HE2002 Macroeconomics II
Lecture 3 Goods and Financial Markets: The IS-LM Model

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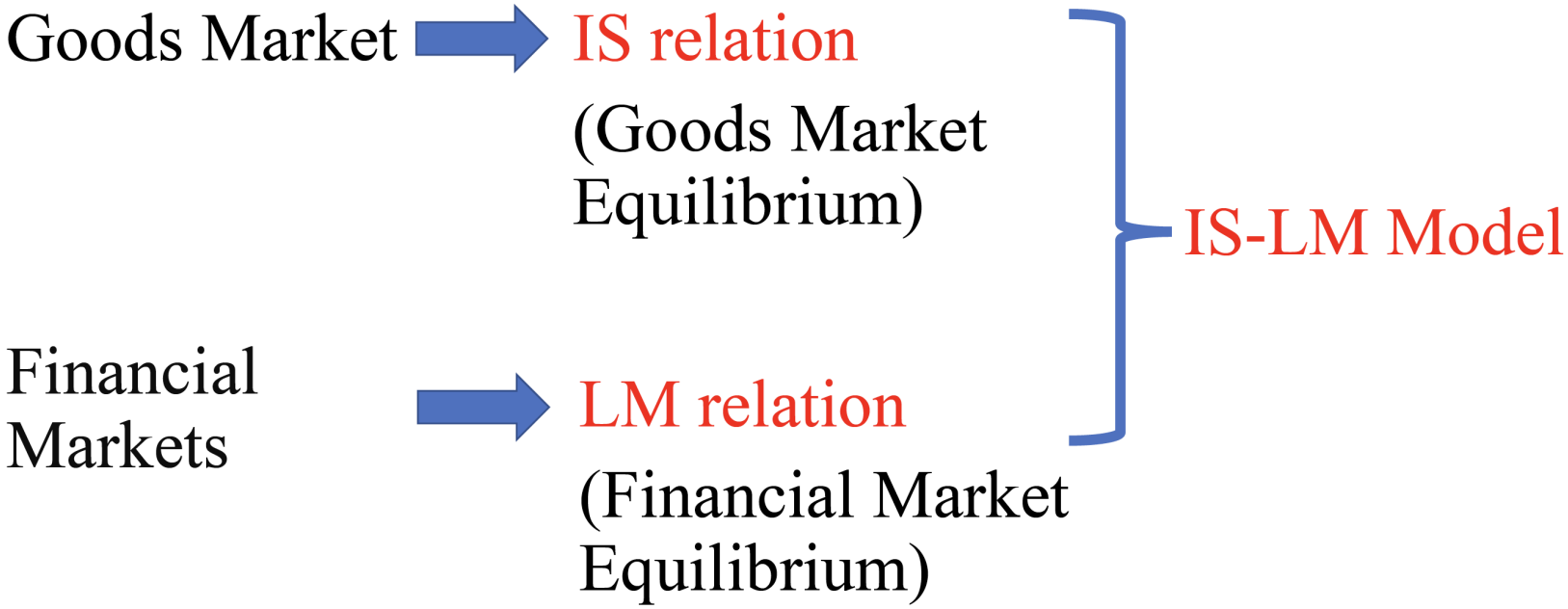
1 Lecture Outline

- The Goods Market and the *IS* Relation
- Financial Markets and the *LM* Relation
- Putting the *IS* and the *LM* Relations Together
- Using a Policy Mix

2 Today's Lecture



- Understand how output and the interest rate are determined in the short run.
- Use the model to study the effects of fiscal and monetary policy.

3 Review of Lecture 1

- In Lecture 1, we characterized equilibrium in goods market as

$$Y = Z$$

- We defined demand as

$$Z = C(Y - T) + \bar{I} + G$$

- The equilibrium condition suggests that:

$$Y = C(Y - T) + \bar{I} + G$$

Note: The expression $C(Y - T)$ denotes the consumption function, where consumption (C) is a function of disposable income ($Y - T$). If we assume that the consumption function is a linear relation, $C(Y - T) = c_0 + c_1(Y - T)$.

4 Investment, Sales, and the Interest Rate

- In Lecture 1, investment was assumed to be constant for simplicity.

- In fact, investment depends on production Y (or sales) and the interest rate i.

$$I = I(Y, i) \qquad (3.1)$$
$$(+, -)$$

5 The Investment Relation

$$I = I(Y, i) \qquad (3.1)$$
$$(+, -)$$

- An increase in output leads to an increase in investment.
- An increase in the interest rate leads to a decrease in investment.

6 The Goods Market and the *IS* Relation

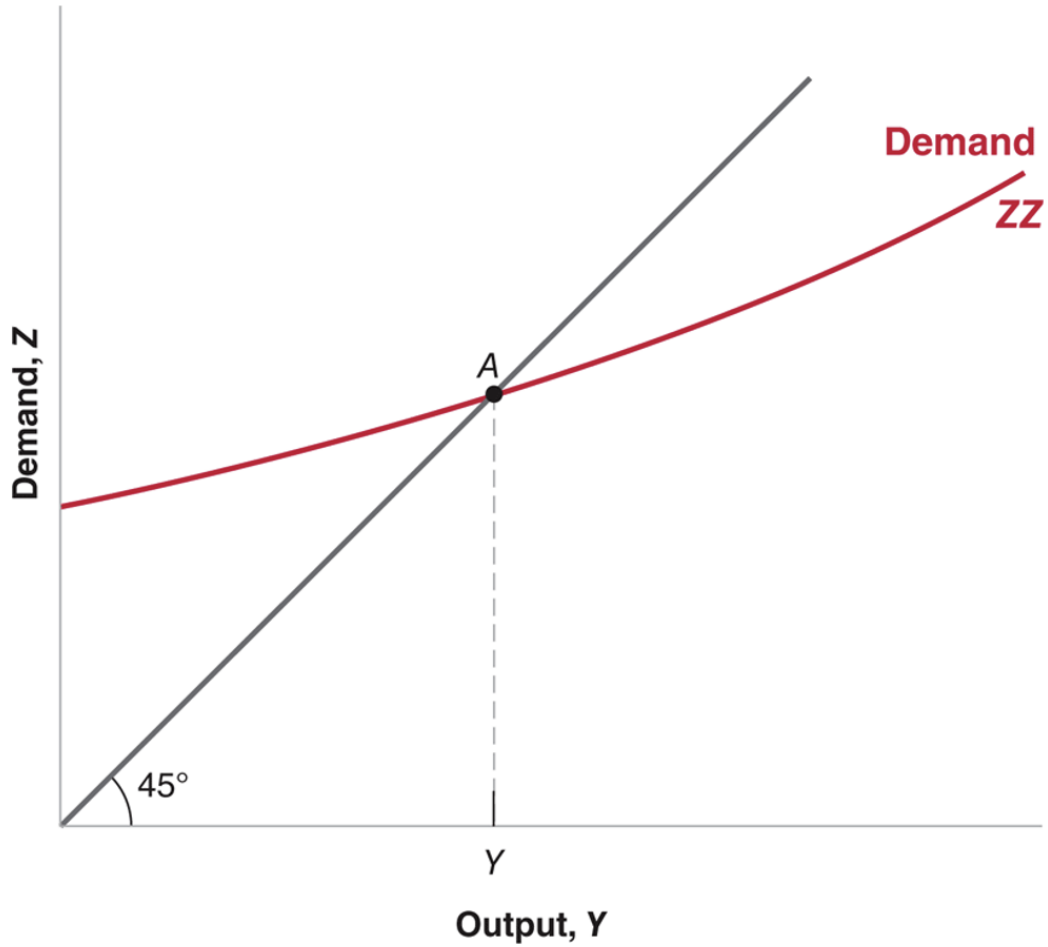
- Taking the investment relation into consideration, the condition for equilibrium in the goods market becomes:

