Macroeconomics 2014
Problem set #6
Due: June 24th at the beginning of the class

a)Make a photocopy of your answer and keep your photocopy and turn in the original so that we can discuss the answer after your submission of your homework. Sometimes, the return of your homework can be late. So use the photocopy for your self-study.

b)The submission of the homework is counted as the attendance of the class. Thus, the submission of your homework by those other than yourself is not accepted.

c) The late homework is not accepted.

d)For grading, the following rule is applied. For excellent work, A. If the homework shows that you make a substantial effort and the result is above average, it is B. If the homework shows that you make a substantial effort, but the result is poor, it is B-. If the homework shows that you are not making a substantial effort to solve the problem set, it is C-.

Read the chapter on Keynsian cross and IS-LM. Then solve the following questions and discuss in your study group. (PDF is attached to clarify the questions since different students have different version of the textbook.) Many questions in the final exam will come from the following questions.

1. Question 1 on page 324.
2. Question 4 on page 324.
3. Question 5 on page 324.
4. Question 1on page 350.
5. Question 2 on page 350.
6. Question 3 on page 350.
7. Question 4 on page 351.
8. Question 8 on page 351.
9. Question 9 on page 352.

income and the interest rate. A higher level of income raises the demand for real money balances, and this in turn raises the interest rate. The upward-sloping *LM* curve summarizes this positive relationship between income and the interest rate.

5. The *IS–LM* model combines the elements of the Keynesian cross and the elements of the theory of liquidity preference. The *IS* curve shows the points that satisfy equilibrium in the goods market, and the *LM* curve shows the points that satisfy equilibrium in the money market. The intersection of the *IS* and *LM* curves shows the interest rate and income that satisfy equilibrium in both markets for a given price level.

KEY CONCEPTS

IS–LM model
IS curve
LM curve
Keynesian cross
Government-purchases multiplier
Tax multiplier
Theory of liquidity preference

QUESTIONS FOR REVIEW

1. Use the Keynesian cross to explain why fiscal policy has a multiplied effect on national income.
2. Use the theory of liquidity preference to explain why an increase in the money supply lowers the interest rate. What does this explanation assume about the price level?
3. Why does the *IS* curve slope downward?
4. Why does the *LM* curve slope upward?

PROBLEMS AND APPLICATIONS

1. Use the Keynesian cross to predict the impact on equilibrium GDP of the following. In each case, state the direction of the change and give a formula for the size of the impact.
   a. An increase in government purchases
   b. An increase in taxes
   c. Equal-sized increases in both government purchases and taxes
2. Although our development of the Keynesian cross in this chapter assumes that taxes are a fixed amount, most countries levy some taxes that rise automatically with national income. (Examples in the United States include the income tax and the payroll tax.) Let's represent the tax system by writing tax revenue as

$$T = \overline{T} + tY,$$

where $\overline{T}$ and t are parameters of the tax code. The parameter t is the marginal tax rate: if income rises by \$1, taxes rise by $t \times \$1$.

   a. How does this tax system change the way consumption responds to changes in GDP?

b. In the Keynesian cross, how does this tax system alter the government-purchases multiplier?

c. In the *IS–LM* model, how does this tax system alter the slope of the *IS* curve?

3. In the Keynesian cross, assume that the consumption function is given by

$$C = 200 + 0.75\ (Y - T).$$

Planned investment is 100; government purchases and taxes are both 100.

a. Graph planned expenditure as a function of income.

b. What is the equilibrium level of income?

c. If government purchases increase to 125, what is the new equilibrium income?

d. What level of government purchases is needed to achieve an income of 1,600?

4. Suppose that the money demand function is

$$(M/P)^d = 1{,}000 - 100r,$$

where r is the interest rate in percent. The money supply M is 1,000 and the price level P is 2.

a. Graph the supply and demand for real money balances.

b. What is the equilibrium interest rate?

c. Assume that the price level is fixed. What happens to the equilibrium interest rate if the supply of money is raised from 1,000 to 1,200?

d. If the Fed wishes to raise the interest rate to 7 percent, what money supply should it set?

