

Problem Set 2: The Keynesian Cross; Liquidity Preference Theory
IS-LM Analysis

Answer all the parts of the questions separately giving your reasons for your answer.

1. Consider the Consumption Function: $C = c_0 + c_1(Y - T)$

- a) What is the intuition for the form of the consumption function?
- b) c_0 is often called autonomous consumption. What does represent?
- c) What does c_1 called? What does it represent? Does it face any particular restrictions?
- d) Suppose there was a shift in tastes of consumption. How could that be represented in the equation above?

2. Lets start with our workhorse Keynesian Model. [Question 2 in Blanchard's Chapter 3, pg. 62].

Suppose the economy is characterized by the following behavioral equations:

$$C = 160 + 0.6Y_D$$

$$I = 150$$

$$G = 150$$

$$T = 100$$

Solve for:

- a. Equilibrium GDP (Y)
- b. Disposable Income (Y_D)
- c. Consumption Spending (C)

3. Consider the Investment Function: $I = I_0 - br$

- a) What is I_0 ? What does it represent?

- b) What is b ? What does it represent? Are there any parameter restrictions on b ?
- c) What is the intuition for the negative relationship between investment and real interest rates? What assumption have we made?
- d) [*] What happens if there is a shift in expectations of inflation? How does that affect the investment function? [Hint: Use your answer to the last part of (c) to give you some idea.]

4. The IS curve represents equilibrium in the goods market. One way it can be derived is from the Keynesian Cross, where aggregate expenditure equals aggregate income in the economy, i.e. $Y = E$ where $E = C + I + G$ and G is exogenous government expenditure. Its functional form can be represented as:

$$Y = \frac{c_0 + I_0 + G - c_1 T}{1 - c_1} - \frac{b}{1 - c_1} r$$

- a) Draw the IS curve in (real) interest rate & output space, i.e. (r, Y) space.
 - b) What is the slope of the IS curve?
 - c) Suppose there is an increase in c_0 . What happens to the IS curve?
 - d) What is meant by the multiplier effect? What is the government multiplier, i.e. what is the full effect on Y from a unit increase in G , i.e. $\frac{\Delta Y}{\Delta G}$?
 - e) What variables cause a shift of the IS curve? What variables cause a movement along the IS curve?
5. [*] Suppose investment also depends positively on output so that $I = I_0 + aY - br$ with $a > 0$ (this is sometimes referred to as an "accelerator" effect).
- (a) Why do you think such an effect might be present?
 - (b) How is the slope of the IS curve affected?
 - (c) How is the value of the multiplier affected?
 - (d) What happens in (b) and (c) if $a + c_1 > 1$? Explain!

6. Consider the demand for money equation: $L(r, Y) = m_0 + kY - hr$

- a) What is the intuition for the form of the demand for money equation?
- b) What does k represent? Is there any parameter restriction?
- c) What does h represent? Is there any parameter restriction?
- d) What assumption is being made here with respect to the fact that the demand for money is a function of the real interest rate? Why may this be important?

7. The LM curve represents equilibrium in the money market, where the demand for money equals the amount of real money balances in the economy i.e. $\frac{M^S}{P} = L(r, Y)$. This can be written as:

$$\frac{M^S}{P} = m_0 + kY - hr$$

- a) Draw the LM curve in (real) interest rate & output space, i.e. (r, Y) space.
- b) What is the slope of the LM curve?
- c) Suppose there is an injection of money into the economy by the government, i.e. M^S increases. What happens to the LM curve?
- d) What would cause a shift of the LM curve? What causes a movement along the LM curve?
- e) Suppose that incomes go up. This leads to disequilibrium in the money market. What is the mechanism by which equilibrium is restored once again in the money market?

8. (Blanchard, question 2, Chapter 5: pg 111). Consider first the goods market model with constant investment that we saw in lecture 4, where

$$C = c_0 + c_1(Y - T)$$

and $I, G,$ and T are given.

- a. Solve for equilibrium output. What is the value of the multiplier?
- b. Now let Investment depend on both sales and the interest rate (i):

$$I = b_0 + b_1Y - b_2i$$

Write down the equilibrium output relation. At a given interest rate, is the effect of a change in autonomous spending bigger than what it was in part (a)? Why? (Assume $c_1 + b_1 < 1$).

- c. [*] Next, write the LM relation as:

$$\frac{M}{P} = d_1Y - d_2i \quad (1)$$

Re-write the equation above in terms of interest rates. Now using your answer to part (b) for equilibrium output, solve for equilibrium output as a function of the exogenous variables.

- d. Is the multiplier you obtained in part 8c) smaller than or larger than the multiplier you obtained in part (a)? Explain how your answer depends on the behavioral equations for consumption, investment and money demand?

9. (Blanchard, question 3, Chapter 5: pg 111). The response of Investment to Fiscal Policy.

- a. Using the IS-LM graph, show the effects on output and the interest rate of a decrease in government spending. Can you tell what happens to investment? Why?

- b. [*] Now consider the following IS-LM model:

$$C = c_0 + c_1(Y - T)$$

$$I = b_0 + b_1Y - b_2i$$

$$\frac{M}{P} = d_1Y - d_2i$$

Solve for the equilibrium output, assuming that $c_1 + b_1 < 1$.

- c. [*] Solve for the equilibrium interest rate.

- d. [*] Solve for Investment.
- e. Under what conditions on the parameters of the model will investment increase when G decreases?
- f. Explain the condition you derived in (e).
10. (Blanchard, question 4, Chapter 5: pg 111) - plugging in numbers for questions 8 and 9. Consider the following IS-LM model:

$$\begin{aligned}C &= 200 + 0.25Y_D \\I &= 150 + 0.25Y - 1000i \\G &= 250; T = 200 \\ \left(\frac{M}{P}\right)^d &= 2Y - 8000i \\ \frac{M}{P} &= 1600\end{aligned}$$

- a. Derive the IS relation.
- b. Derive the LM relation.
- c. Solve for equilibrium output.
- d. Solve for the equilibrium real interest rate.
- e. Solve for the equilibrium values of C and I and verify the value you obtained for Y by adding up C , I and G .
- f. Now suppose that the money supply increases to $\frac{M}{P} = 1840$. Solve for Y, i, C and I and describe in words the effects of an expansionary monetary policy.
- g. Set $\frac{M}{P}$ equal to its initial value of 1600. Now suppose that government spending increases to $G = 400$. Summarize the effects of an expansionary fiscal policy on Y, i and C .