$$Y = C(Y - T) + I(Y, i) + G \qquad (3.2)$$

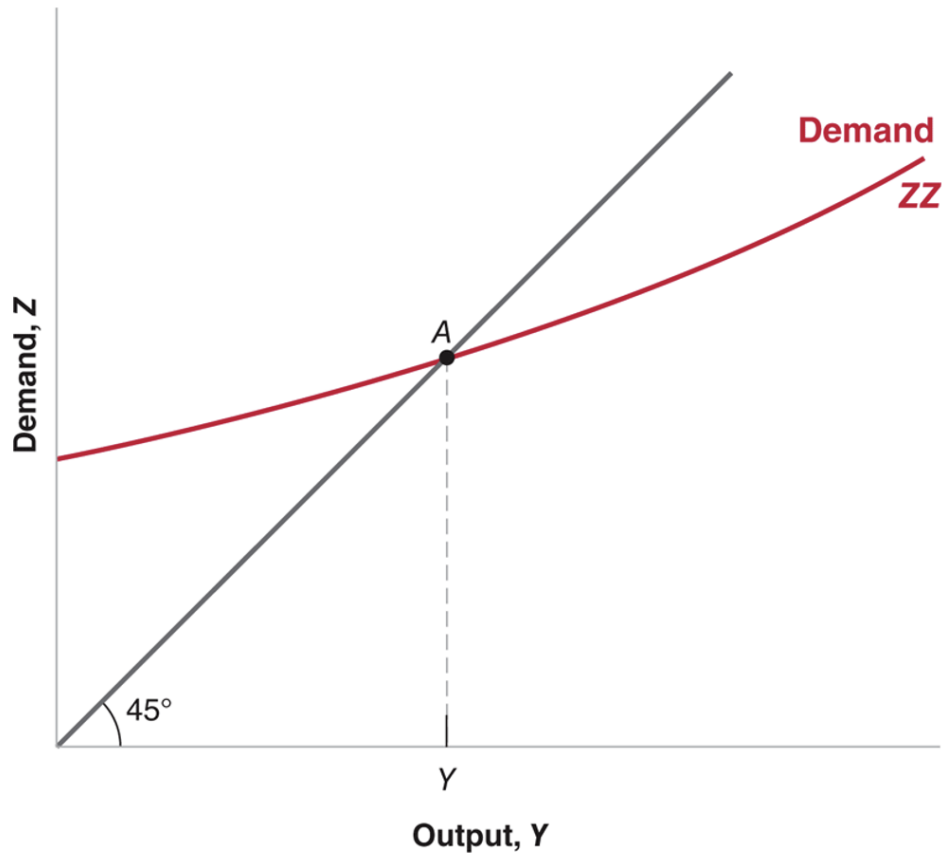
which is the **IS relation**.

7 Equilibrium in the Goods Market I

- The demand for goods is an increasing function of output.
- Equilibrium requires that the demand for goods equals output.

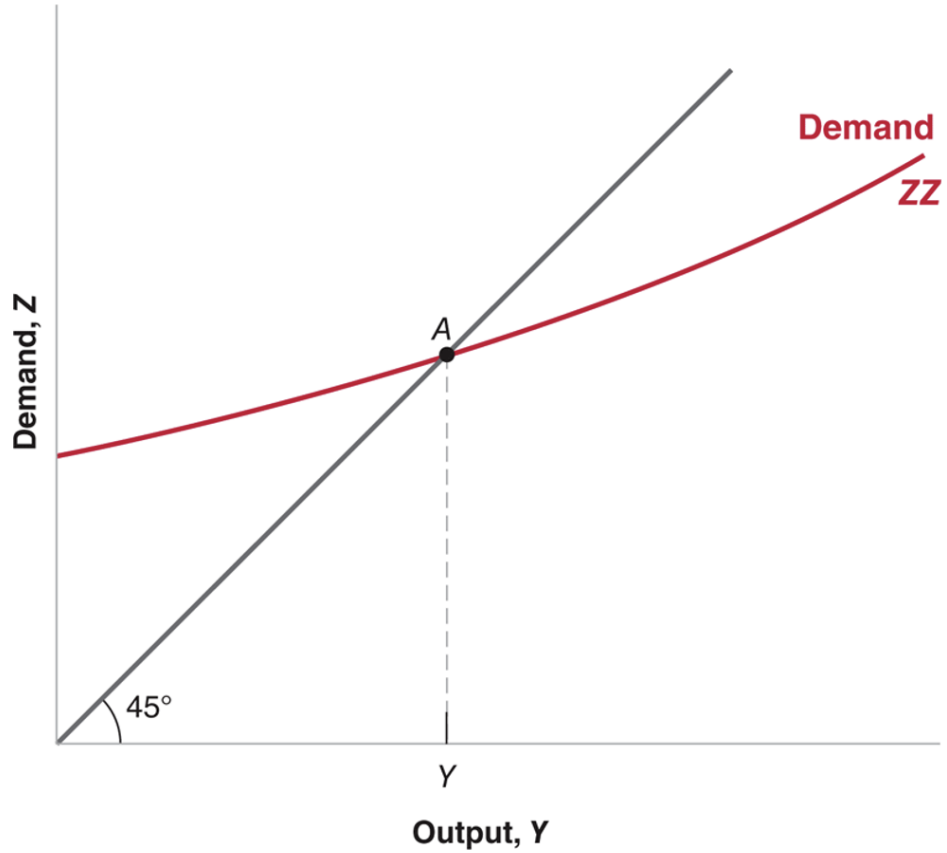


8 Equilibrium in the Goods Market II



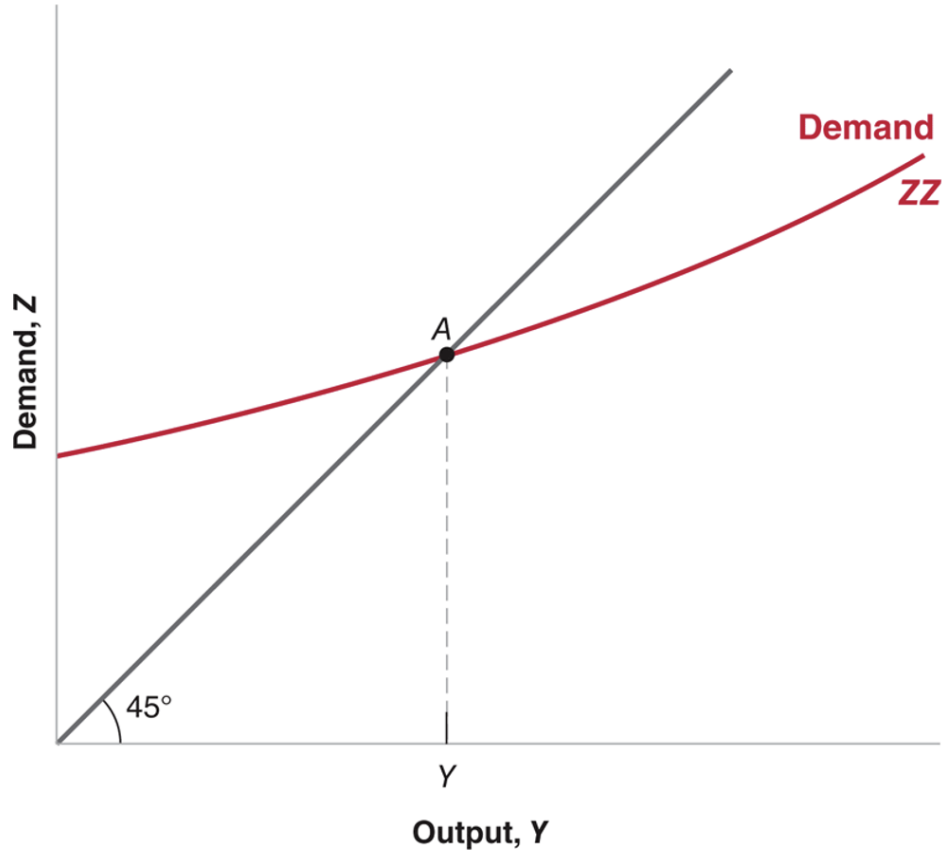
- ZZ is **upward-sloping** because, for a given value of the interest rate, an increase in output leads to an increase in the demand for goods through its effects on consumption and investment.

