

ADVANCED MACROECONOMICS

Problem Set 5: Business Cycle Moments

Due Date: July 3, 8:15

(Numerical) Matlab Exercises are designated with N
References to exercises in lecture notes are given in square brackets

Exercise N1 TFP fluctuations

1. Download the following statistical US time series for the time period from 1948Q1 to 2018Q1, load them into Matlab (using either `xlsread` or the Matlab import utility¹), and plot them:
 - Capital Utilization in Manufacturing (SIC) (Code: G17/CAPUTL/CAPUTL.B00004.S.Q or CAPUTL), Source: Federal Reserve, Table G.17 - Industrial Production and Capacity Utilization, www.federalreserve.gov/, denoted in the following with u_t . This series indicates the utilization of the existing capital stock in percent. (Capital utilization and Capacity utilization are used synonymously.)
 - Real Gross Domestic Product, Chained Dollars, Source: U.S. Department of Commerce: Bureau of Economic Analysis <http://bea.gov/> or Federal Reserve Economic Data (FRED) <http://research.stlouisfed.org/fred2/>, denoted in the following with Y_t .
 - Nonfarm Business Hours Index (2009=100), (Code: PRS85006033), Source: Bureau of Labor Statistics <http://bls.gov/>, denoted in the following with L_t .
2. Load the capital index, denoted with K_t , from the Excel-file `CapitalStock.xlsx` into Matlab.
3. Compute the logarithm of the Solow-residual for 1948Q1-2018Q1

$$\log(SR_t) = \log(Y_t) - \alpha \log(K_t) - (1 - \alpha) \log(L_t) \quad (1)$$

and plot it. Use the average capital share in the US data of $\alpha = 0.338$. Use the capital index as K_t .

4. Linearly detrend $\log(SR_t)$ (Hint: use `detrend`) and plot the detrended series.
5. Compute an $AR(1)$ -process for the detrended logarithm of the Solow-residual and report the autocorrelation coefficient and the variance of the error term (Hint: use either `regress` or the regression formula `x\y`). [Exercise 3, Chapter 7]
6. Now use the HP-filter function (`myhpfiler.m`) instead of the linear trend and plot the resulting detrended Solow-residual.
7. Repeat subquestions 4 to 6 with $K_t u_t$ instead of K_t in (1). Note: Do not forget to label the x-axis correctly.

¹If you are using the import utility, please provide the necessary data as mat-file, type `help save` for more.

Exercise N2

Business Cycle Statistics

For each group, download the following time series for **two** of your birth countries into an Excel Datasheet:

- a) Real gross domestic product (often termed “at constant prices”)
- b) Nominal gross domestic product (often termed “at current prices”)
- c) GDP deflator
- d) Private consumption
- e) Private investment (often called “gross fixed capital formation ”)
- f) Government spending, i.e. government consumption plus investment (alternatively: only government consumption)
- g) Net Exports (you may have to compute them as Exports minus Imports)
- h) Consumer price index (CPI)
- i) Total Population or total workforce

You should download data from the **quarterly national accounts**. However, particularly for less wealthy countries there may only be annual series available. So if you cannot find quarterly data, download the annual ones. If you find quarterly data, **please download seasonally adjusted data**.

Ultimately, we are interested in **real variables**. Thus, for items d) to f) try to download real variables. If no real variables are available, take the nominal ones. We will then use the GDP deflator to deflate the series. Note that not for all countries a) to c) are available. But all should have two out of three so that the third one can be constructed.

Data sources are typically the national central banks and the national statistical offices.

Bring your data and code to the exercise session. In the following exercises, do not forget to label the axes. All necessary data manipulations should be done in Matlab, not Excel.

1. Download the data into an Excel file. Create a timeline in the first column. Then place the items a) to i) in columns B to J. If a variable is not available, leave the respective column empty.
2. Read the series into Matlab and plot the log per capita values of items a) to f), and the level for c).
3. Plot the share of net exports and government spending in GDP. Remember that you either have to take only real series or nominal series.
4. Plot the growth rates of the consumer price index. You can use log-differences.