Assignment 1

Rules:

- You may use LaTeX, Word, or any other text editor but please hand in a **pdf document** with your solution.
- I recommend to use **R** for solving the assignment. Alternatively, you may use Python, Matlab, or Ox. No Eviews, Stata, or anything else.
- You have to write your own code - built-in packages (such as **vars** in R) may only be used to double-check the results. **Please hand in your code in an Appendix.**
- You should **answer** the questions - do not just paste estimation output without explanation (except when nothing else is asked). **All results should be presented in a readable, clear and consise way.**

In this assignment, you are asked to build multiple time series models for quarterly U.S. data on gross domestic product (GDP), consumer price index (CPI), and Federal funds rate (IR), a monetary policy interest rate that is set by the central bank. Download the data set **data_assignment1** from Canvas and load it into your software.

(a) (1 point) Plot the three time series in separate graphs. Make sure the x-axis shows the correct time. Transform the two macro series (GDP and CPI) to monthly log growth rates. Plot the bivariate transformed data set as well.

(b) (2 point) Estimate a **bivariate** $VAR(3)$ model for GDP growth and the inflation rate. Include a constant term. Report the estimated coefficients. Does the estimated VAR fulfill the stability condition? Justify your answer by reporting the appropriate results.

(c) (3 points) Compute the Akaike, Schwartz, and Hannan-Quinn information criteria for the $VAR(3)$, and also for a $VAR(2)$, and a $VAR(1)$. Which model is the best choice to describe the data according to the least conservative information criterion?
Hint: In order to make a reasonable comparison, you should set aside **3** pre-sample values, that you also do not use for estimating the lower order VARs. This means that the sample size used for estimation is always the same.

(d) (3 points) Using the best VAR model from part (c), calculate and plot the four response functions of your system after impulses of one unit. Also plot the accumulated impulse responses. Interpret the two sets of plots.

(e) (3 points) Estimate a three-dimensional $VAR(2)$ model that includes GDP growth, inflation rate and federal funds rate. Include a constant term. Report the estimated coefficients.

(f) (3 points) Using the estimated three-dimensional $VAR(2)$, test whether the federal funds rate Granger-causes the two macro series as a group. Interpret the test result.