9 Equilibrium in the Goods Market III



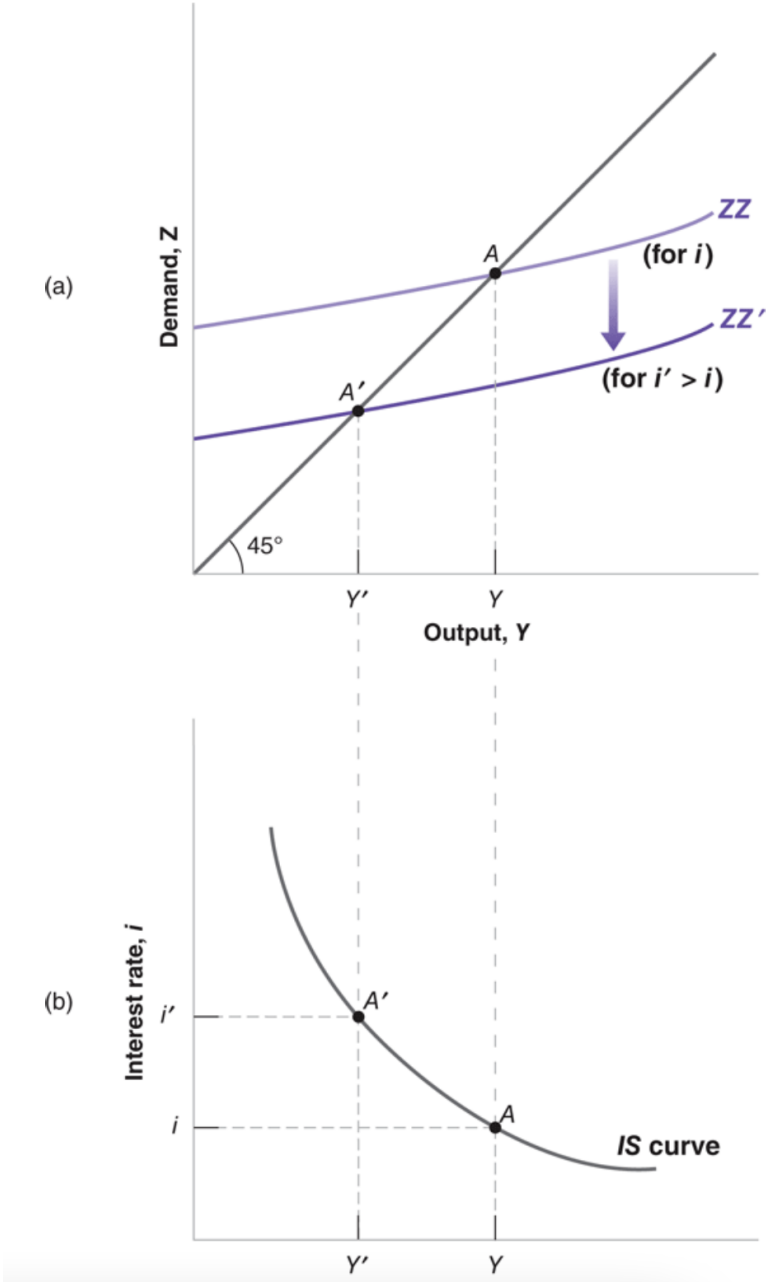
- ZZ is **flatter than the 45-degree line** because we have assumed that an increase in output leads to a less than one-for-one increase in demand.

10 Equilibrium in the Goods Market IV



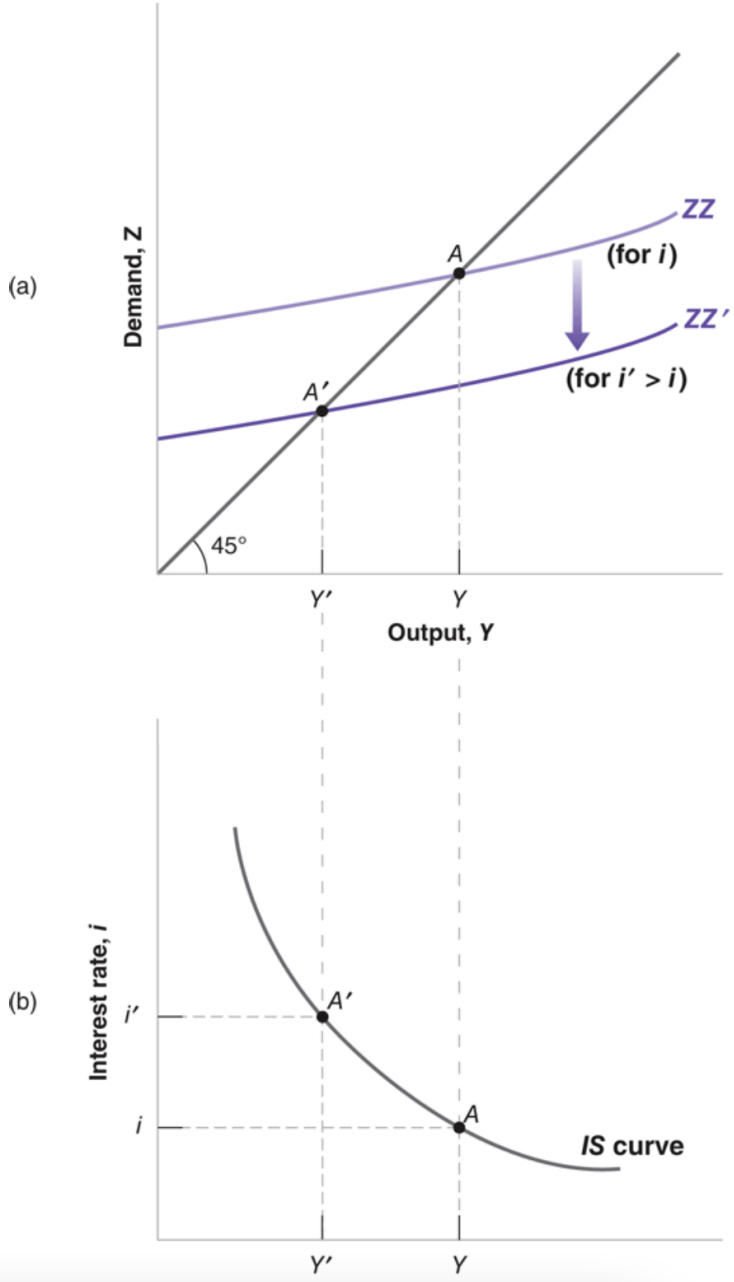
- The intersection of ZZ and the 45-degree line (point A) is the equilibrium level of output.

