

ISCTE — INSTITUTO UNIVERSITÁRIO DE LISBOA

BA in Economics

MODERN MACROECONOMICS

MATLAB Questions

To be submitted by 5 May 2014

Please notice that what is required from you in this exercise is basically two things:

1. *Write, adapt routines (I send some routines to you for this purpose), or interpret a routine in Matlab. These routines should be sent back to me (once adapted to your exercise) as part of the solutions to the homework.*
2. *Copy the figures into a Word file (or any other text editor available), and provide some comments about what you have done, if this comment is required to.*

Question I. Write a script code in order to have in the same figure the following three functions represented:

$$\begin{aligned}f(x) &= 2x^2 + 3x + 6 \\g(x) &= -4x + x^2 \\z(x) &= -3\end{aligned}$$

with x defined in the interval $[-2, 4]$. Use different colors for representing each function in the same figure. Hint: You could just adapt the routine that was provided to you in classes (`par_script.m`) in order to answer this question.

Question II. Assume the two following equations which represent the preferences/utility of two different economic agents concerning the pairs of unemployment (x) versus inflation (y), and tea (t) versus oranges (c):

$$\begin{aligned}z &= f(x, y) = 5(0.5x^2 + 2y^2) \\u &= g(t, c) = 5t^{0.6}c^{0.4}\end{aligned}$$

The two exogenous variables in $f(x; y)$ are defined in the interval $[-2, 2]$ with an increment step of 0.1; and defined in the interval $[0, 4]$ for the function $g(t, c)$, with the same increment step.

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Adapting the scripts attached "BC-Objetivo.m" and "BC_Objetivo_Contour.m" present the figures associated with each equation above. Can you provide (in the text) a small explanation about what each one of them may represent in economics (e.g., which ones look like bad goods, good goods, indifference curves associated with each of those, ...)?

Question III. Go to the Federal Reserve Bank of St. Louis, to FRED (<http://research.stlouisfed.org/fred2/>) and download four time series. **Do not forget to choose all the time to download only "seasonally adjusted" data.**

1. One related to a real GDP series (quarterly data), and another related to a monetary aggregate at your choice (quarterly data as well).
2. And the last two should be: (i) a consumer price index series, and (ii) the unemployment rate. These two should have also quarterly observations.

Put them in a same Excel file. From the Excel, save the file as a `txt` file (in Excel when the `txt` option appears, choose the "tab. delimited" option). Remember that in order to save it as a `txt` file, the Excel file has to be "cleaned up": no notes, no figures, nothing; just numbers in every column (and don't forget that Matlab does not recognize ",", only "."). What you are requested to perform is the following:

1. Write a routine that graphically represents the four time series in 4 panels. **That is: 4 panels in 1 same figure.** Present the figure in the Word file.
2. Write a routine that compares the evolution (that is, the time series) of the unemployment rate and the inflation rate in a `plotyy`. Present the figure in the Word file.
3. Do the same for the other two time series.

Question IV. Present a script that is capable of showing the dynamics of the following stochastic process (x_t):

$$x_{t+1} = a + bx_t + c\varepsilon_t$$

where ε_t is a IID random variable, with mean equal to zero and variance equal to 1. In Matlab this random variable is written as: `randn(1)`. The parameters are as follows: $a = 2, b = 0.5, c = 1/10$.

1. Simulate the dynamics of this process for $t = [1, 80]$.
2. Show the time series also for the random component of this process.

Instead of answering question number V (next page), you may choose to answer question number VI. But answer only to one of them:

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Question V. Using the routine "phillips_script_MasterNovember2012.m" that is attached to this link, and using the data you downloaded from FRED (about the rate of inflation and unemployment rates) interpret the output that we get from running this routine.

Question VI. By adapting the routine "hpfilter_script.m"(attached to this document) to your data file, obtain the Hodrick-Prescott filter for two of your time series (GDP and another one at your choice). Is this second variable procyclical or countercyclical? You should answer this question by looking at a cross plot of the two variables under consideration, which appears also in the output of the script above.