock. Plot the impulse response of the three variables in the system to the monetary policy shock. Interpret them: In particular, answer the following questions:

   - Which prior did you use?
   - What are the differences compared to the frequentist VAR?
   - How do you interpret the uncertainty bands?