11 The Downward Sloping IS Curve I



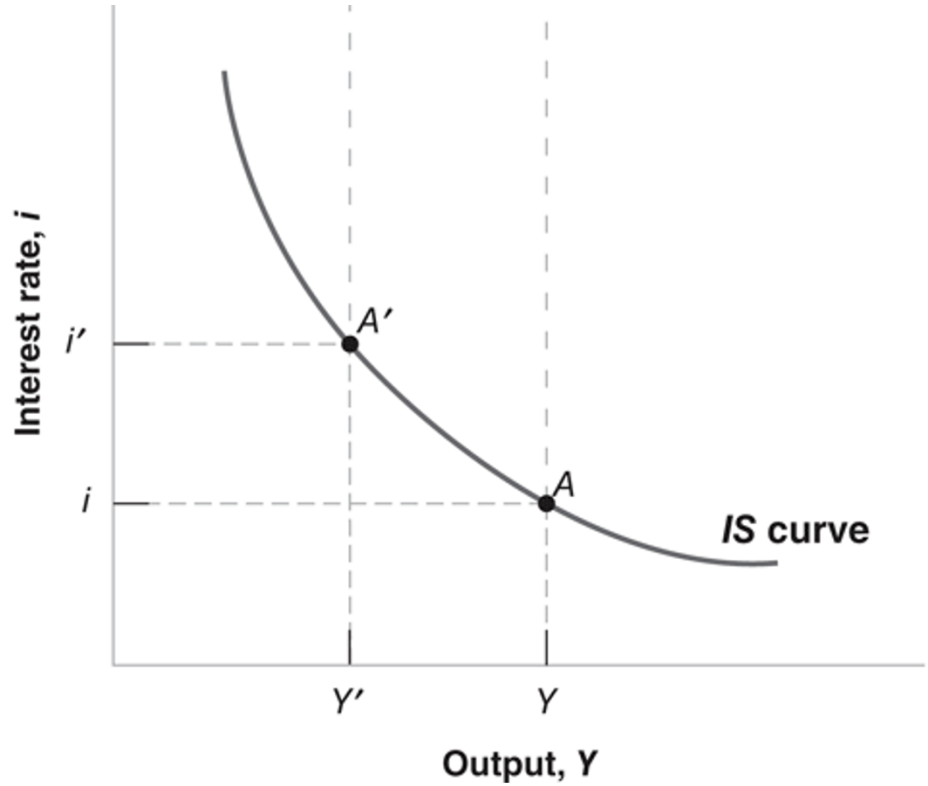
- An increase in the interest rate decreases the demand for goods at any level of output, leading to a decrease in the equilibrium level of output.

12 The Downward Sloping IS Curve II



- Equilibrium in the goods market implies that an increase in the interest rate leads to a decrease in output.

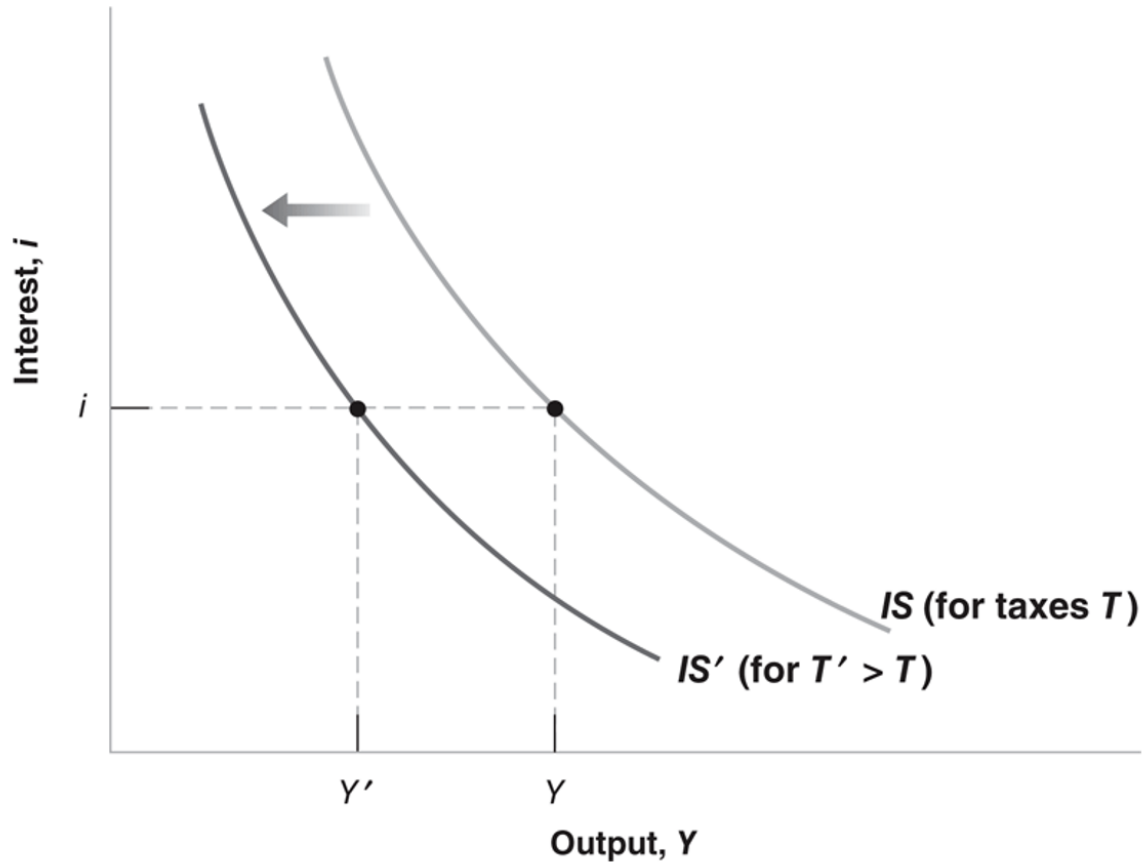
13 The Downward Sloping IS Curve III



- The **IS curve** is therefore **downward sloping**.

14 Shifts of the IS Curve

- An increase in taxes shifts the IS curve to the left.



What are the other exogenous changes in this model that could shift the IS curve?

15 Understanding the IS Curve

- Downward-sloping IS curve:
  - Equilibrium in the goods market implies that an increase in the interest rate leads to a decrease in output.
- Shifting the IS curve:
  - Changes in factors that decrease (increase) the demand for goods given the interest rate shift the IS curve to the left (right).

16 Review of Lecture 2

- We saw in Lecture 2 that the interest rate is determined by the equality of the supply and demand for money:

$$M = \$Y\, L(i)$$

The LHS M is the nominal money stock. The RHS gives the demand for money.

- Nominal GDP is real GDP multiplied by GDP deflator:

$$\$Y = PY$$

- Real GDP is nominal GDP divided by the GDP deflator:

$$\frac{\$Y}{P} = Y$$

17 Rewrite the Money Market Equilibrium Condition

$$M = \$Y\ L(i)$$

- We rewrite the money market equilibrium condition to get a relation among **real money**, **real income** and the **interest rate**.
- Divide both sides of the equation by the price level P:

$$\frac{M}{P} = Y\ L(i) \qquad (3.3)$$

- In equilibrium, real money supply equals real money demand, which depends on real income Y, and the interest rate i.

18 Financial Markets and the LM Relation

- In deriving the LM curve, we have to decide how we characterize monetary policy: as the choice of M or the choice of i.

- In the past, central banks thought of the money supply as the monetary policy variable. However, today, central banks tend to focus directly on the interest rate.

- They choose an interest rate, call it $\bar{i}$ and adjust the money supply to achieve it.

