

6. The IS-LM, AD-AS Model and Its Application

Case & Fair, ch. 10-11; LCR, ch. 27-29, Froyen p.335-339

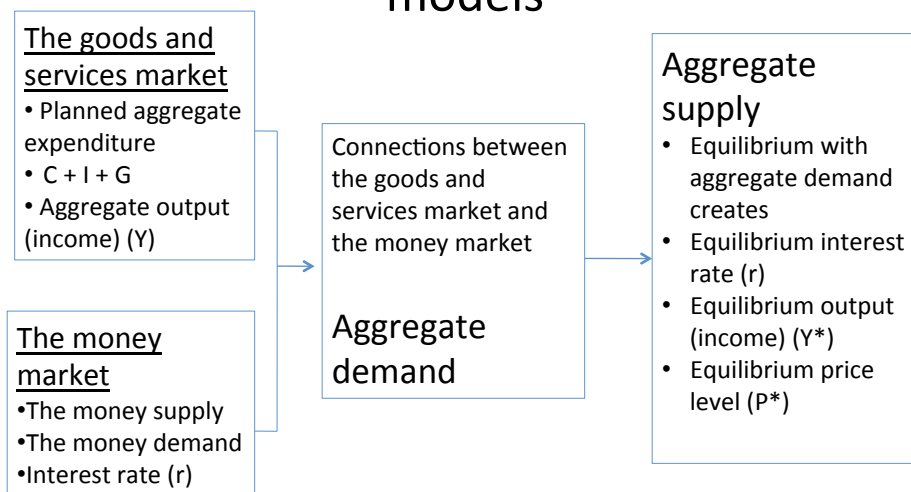
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1 Introduction

The overview of basic macroeconomic models



- Remember our earlier depiction of the interactions between goods and money markets.
- In fact, we can depict the interaction between the two markets via mapping their equilibriums.
- And this is what led to the IS (goods market equilibrium) and LM (money market equilibrium) model
- The “interest rate” provides the link between the money market (what its equilibrium determines) and the goods market (interest rate determines investment).
 - The “interest rate”, therefore, will be the key variable in IS-LM model. We want to plot the relationship between “interest rate” and “output” that arises from the equilibriums in each of the market.

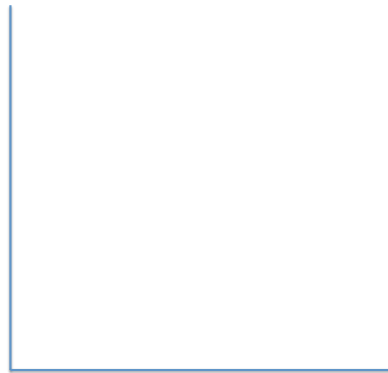
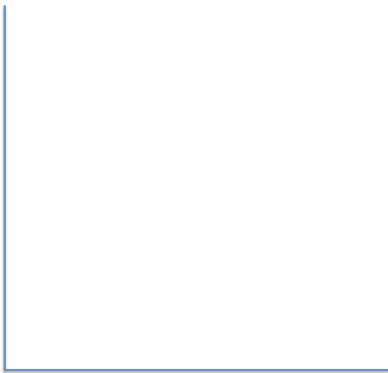
2 The Goods Market and the IS Curve

2.1 IS (Investment and Saving) curve : meaning

- Represents what is going on in the market for goods and services.
 - Remember our “Keynesian Cross” model (DAE and Output equilibrium)
- IS (Investment and Saving) curve

2.2 Plotting the IS curve

- We will be plotting the IS curve from the relationship between the interest rate and equilibrium output in the goods market.
- The derivation can be achieved through plotting what happens to the DAE & Y equilibrium when the interest rate changes.