5. The following equations describe an economy.

$$Y = C + I + G.$$
$$C = 120 + 0.5(Y - T).$$
$$I = 100 - 10r.$$
$$G = 50.$$
$$T = 40.$$
$$(M/P)^d = Y - 20r.$$
$$M = 600.$$
$$P = 2.$$

a. Identify each of the variables and briefly explain their meaning.

b. From the above list, use the relevant set of equations to derive the *IS* curve. Graph the *IS* curve on an appropriately labeled graph.

c. From the above list, use the relevant set of equations to derive the *LM* curve. Graph the *LM* curve on the same graph you used in part (b).

d. What are the equilibrium level of income and equilibrium interest rate?

6. Consider the impact of an increase in thriftiness in the Keynesian cross. Suppose the consumption function is

$$C = \bar{C} + c(Y - T),$$

where $\bar{C}$ is a parameter called *autonomous consumption* and c is the marginal propensity to consume.

a. What happens to equilibrium income when the society becomes more thrifty, as represented by a decline in $\bar{C}$?

b. What happens to equilibrium saving?

c. Why do you suppose this result is called the *paradox of thrift*?

d. Does this paradox arise in the classical model of Chapter 3? Why or why not?

5. Expansionary monetary policy shifts the *LM* curve downward. This shift in the *LM* curve lowers the interest rate and raises income. The increase in income represents a rightward shift of the aggregate demand curve. Similarly, contractionary monetary policy shifts the *LM* curve upward, raises the interest rate, lowers income, and shifts the aggregate demand curve to the left.

KEY CONCEPTS

Monetary transmission mechanism

Pigou effect

Debt-deflation theory

QUESTIONS FOR REVIEW

1. Explain why the aggregate demand curve slopes downward.
2. What is the impact of an increase in taxes on the interest rate, income, consumption, and investment?
3. What is the impact of a decrease in the money supply on the interest rate, income, consumption, and investment?
4. Describe the possible effects of falling prices on equilibrium income.

PROBLEMS AND APPLICATIONS

1. Determine whether each of the following statements is true or false, and explain why. For each true statement, discuss the impact of monetary and fiscal policy in that special case.
   a. If investment does not depend on the interest rate, the *LM* curve is horizontal.
   b. If investment does not depend on the interest rate, the *IS* curve is vertical.
   c. If money demand does not depend on the interest rate, the *IS* curve is horizontal.
   d. If money demand does not depend on the interest rate, the *LM* curve is vertical.
   e. If money demand does not depend on income, the *LM* curve is horizontal.
   f. If money demand is extremely sensitive to the interest rate, the *LM* curve is horizontal.
2. According to the *IS–LM* model, what happens in the short run to the interest rate, income, consumption, and investment under the following circumstances? Be sure your answer includes an appropriate graph.
   a. The central bank increases the money supply.
   b. The government increases government purchases.
   c. The government increases taxes.
   d. The government increases government purchases and taxes by equal amounts.
3. Consider the economy of Hicksonia.
   a. The consumption function is given by

$$C = 200 + 0.75(Y - T).$$

   The investment function is

$$I = 200 - 25r.$$

   Government purchases and taxes are both 100. For this economy, graph the *IS* curve for r ranging from 0 to 8.
   b. The money demand function in Hicksonia is

$$(M/P)^d = Y - 100r.$$

   The money supply M is 1,000 and the price level P is 2. For this economy, graph the *LM* curve for r ranging from 0 to 8.
   c. Find the equilibrium interest rate r and the equilibrium level of income Y.

d. Suppose that government purchases are raised from 100 to 150. How does the *IS* curve shift? What are the new equilibrium interest rate and level of income?

e. Suppose instead that the money supply is raised from 1,000 to 1,200. How does the *LM* curve shift? What are the new equilibrium interest rate and level of income?

f. With the initial values for monetary and fiscal policy, suppose that the price level rises from 2 to 4. What happens? What are the new equilibrium interest rate and level of income?

g. Derive and graph an equation for the aggregate demand curve. What happens to this aggregate demand curve if fiscal or monetary policy changes, as in parts (d) and (e)?