$$\text{Original LM Relation:} \qquad \frac{M}{P} = Y\, L(i) \Longrightarrow$$

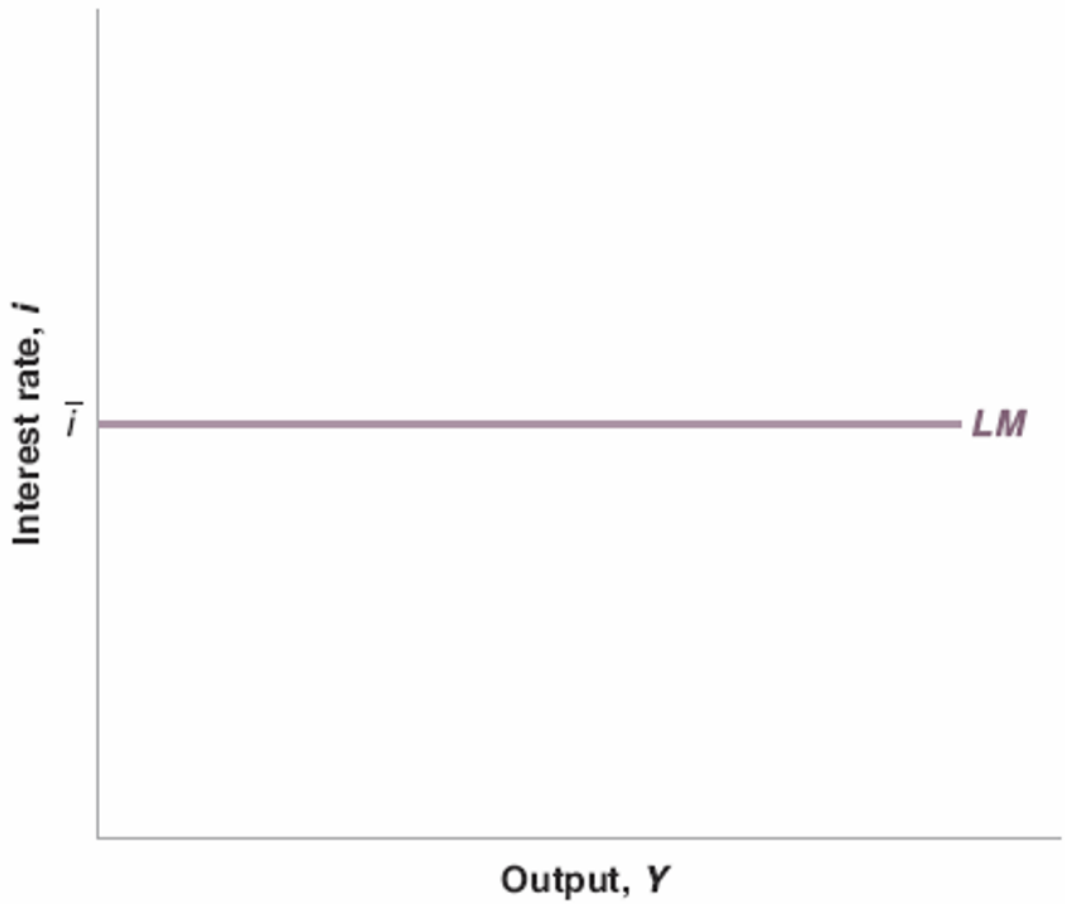
$$\text{New LM Relation:} \qquad i = \bar{i} \qquad (3.4)$$

Recap of HE1002 - Fed Controls the Nominal Interest Rate

- Fed policy is announced in terms of interest rates because
  - Public is not familiar with the size of money supply
  - Main effects of monetary policy on the economy work through interest rates
  - Interest rates are easier to monitor than money supply

19 The LM Curve

- The central bank chooses the interest rate (and adjusts the money supply so as to achieve it).



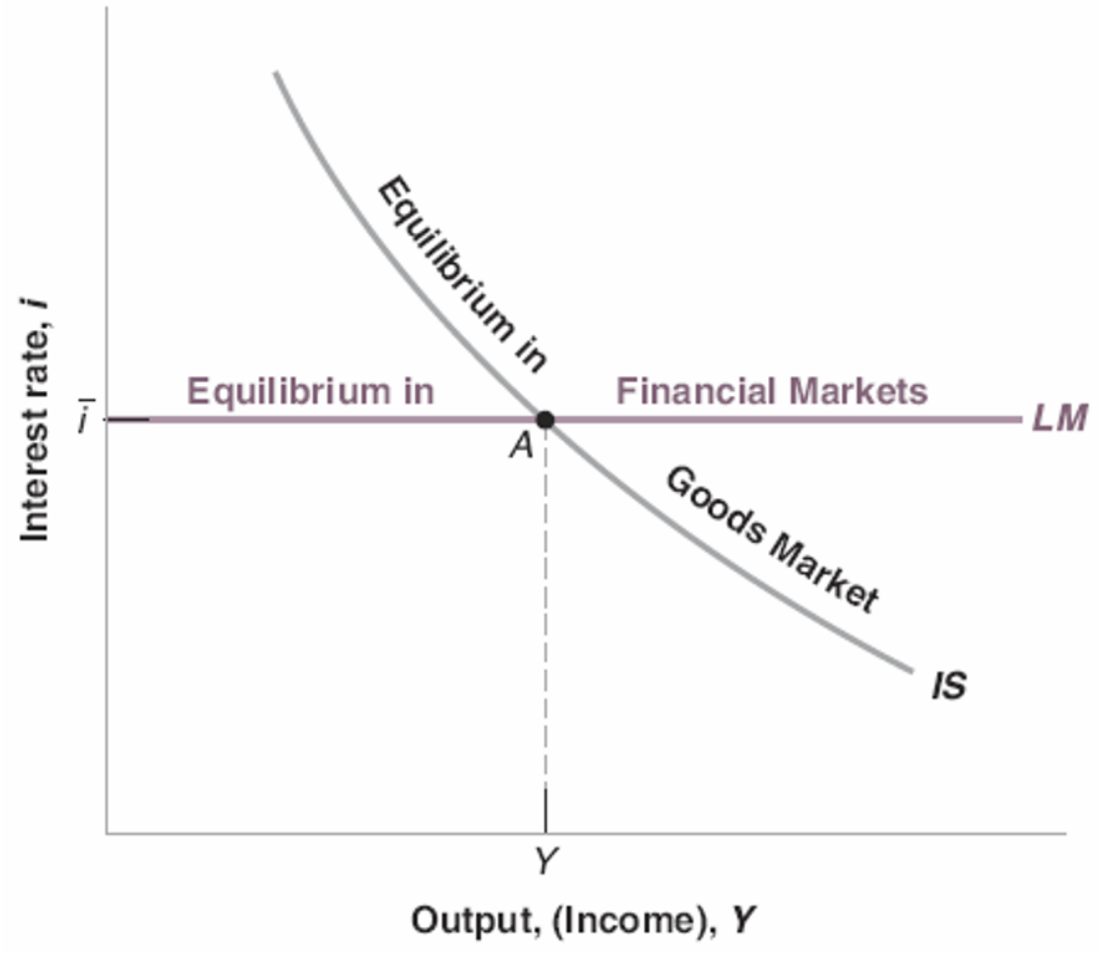
20 The IS Relation and the LM Relation I

- IS relation: $Y = C(Y - T) + I(Y, i) + G$
- LM relation: $i = \bar{i}$
- The IS and LM relations together determine output.

21 The IS Relation and the LM Relation II

- Any point on the downward sloping IS curve corresponds to equilibrium in the goods market.
- Any point on the horizontal LM curve corresponds to equilibrium in financial markets.
- **Only at their intersection** (point A) are both equilibrium relations satisfied.

22 The IS-LM Model



- Only at point A, which is on both curves, are both goods and financial markets in equilibrium.

Sample Question 1 (vevox ID: 191-984-461)

Suppose the economy is currently operating on both the LM curve and the IS curve. Which of the following is true for this economy?