2.3 Slope of the IS curve

- $r \uparrow \Rightarrow I \downarrow \Rightarrow DAE \downarrow \Rightarrow Y \downarrow$
- slope of the IS curve depends on MPC and interest elasticity of investment
 - IS is steep ; $\left| \frac{\Delta r}{\Delta Y} \right|$ is high. Big change in interest rate, small change in Y in the opposite direction
 - IS is flat ; $\left| \frac{\Delta r}{\Delta Y} \right|$ is low. change in interest rate, change in Y in the opposite direction

1. MPC ;

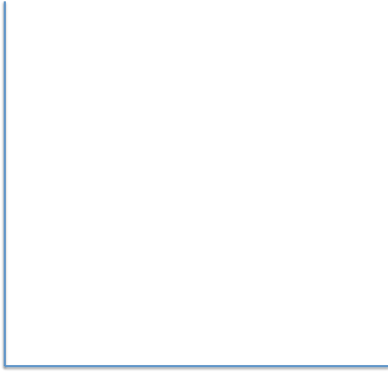
- high MPC ; DAE is ; income multiplier
- $r \uparrow \Rightarrow I \downarrow \Rightarrow DAE \downarrow \Rightarrow Y \downarrow$
- high MPC, IS is

2. Interest elasticity of investment

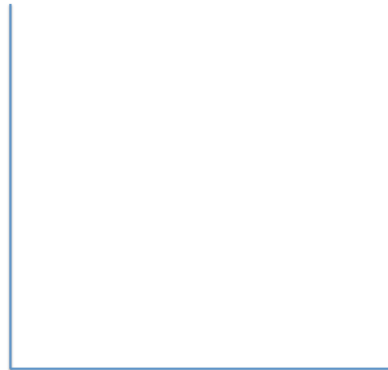
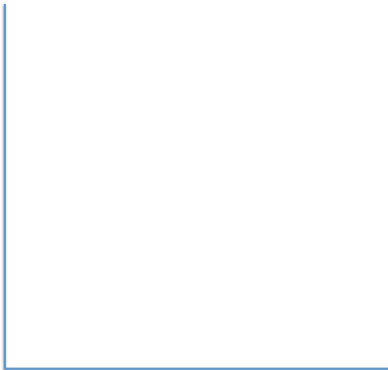
- high interest elasticity of investment (investment is very sensitive to change in interest rate) ; interest rate increases by a little, investment decreases a lot.
- $r \uparrow \Rightarrow I \downarrow$ $\Rightarrow DAE \downarrow \Rightarrow Y \downarrow$
- high interest elasticity of investment, IS is

2.4 How fiscal policy shifts the IS curve

- Expansionary Fiscal Policy :



- Contractionary Fiscal Policy :

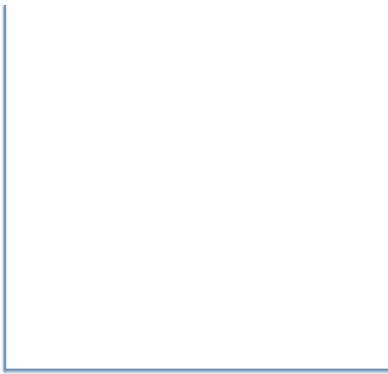


3 The Money Market and the LM Curve

3.1 LM curve : meaning

- LM (Liquidity and Money) Curve
- Remember the equilibrium between money supply and money demand
- Hold the price constant.
- With there's a change in output, money demand will shift, and the equilibrium interest rate will change accordingly.
- The LM curve simply summarizes what happen.

3.2 Plotting the LM curve

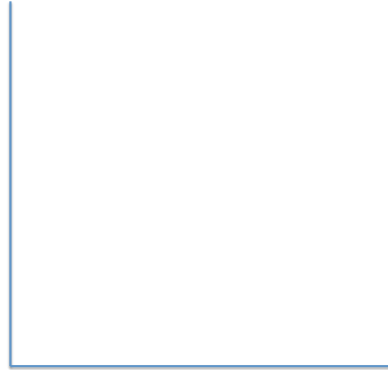
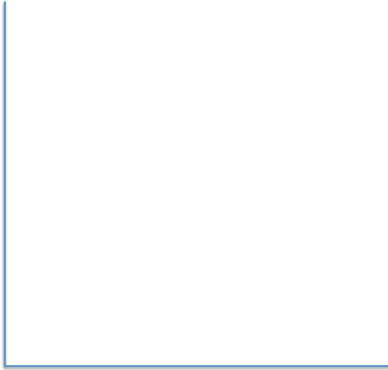