4. Use the *IS–LM* model to predict the short-run effects of each of the following shocks on income, the interest rate, consumption, and investment. In each case, explain what the Fed should do to keep income at its initial level.

a. After the invention of a new high-speed computer chip, many firms decide to upgrade their computer systems.

b. A wave of credit card fraud increases the frequency with which people make transactions in cash.

c. A best-seller titled *Retire Rich* convinces the public to increase the percentage of their income devoted to saving.

d. The appointment of a new "dovish" Federal Reserve chairman increases expected inflation.

5. Use the *IS–LM* diagram to describe both the short-run effects and the long-run effects of the following changes on national income, the interest rate, the price level, consumption, investment, and real money balances.

a. An increase in the money supply

b. An increase in government purchases

c. An increase in taxes

6. Monetary policy and fiscal policy often change at the same time.

a. Suppose that the government wants to raise investment but keep output constant. In the *IS–LM* model, what mix of monetary and fiscal policy will achieve this goal?

b. In the early 1980s, the U.S. government cut taxes and ran a budget deficit while the Fed pursued a tight monetary policy. What effect should this policy mix have?

7. Suppose that the demand for real money balances depends on disposable income. That is, the money demand function is

$$M/P = L(r, Y - T).$$

Using the *IS–LM* model, discuss whether this change in the money demand function alters the following.

a. The analysis of changes in government purchases

b. The analysis of changes in taxes

8. This problem asks you to analyze the *IS–LM* model algebraically. Suppose consumption is a linear function of disposable income:

$$C(Y - T) = a + b(Y - T),$$

where $a > 0$ and $0 < b < 1$. The parameter b is the marginal propensity to consume, and the parameter a is a constant sometimes called autonomous consumption. Suppose also that investment is a linear function of the interest rate:

$$I(r) = c - dr,$$

where $c > 0$ and $d > 0$. The parameter d measures the sensitivity of investment to the interest rate, and the parameter c is a constant sometimes called autonomous investment.

a. Solve for Y as a function of r, the exogenous variables G and T, and the model's parameters a, b, c, and d.

b. How does the slope of the *IS* curve depend on the parameter d, the interest sensitivity of investment? Refer to your answer to part (a), and explain the intuition.

c. Which will cause a bigger horizontal shift in the *IS* curve, a \$100 tax cut or a \$100 increase in government spending? Refer to your answer to part (a), and explain the intuition.

Now suppose demand for real money balances is a linear function of income and the interest rate:

$$L(r, Y) = eY - fr,$$

where $e > 0$ and $f > 0$. The parameter e measures the sensitivity of money demand to income, while the parameter f measures the sensitivity of money demand to the interest rate.

d. Solve for r as a function of Y, M, and P and the parameters e and f.

e. Using your answer to part (d), determine whether the LM curve is steeper for large or small values of f, and explain the intuition.

f. How does the size of the shift in the LM curve resulting from a \$100 increase in M depend on

i. the value of the parameter e, the income sensitivity of money demand?

ii. the value of the parameter f, the interest sensitivity of money demand?

g. Use your answers to parts (a) and (d) to derive an expression for the aggregate demand curve. Your expression should show Y as a function of P; of exogenous policy variables M, G, and T; and of the model's parameters. This expression should not contain r.

h. Use your answer to part (g) to prove that the aggregate demand curve has a negative slope.

i. Use your answer to part (g) to prove that increases in G and M, and decreases in T, shift the aggregate demand curve to the right. How does this result change if the parameter f, the interest sensitivity of money demand, equals zero? Explain the intuition for your result.

9. The Fed is considering two alternative monetary policies:

- holding the money supply constant and letting the interest rate adjust, or
- adjusting the money supply to hold the interest rate constant.

In the *IS–LM* model, which policy will better stabilize output under the following conditions? Explain your answer.

a. All shocks to the economy arise from exogenous changes in the demand for goods and services.

b. All shocks to the economy arise from exogenous changes in the demand for money.