- A) Production equals demand.
- B) The quantity supplied of bonds equals the quantity demanded of bonds.
- C) The money supply equals money demand.
- D) Financial markets are in equilibrium.
- E) all of these

23 Analyzing the Effects of Changes in Policy or Exogenous Variables

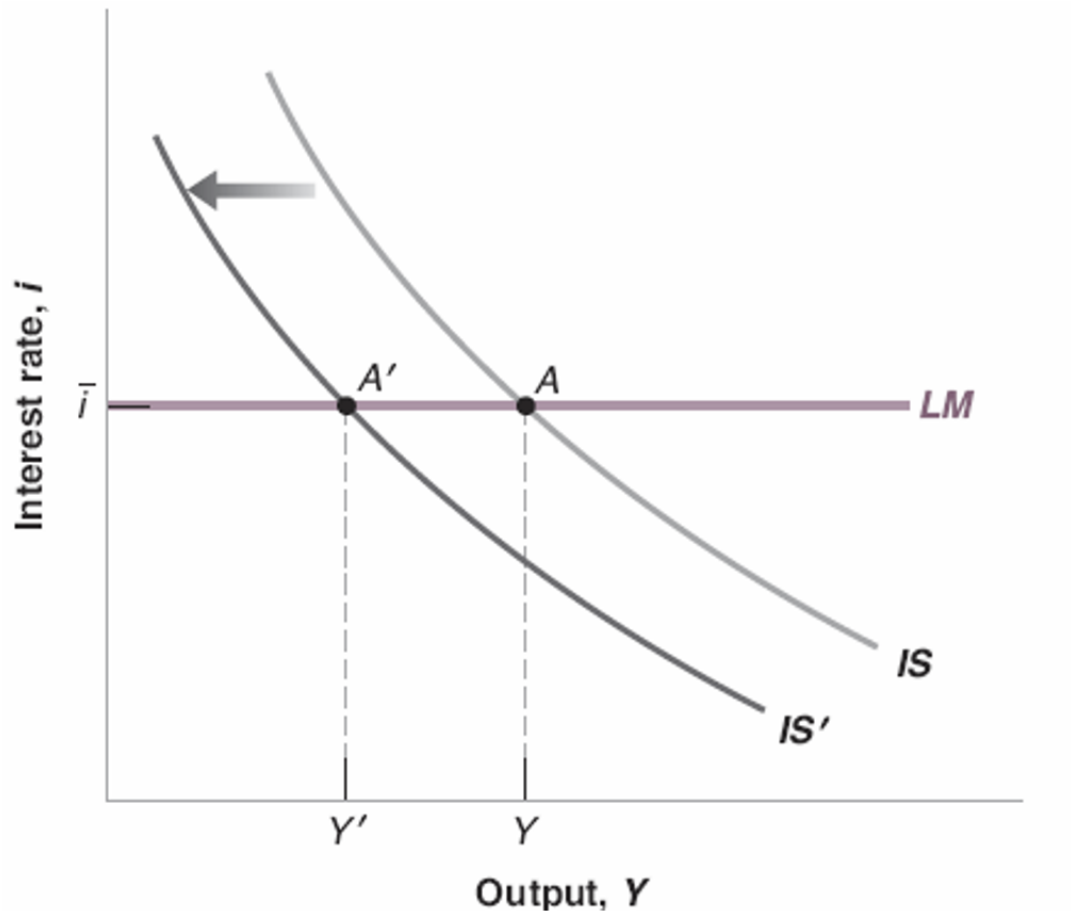
- Steps for analyzing the effects of changes in policy or exogenous variables:
  - 1. Does it shift the IS curve and/or the LM curve?
  - 2. What does this do to equilibrium output and the equilibrium interest rate?
  - 3. Describe the effects in words.

24 Fiscal Policy

- Fiscal Policy:
  - Decrease in $G-T \Leftrightarrow$ **fiscal contraction** $\Leftrightarrow$ **fiscal consolidation**
  - Increase in $G-T \Leftrightarrow$ **fiscal expansion**

25 The Effects of an Increase in Taxes

- An increase in taxes shifts the IS curve to the left, and leads to a decrease in the equilibrium level of output.

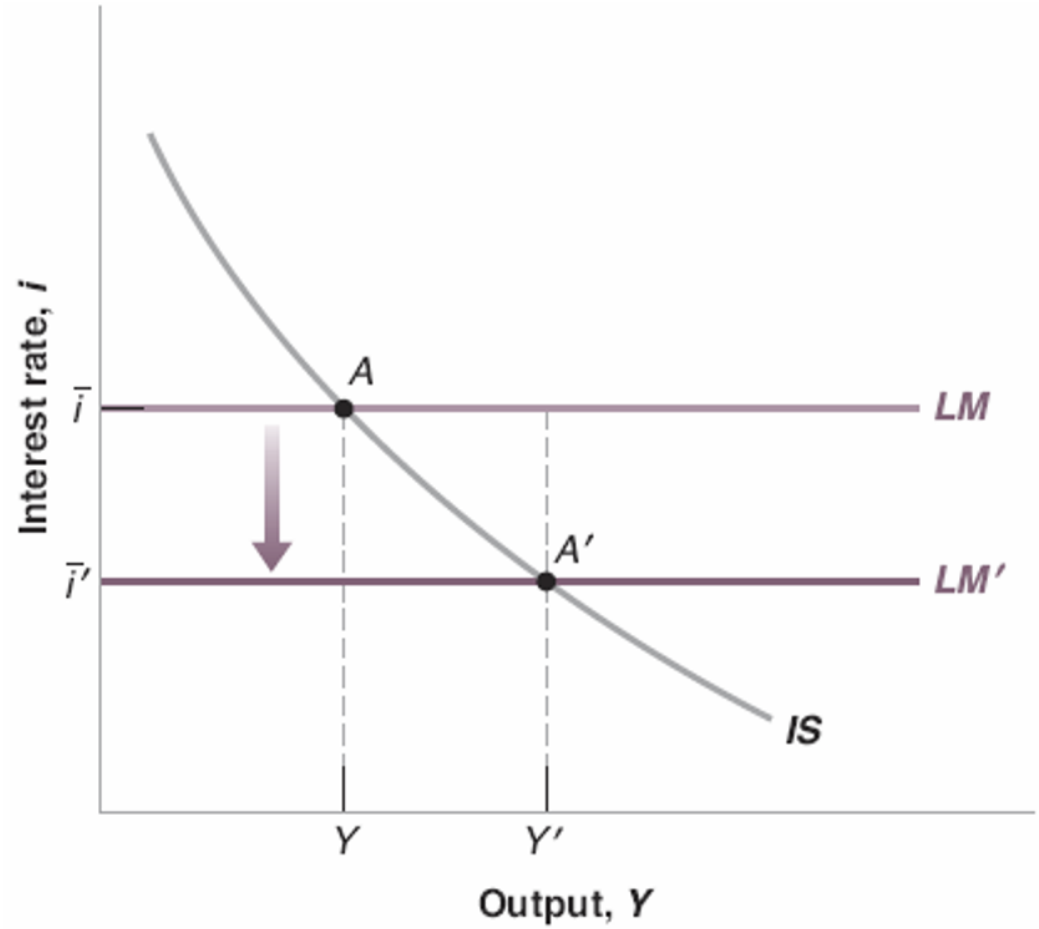


26 Monetary Policy

- Monetary Policy:
  - Decrease in $i \Leftrightarrow$ increase in $M \Leftrightarrow$ **monetary expansion**
  - Increase in $i \Leftrightarrow$ decrease in $M \Leftrightarrow$ **monetary contraction** $\Leftrightarrow$ **monetary tightening**

27 The Effects of a Decrease in the Interest Rate

- A monetary expansion shifts the LM curve down, and leads to higher output.



Sample Question 2 (vevox ID: 191-984-461)

