

EC377.01
The World Economy:
From the Gold Standard to Globalization
Homework Assignment 1

Fabio Ghironi
Boston College

Due in class on Thursday, January 22, 2009

This homework assignment requires you to review basic mathematical tools that we will use later in the course and some macroeconomic theory.

1 Math Review

1. Suppose the variable y is a continuous, differentiable function f of the variable x : $y = f(x)$. Denote the first derivative of $f(x)$ with respect to x with f_x . Suppose x changes by the amount dx , where dx denotes a small increment in x . By how much does y change? (Denote the change in y with dy .)
2. Suppose the variable y is a continuous, differentiable function f of the variables x and z : $y = f(x, z)$. Denote the first derivative of $f(x, z)$ with respect to x with f_x and the first derivative of $f(x, z)$ with respect to z with f_z . Suppose x changes by the amount dx , where dx denotes a small increment in x , while z remains unchanged. By how much does y change? Now suppose z changes by the amount dz , where dz denotes a small increment in z , while x remains unchanged. By how much does y change? (Denote the change in y with dy .)
3. Suppose the variable y is the product of the variable x times a continuous, differentiable function f of x : $y = xf(x)$. Suppose x changes by the amount dx . By how much does y change? (Denote the change in y with dy .)
4. If the variables Y and X are related by $Y = X^\alpha$, where α is a parameter, how is $\log Y$ related to $\log X$?

5. If the variables Y , X , and Z are related by $Y = (X/Z)^\alpha$, where α is a parameter, how is $\log Y$ related to $\log X$ and $\log Z$?
6. If the variables Y , X , and Z are related by $Y = X^\alpha Z^\beta$, where α and β are parameters, how is $\log Y$ related to $\log X$ and $\log Z$?
7. Suppose the variable L depends on the variable y according to: $L = ay^2 + by + c$, where a , b , and c are strictly positive parameters. Find the first- and second-order conditions for the problem of minimizing L with respect to y . Why is checking the second-order condition redundant in this exercise?
8. Suppose the variable L depends on the variable y according to: $L = ay^2$, where a is a strictly positive parameter. However, now y depends on x and z according to $y = bx + cz$, where b and c are parameters. Find the first-order condition for the problem of minimizing L with respect to x . Solve this first-order condition for x as a function of z . Why is it the case that we do not need to check the second-order condition to be sure that the solution we find minimizes L ?
9. Suppose the variables y_1 and y_2 depend on x as in the following system:

$$\begin{aligned} y_1 &= a_1 y_2 + b_1 x, \\ y_2 &= a_2 y_1 + b_2 x, \end{aligned}$$

where a_1 , a_2 , b_1 , and b_2 are parameters. Solve the system for y_1 and y_2 as functions of x .

2 Macroeconomic Theory Review

1. Using a standard Aggregate Supply-Aggregate Demand diagram explain the effects of a monetary policy expansion (an increase in money supply) starting from a situation in which output is at its potential (or natural) level. Explain clearly the difference between short-run effects and long-run effects, and the role of price expectations in the dynamics from the short to the long run. Next, go “behind the scenes”: What happens to the IS and LM curves in the IS-LM diagram in the short run, long run, and during the transition? What happens to the nominal interest rate? What happens to the real interest rate in the short and in the long run?

2. Using a standard Aggregate Supply-Aggregate Demand diagram explain the effects of a fiscal policy expansion (an increase in government spending) starting from a situation in which output is at its potential (or natural) level. Explain clearly the difference between short-run effects and long-run effects, and the role of price expectations in the dynamics from the short to the long run. Next, go “behind the scenes”: What happens to the IS and LM curves in the IS-LM diagram in the short run, long run, and during the transition? What happens to the nominal interest rate?
 3. Using a standard Aggregate Supply-Aggregate Demand diagram explain the effects of an increase in oil prices starting from a situation in which output is at its potential (or natural) level. Explain clearly the difference between short-run effects and long-run effects, and the role of price expectations in the dynamics from the short to the long run. Why does an oil price shock pose a difficult challenge for policy?
- Note: Depending on your macroeconomic theory textbook, what I referred to as long run in the exercises above may be referred to as medium run. For instance, this is the convention in the editions of Olivier Blanchard’s textbook that I used in the past. Feel free to use the convention you are familiar with.