3.3 Slope of the LM curve

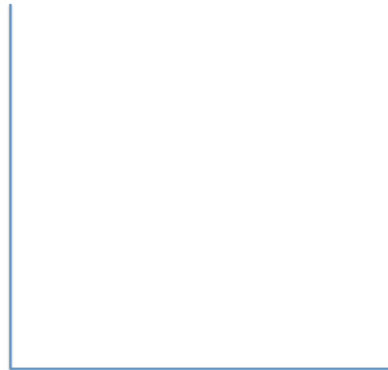
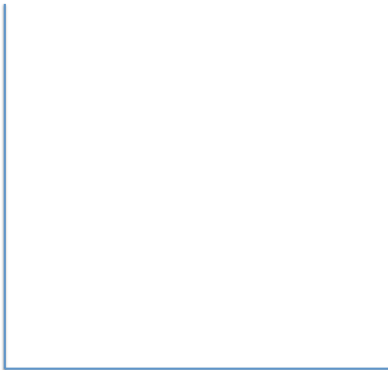
- slope of the LM curve depends on money demand elasticity of income
 - LM is steep ; $\frac{\Delta r}{\Delta Y}$ is high, small change in Y, big change in r ; in the same direction
 - LM is flat ; $\frac{\Delta r}{\Delta Y}$ is low, change in Y, change in r ; in the same direction
- $Y \uparrow \Rightarrow M^d \uparrow \Rightarrow r \uparrow$
- Money demand is highly sensitive to income change
 - $Y \uparrow$ a little $\Rightarrow M^d \uparrow$ $\Rightarrow r \uparrow$
 - LM is
- Money demand is lowly sensitive to income change
 - $Y \uparrow$ a lot $\Rightarrow M^d \uparrow$ $\Rightarrow r \uparrow$
 - LM is

3.4 How monetary policy shifting the LM curve

- Expansionary Monetary Policy



- Contractionary Monetary Policy



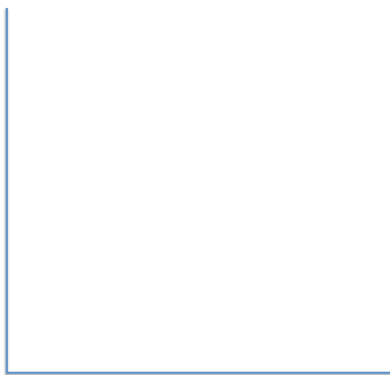
IS	LM
Derivation equilibrium in the goods market $r \uparrow \Rightarrow I \dots \Rightarrow DAE \dots \Rightarrow Y \dots$ r and Y has relationship IS has slope	Derivation equilibrium in the money market $Y \uparrow \Rightarrow M^d \dots \Rightarrow r \dots$ r and Y has relationship LM has slope
Slope of IS depends on 1. MPC 2. Interest elasticity of investment flat IS ; MPC Interest rate elasticity of investment	Slope of LM depends on money demand elasticity of income flat LM money demand elasticity of income
Shift in IS $G \uparrow \Rightarrow IS$ shifts to the $T \uparrow \Rightarrow IS$ shifts to the $G \uparrow$ by equal amount as $T \uparrow \Rightarrow IS$ shifts to the..... C or $I \uparrow$ for all levels of r and Y $\Rightarrow IS$ shifts to the	Shift in LM $M^S \uparrow \Rightarrow LM$ shifts to the $M^S \downarrow \Rightarrow LM$ shifts to the $M^d \uparrow$ for all levels of r and Y $\Rightarrow LM$ shifts to the