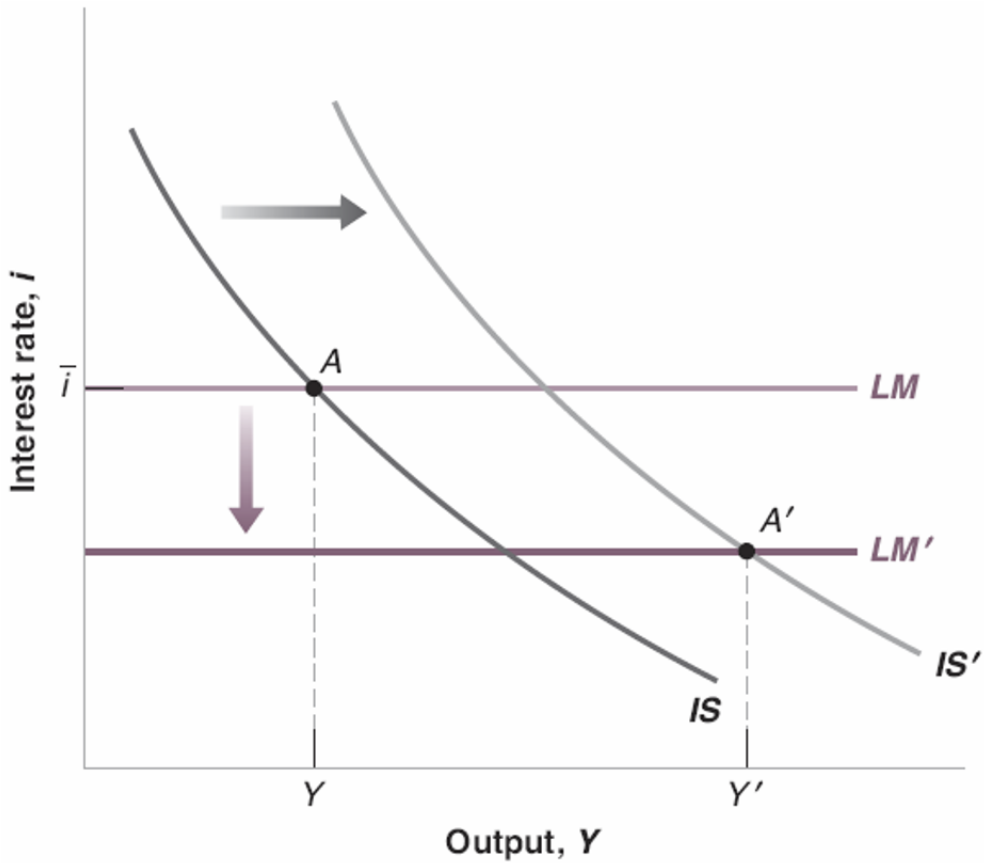
During 2008 in the United States, consumer confidence fell significantly. Which of the following will occur as a result of this reduction in consumer confidence?

- A) The LM curve will shift up.
- B) The LM curve will shift down.
- C) The IS curve will shift rightward.
- D) The IS curve will shift leftward.
- E) The IS curve will shift rightward, and the LM curve will shift up.

28 Monetary-fiscal Policy Mix

- Monetary-fiscal policy mix is the combination of monetary and fiscal policies.
- Suppose that the economy is in a recession and output is too low.
- Both fiscal and monetary policies can be used to increase output.

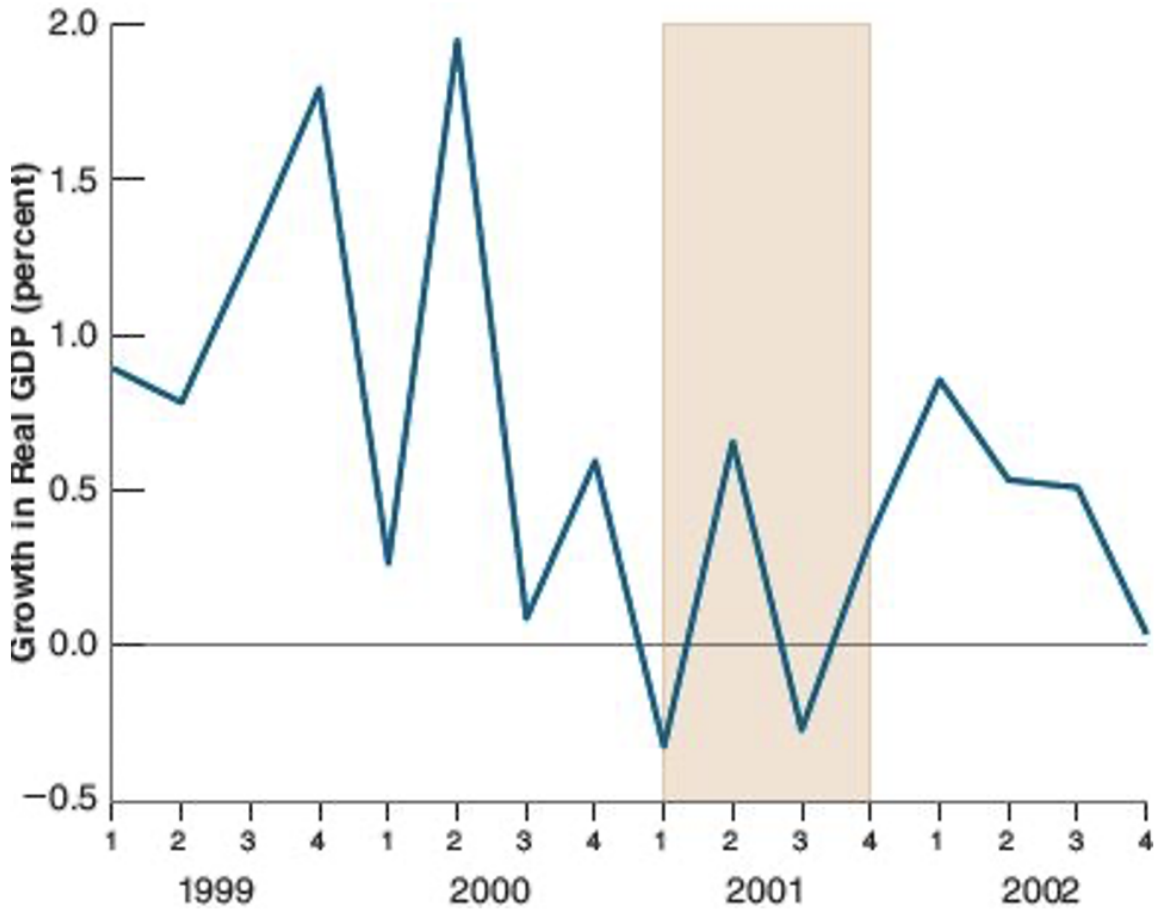
29 The Effects of a Combined Fiscal and Monetary Expansion



- The fiscal expansion shifts the IS curve to the right.
- A monetary expansion shifts the LM curve down.
- Both lead to higher output.

