Macroeconomic Theory II (1412)

Data Assignment in Matlab/Python

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Exercise 1 Use the file mat file GDP_data to load your dataset (see in the MT2 GitHub Repository). In this file, there are three matrices with data:

1. Nominal GDP

2. Real GDP

3. GDP Index

Each matrix contains the respective time series over the period 1995-2022 for Euro Area and Greece in the first and second column, respectively.
Create an M-file which executes the following:

1. Loads the mat file with your dataset.

2. Creates a matrix $gdp\ \_deflator$ in which it stores the respective GDP deflator for EA and Greece.

3. Take the logarithm (use log(X))

4. Computes the growth rates of nominal, $\Delta log(Y_t)$, real GDP, $\Delta(log(y_t))$, and GDP deflator, $\Delta log(P_t)$.

5. Shows that
$$\frac{Y_t}{Y_{t-1}} = \frac{y_t}{y_{t-1}} \frac{P_t}{P_{t-1}}$$

   or in logs

$$\Delta log(Y_t) = \Delta(log(y_t)) + \Delta log(P_t)$$

Exercise 2 Create a Matlab **function** that finds the base year, i.e., finds t for which $Y_t = y_t$.

Exercise 3 Create a Matlab **function** that plots in three subplots Nominal and real GDP growth as well as the growth rate of GDP deflator.

Exercise 4 Now, use the excel file entitled as $Annual\ \_Data$ which contains the main macroeconomic aggregates on an annual frequency (nominal, real and deflators) for EA and Greece taken from Eurostat and repeat the steps of exercises 1 to 3 for the following variables:

1. Final consumption expenditure

2. Final consumption expenditure of general government

3. Final consumption expenditure of households

4. Gross fixed capital formation

5. Exports of goods and services

6. Imports of goods and services

Exercise 5 Now, use the excel file entitled as *Quarterly _Data* which contains the main macroeconomic aggregates on quarterly frequency taken from Eurostat and repeat exercises 1-3 for the following variables:

1. Gross domestic product

2. Final consumption expenditure

3. Gross fixed capital formation

Exercise 6 Compute the trend and the cyclical component of GDP, Private consumption and Investment (GFCF) using the HP-filter. All variables in real terms. (**Hint:** To do this use the Matlab built-in function *hpfilter*)

1. For each variable plot in the same graph the actual macroeconomic variable and its trend.

2. Plot in a single plot three subplots with the cyclical component of each variable.

3. Plot in a single plot all the cyclical components.

4. Compute the volatility of the cyclical component of each variable.

5. Compute the relative volatility of the cyclical component of each variable with respect to the volatility of the cyclical component of GDP (i.e., $\text{vol}(C_t)/\text{vol}(Y_t)$).

6. Create a matlab function that takes as inputs the matrix with the macro data of ex. 6, executes steps 4 and 5 and delivers as output a Table with the relative volatilities.