4 The Equilibrium between IS-LM

4.1 Simultaneous Equilibrium

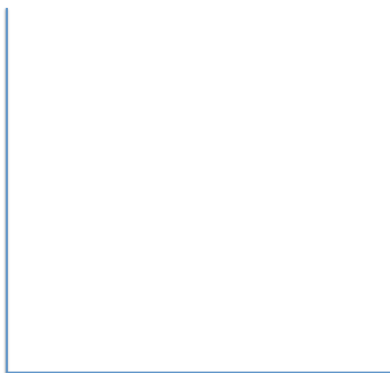
- Putting the IS curve and LM curve together, we get the simultaneous equilibrium of the goods market and the money market.
- Note that what we will know will be the equilibrium interest rate and the equilibrium output.
- And also note that this is the short-run depiction.

At the equilibrium,



- (Y^E, r^E) is on both IS and LM ; both goods market and money market are in equilibrium
- other points is not on both IS and LM ; either of the two markets is not in equilibrium or both market is not in equilibrium
- there will be adjustment to equilibrium

4.2 Adjustment to equilibrium

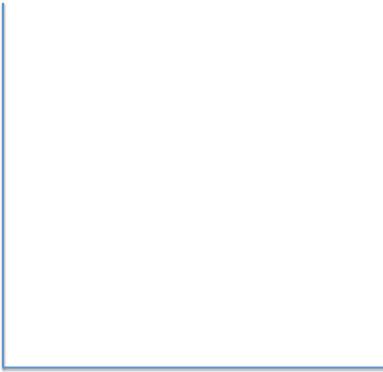


- any point not on IS or LM or both will adjust until it falls to both IS and LM
- adjustment will take place in goods market or money market or both
- equilibrium is at the intersection between IS and LM

5 Application of IS-LM to explain policies

5.1 How fiscal policy shifts the IS curve and the equilibrium in the IS-LM model.

5.1.1 Expansionary Fiscal Policy



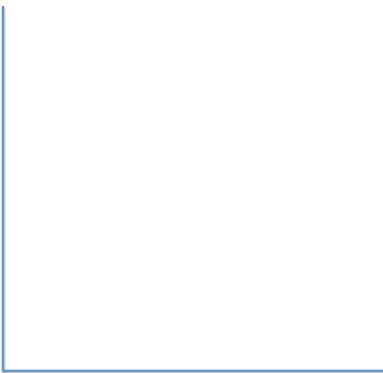
- $G \dots$
- $T \dots$
- Balance budget change ; $G \dots T \dots$ by equal amount

Expansionary Fiscal Policy $\Rightarrow DAE \uparrow \Rightarrow Y \dots$ from $\dots$ to $\dots$

$Y \uparrow \Rightarrow M^d \dots \Rightarrow r \dots \Rightarrow I \dots \Rightarrow DAE \dots \Rightarrow Y \dots$ from $\dots$ to $\dots$

For the case $G \uparrow$; $G \uparrow \Rightarrow r \uparrow \Rightarrow I \downarrow$ is called “**crowding out effect**”.

5.1.2 Contractionary Fiscal Policy



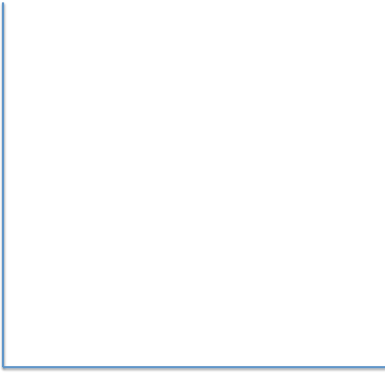
- $G \dots$
- $T \dots$
- Balance budget change ; $G \dots T \dots$ by equal amount

Contractionary Fiscal Policy $\Rightarrow DAE \downarrow \Rightarrow Y \dots$ from $\dots$ to $\dots$

$Y \downarrow \Rightarrow M^d \dots \Rightarrow r \dots \Rightarrow I \dots \Rightarrow DAE \dots \Rightarrow Y \dots$ from $\dots$ to $\dots$

