

14.02 Principles of Macroeconomics

Problem Set #3, Questions

Posted: Thursday, February 28, 2002

Due Date: Thursday, March 7, 2002

Please remember to write your TA's name and section time on the front page of your problem set.

Part I: True, False Questions. Decide whether each statement is true or false and justify your answer with a short argument. (2 points each, 12 points total)

- 1.) Investment does not count in current GDP, because it increases the capital stock that will be used in the future.
- 2.) Over the past century, technological convergence allowed some poor countries to grow faster than rich countries.
- 3.) Bond prices are negatively related to the interest rate.
- 4.) The estimate from a OLS regression of dC on dY^D gives the marginal propensity to consume.
- 5.) The Central Bank fully controls inflation.
- 6.) Inflation is good, as it increases wages.

Part II: (50 points total)

You take a summer job at the central bank of New Zealand. The governor of the central bank leaves for a holiday right when you start working. You are in charge of monetary policy over the next three months....

1. You want to learn something about money demand. You remember from class
$$M^d = \alpha Y L(i)$$
 - a) **(2 points)** Explain why money demand is proportional to nominal income Y .
 - b) **(2 points)** How does money demand depend on i ? Give an economic explanation for this dependency.
2. Now you want to obtain an econometric model from this specification.
 - a) **(2 points)** You specify the following functional form
$$L(i) = \exp(-\alpha - \beta i)$$
Replace in the money demand equation from question 1, take logarithms of your equation, and impose equilibrium by setting $M = M^d$. Call it equation 2.a.
 - b) **(2 points)** By using the following change of variable, $v = \ln Y - \ln M$, in equation 2.a., explain in words why the following econometric model makes sense:
$$v = \alpha + \beta i + \varepsilon$$
 - c) **(2 points)** Give the formulas for the estimates of α and β and interpret.

3. Now you go to the data. You want to estimate your money demand function. You find quarterly data from Mar 1994 to Sep 2001. You have a quarterly series of nominal GDP, that you denoted \$Y, money supply in circulation denoted M, and 90 day nominal interest rates i. You can download the data directly from the website of the central bank of New Zealand at www.rbnz.govt.nz or you simply download the spreadsheet from web.mit.edu/14.02/www.
 - a) **(5 points)** Plot Y versus M and interpret.
 - b) **(5 points)** Construct v, and plot v versus i. Interpret.
4. Run your regression of v on i. (Hint: you can run the regression in Excel, under Tools, select Data Analysis. If it is not there, go to Tools, and then Add-Ins, and select to install the Analysis ToolPak. After selecting the Data Analysis, choose to run a regression. Then all you need to is to specify your dependent variable and explanatory variable.
 - a) **(8 points)** What is your estimate of α and β ?
 - b) **(8 points)** Interpret your t-statistics and the R2 that you find.
5. Now you want to check for misspecification. Run the following regression:

$$\ln M = \alpha + \beta i + \gamma \ln \$Y + \varepsilon$$
 - a) **(1 Point)** What coefficient do you expect for γ ?
 - b) **(8 Points)** Interpret your regression results. Is the coefficient you find in your regression significantly different from the one you expected?
6. **(5 points)** The next day you go to work, you look at the regressions that you estimated in parts 4 and 5. Did you really estimate a money demand function? Explain. (Hint: think about IS-LM)

Part III A simple AS-AD model (Total points: 40)

(For simplicity, we assume a closed economy: $X=IM=0$)

Important note: All questions of this problem build one onto the next, so answer questions and solve equations sequentially.

1. IS: The goods market
 1. **(2 points)** State the definition of private savings and government saving, and use the following accounting identity to relate I and S:

$$Y \equiv C + I + G$$
 2. **(2 points)** From now on and for the rest of the question, consider the following consumption and investment functions: $C = 50 + 0.6(Y - T)$ and $I = 50 - i$. Solve for i and draw aggregate investment in the (i, Y) space.
 3. **(2 points)** What does this curve represent?
 4. **(2 points)** Explain what happens when G increases, holding T fix.
2. LM: The money market
 - a) **(2 points)** Money demand is given by

$$M^d = PYe^{-i} \Rightarrow \ln M^d = \ln P + \ln Y - i$$

Explain in words why money demand depends positively on the price level and aggregate output, and negatively on the interest rate.
 - b) **(2 points)** The central bank controls money supply, so that the equilibrium condition on the money market is money supply = money demand

$[M^s=M^d=M]$. This is the LM curve. Solve the equilibrium condition for i , and draw it in the (i, Y) space.

- c) **(2 points)** What does this curve represent?
 - d) **(2 points)** What happens when P increases? Explain.
 - e) **(2 points)** Explain the economics of expansionary monetary policy via an open market operation, and draw the appropriate graph.
 - f) **(3 points)** Suppose that the White House decides to increase spending, and the fed decides to accommodate the fiscal policy by changing its monetary policy. For a given change in G , and assuming that $T=0$, by how much needs money supply change to keep the interest rate fixed?
3. AD: The aggregate demand curve
- a. **(2 points)** The IS-LM curves give you the equilibrium on the money and goods market. Assume $T=0$. By combining IS and LM from questions 1. and 2., eliminate the interest rate. Solve your equation for P . This is the AD curve.
 - b. **(2 points)** What does this curve represent?
 - c. **(2 points)** Your AD curve from 3 a) depends on P^e , G and M . Draw the curve in space (P, Y) . What happens when M increases? Explain. What happens to the AD curve when G increases? Explain.
4. AS: Aggregate supply
- a. **(1 point)** Denote the number of people who would like to work by L , and the number of people who are employed by N . Write down the definition of the unemployment rate and call it 4.a
 - b. **(1 point)** Assume that the wage setting equation is given by: $W/P^e=10-u$ What is the natural rate of unemployment implied by this equation?
 - c. **(1 point)** Replace your definition of the unemployment rate from part a. Call your new equation 4.c.
 - d. **(1 point)** Assume that the price setting equation is given by $P=2W$. How big is the mark-up implied by this equation?
 - e. **(1 point)** Assume $L=100$ and use the price setting equation to eliminate W in equation 4.c. Interpret., and call your new equation 4.e.
 - f. **(1 point)** Assume that the production technology is $Y=N$. What happens to the curve when expected prices shift? Explain
 - g. **(1 point)** What does this curve represent?
 - h. **(1 point)** Draw the curve in (P, Y) .
5. Equilibrium
- a) **(2 points)** Draw your AD curve from part 3. together with your AS curve from part 4. in space (P, Y) .
 - b) **(3 points)** Assume that P^e increases. What kind of fiscal or monetary policy would you advise the government to do? What is the trade-off? Argue using graphs.