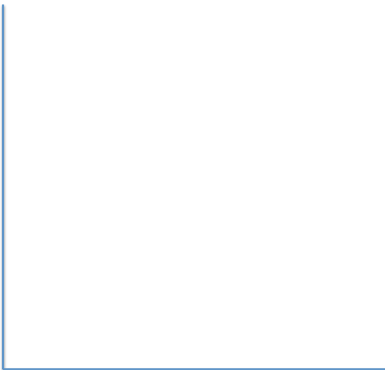
5.2 How monetary policy shifts the LM curve and the equilibrium in the IS-LM model.

5.2.1 Expansionary Monetary Policy



- M^S ;
 - OMO ; central bank bonds
 - Bank rate
 - legal reserve ratio
- $M^S \uparrow \Rightarrow r \dots\dots$
- $r \downarrow \Rightarrow I \dots\dots \Rightarrow DAE \dots\dots \Rightarrow Y \dots\dots$

5.2.2 Contractionary Monetary Policy



- M^S ;
- $M^S \downarrow \Rightarrow r \dots\dots$
- $r \uparrow \Rightarrow I \dots\dots \Rightarrow DAE \dots\dots \Rightarrow Y \dots\dots$

5.3 Other Analysis

- the IS-LM model can be used to explain the simultaneous use of fiscal and monetary policies.
- the IS-LM model can be used to explain shocks to consumption, investment, and money demand.

6 Understanding policy effectiveness

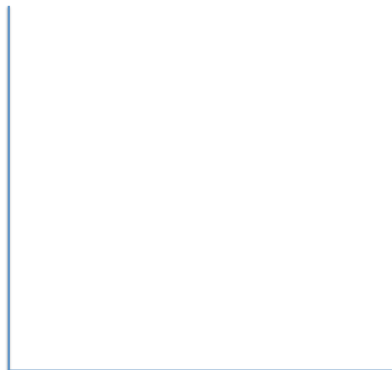
- IS-LM model can be used to understand how policy can be effective or not.
- Policy effectiveness : size of the change in Y when there is a change in an economic policy
- small change in economic policy $\rightarrow$ change in Y $\rightarrow$. the policy is effective.
- The key is to understand when **IS or LM curve is flat or steep**.

IS will be flat when	LM will be flat when
1. MPC is	money demand elasticity of income is
2. Interest elasticity of investment is	
When the IS curve is flat, monetary policy will be effective. And when the LM curve is flat, fiscal policy will be effective.	

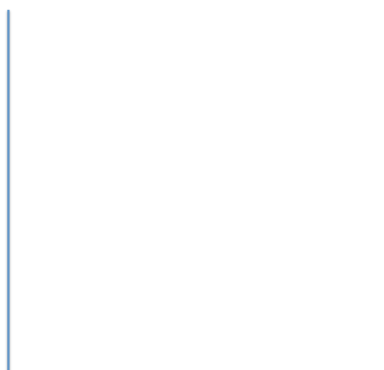
- We can draw a graph to understand policy effectiveness.

6.1 Fiscal Policy Effectiveness

- IS flat



- IS steep

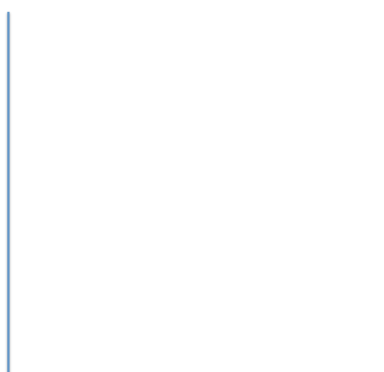


the steeper the IS, the effectiveness fiscal policy is.

- LM flat



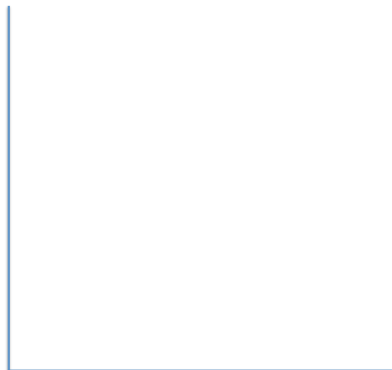
- LM steep



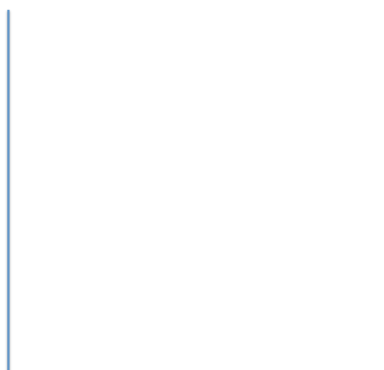
the steeper the LM, the effectiveness fiscal policy is.

6.2 Monetary Policy Effectiveness

- IS flat



- IS steep

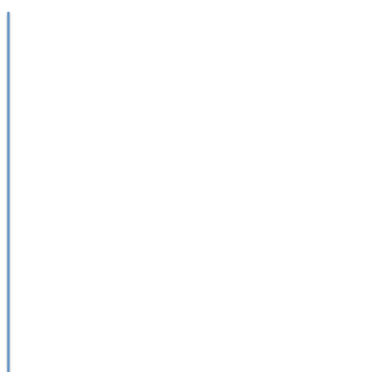


the steeper the IS, the effectiveness monetary policy is.

- LM flat



- LM steep



the steeper the LM, the effectiveness monetary policy is.

7 Linking IS-LM to Aggregate Demand

7.1 Derivation of AD curve

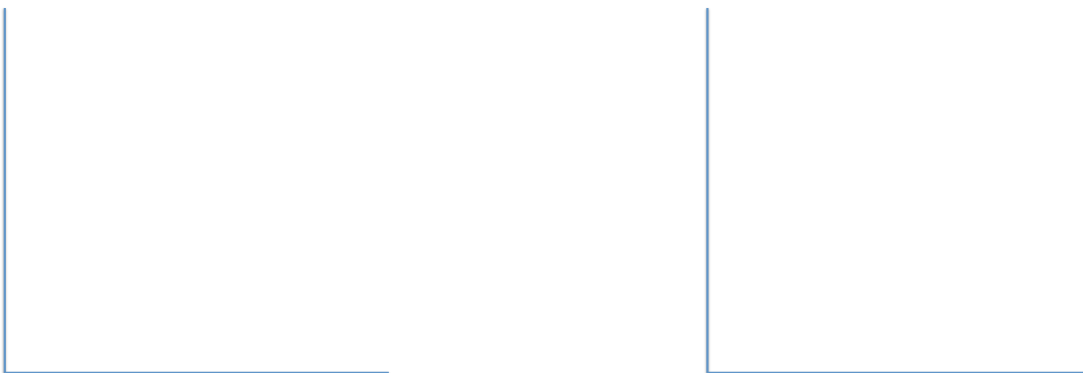
- We can use IS-LM to plot the relationship that underpinned the AD curve.
 - Why, as price level rises, output falls.



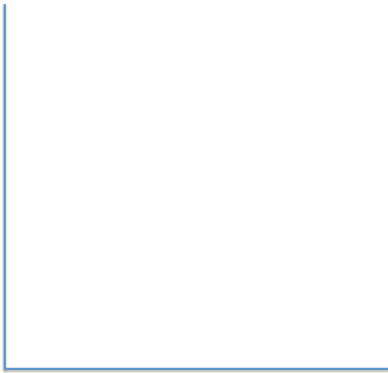
- A change in price level shifts the LM curve, resulting in the new equilibrium output.
- The change in output resulting from the change in price represents a movement along the AD curve.

7.2 Shift in AD curve

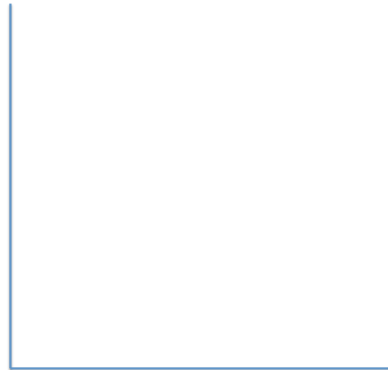
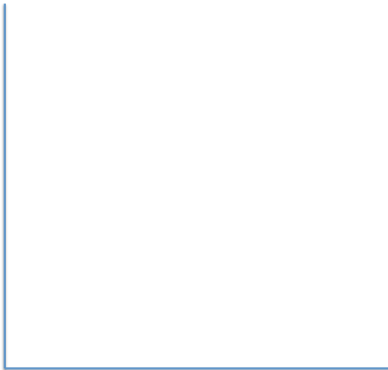
- Suppose the government uses expansionary fiscal policy



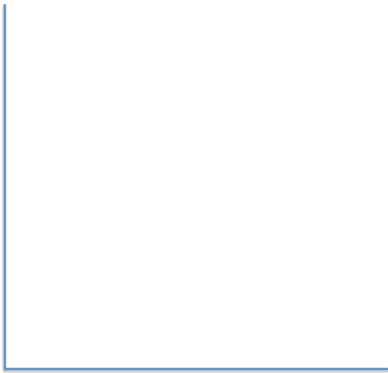
- Suppose the government uses contractionary fiscal policy



- Suppose the government uses expansionary monetary policy



- Suppose the governments uses contractionary monetary policy



Question 1: The Early 1980's The early 1980s were an exciting time for the macroeconomy. President Reagan was attempting a tax cut revolution while the Federal Reserve, under Chairman Paul Volcker, was attempting to control inflation.

a. President Reagan's tax policies were a crucial part of his economic plan. The most important policy tool was a massive tax cut (30 percent in three years). Use an IS-LM diagram to show how tax cuts would affect the economy. Assume that monetary policy does not change in this question.

b. Now say that President Reagan's fiscal policies were expansionary while Volcker's monetary policy was contractionary. How would these two contemporaneous policies be represented in a single IS-LM diagram? Write a few sentences to explain your diagram. Can you say anything definitive about how output and interest rates would change?

Question 2: Japan in the 1990s The 1990s were characterized as the "lost decade" for Japan. Growth in per-capita GDP was very low as the economy stagnated. As usual, economists debated at length whether Japan should try to use monetary or fiscal policy to solve its problems. The IS-LM model played a key role in these debates. Remember that the Japanese economy is in a pretty deep recession. This question is about trying to understand which policy the government should use to try to pull Japan out of a recession. Should it be expansionary or contractionary? More crucially, should the government use monetary policy or fiscal policy?

a. To start thinking about which policy the government should follow, let's first think about the situation in Japan and what the LM curve looks like for Japan. Interest rates were extremely low in Japan at this time. When interest rates get close to zero, the demand for money is extremely high (say close to infinity). In this case, what does the LM curve look like? (Note that nominal interest rates cannot be lower than zero, so the LM curve cannot cross the horizontal axis of the IS-LM diagram). Draw a picture of what the LM curve may look like for Japan.

b. Now, let's think about the IS-LM equilibrium in Japan. Which part of this LM curve do you think the Japanese economy is in equilibrium at? Indicate this on your graph and draw in the IS curve now to give you an equilibrium at that point.

c. To decide whether it should use monetary or fiscal policy, let's think about what happens to the LM curve when there is an injection of liquidity into the system, i.e. the government uses expansionary monetary policy. How does the LM curve shift and how does this affect output and interest rates? Therefore, how effective a tool is monetary policy for pulling the economy out of the recession in Japan?

d. Given where Japan is, is fiscal policy more or less effective than the usual case (i.e. the standard case we have talked through in class)? Can you show this with an IS-LM diagram? Compare the Japan case to the usual case using an IS-LM diagram for each.

e. How do these findings inform the choice of policy for Japan in the 1990s?