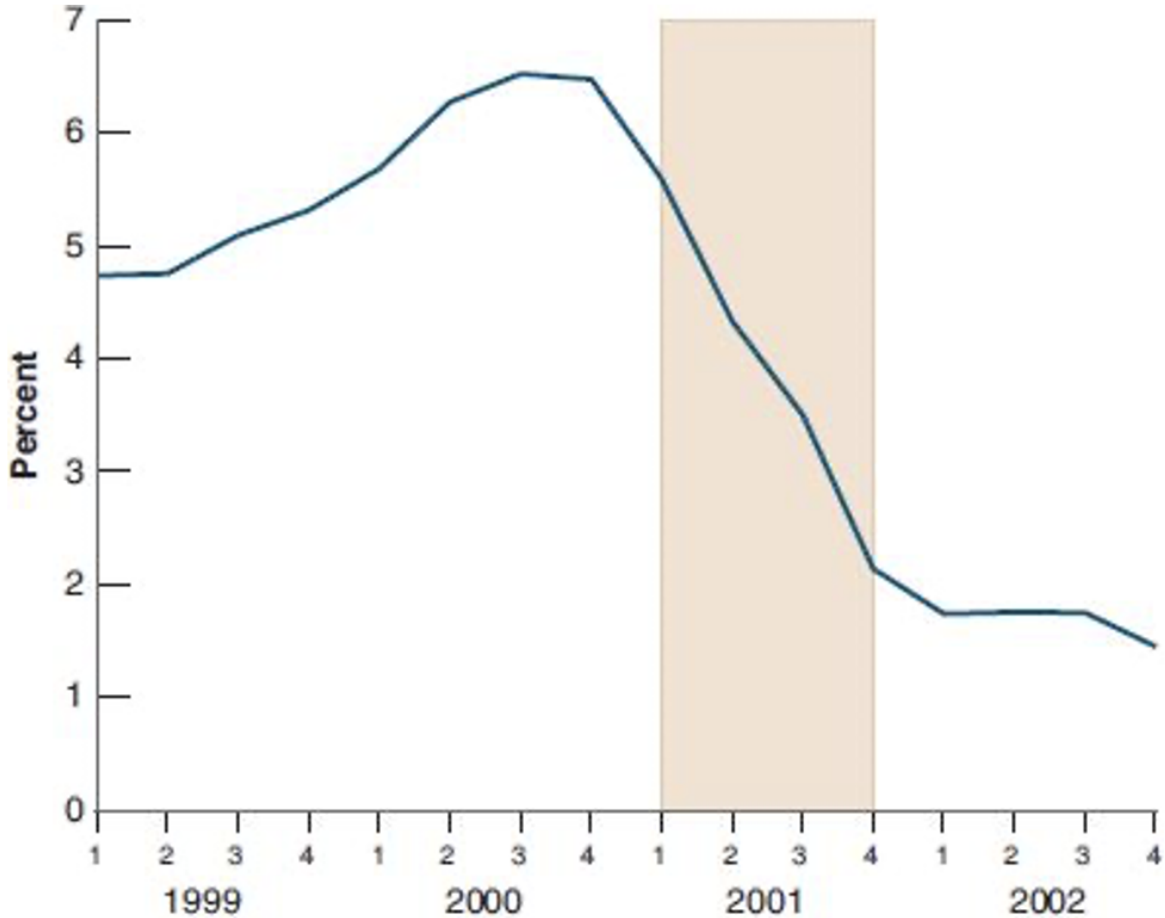
30 The U.S. Recession of 2001 I

- The U.S. economy was in a recession between March 2001 and December 2001



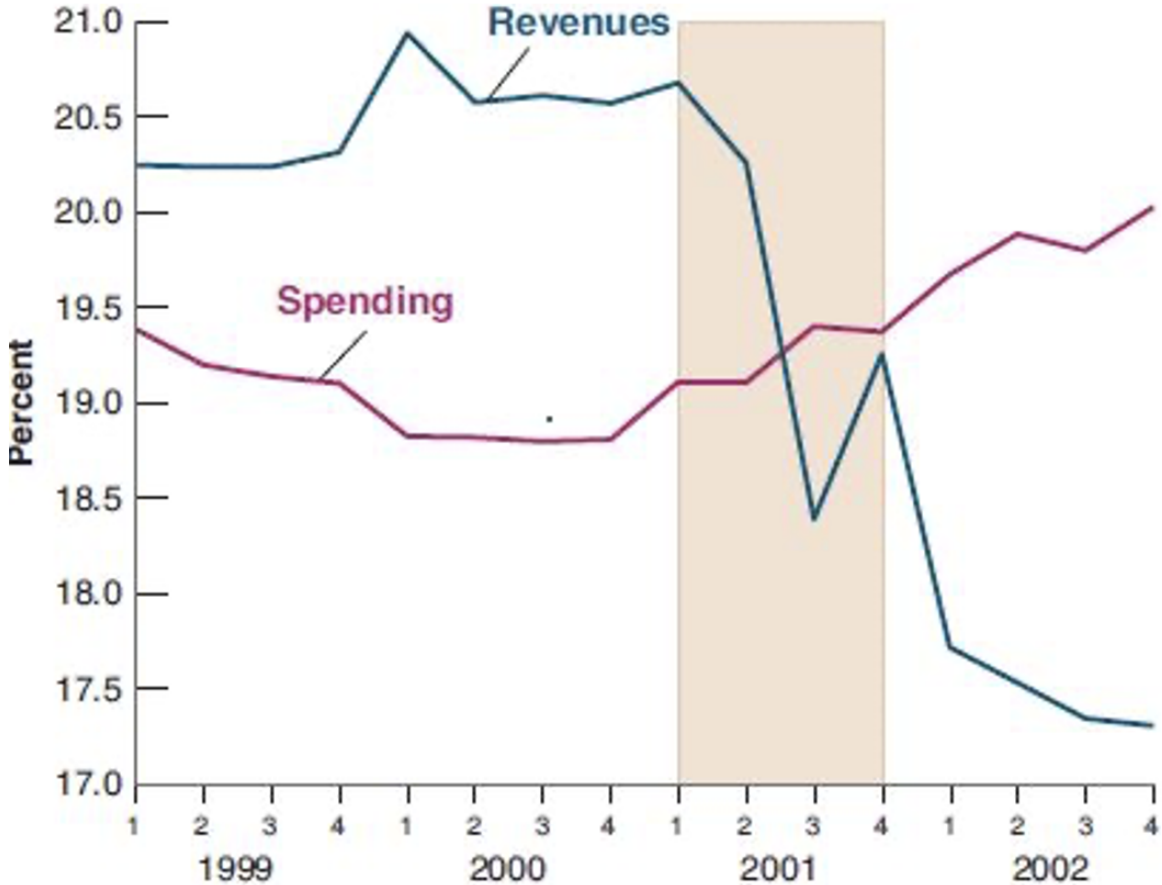
31 The U.S. Recession of 2001 II

- The Fed cut the federal funds rate from 6.5% in January to 2% at the end of 2001.

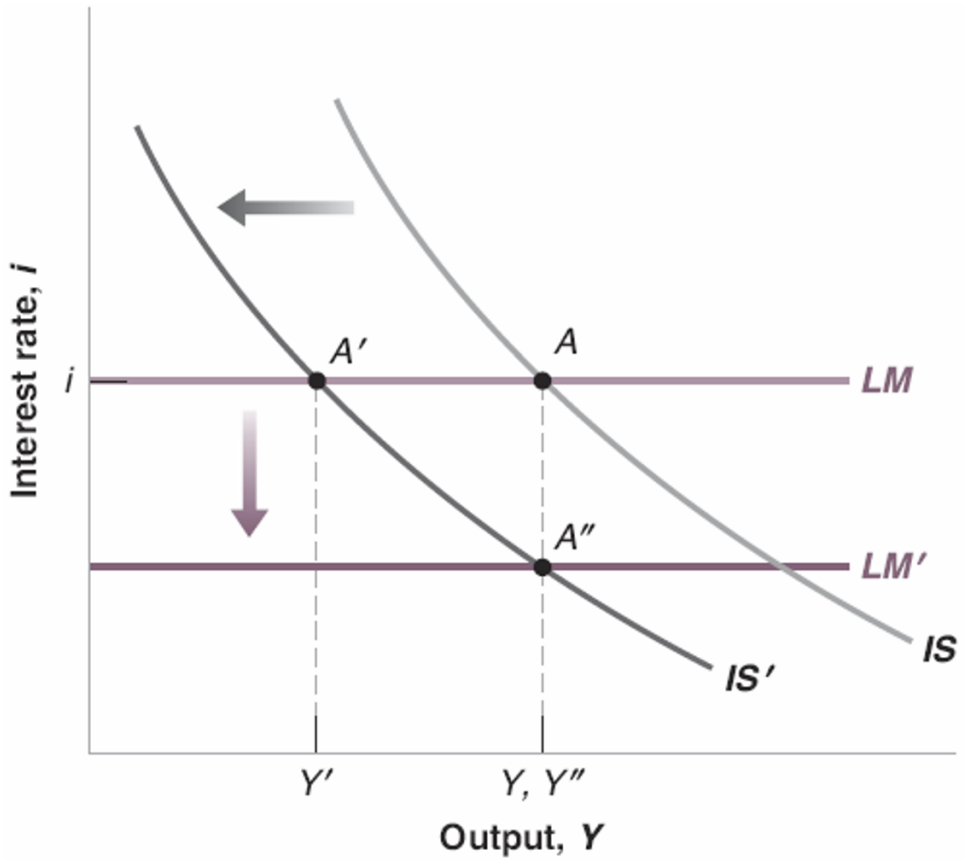


32 The U.S. Recession of 2001 III

- President George Bush also cut taxes in 2001 and 2002 budgets.
- The events of September 11, 2001 led to an increase in spending on defense and homeland security.

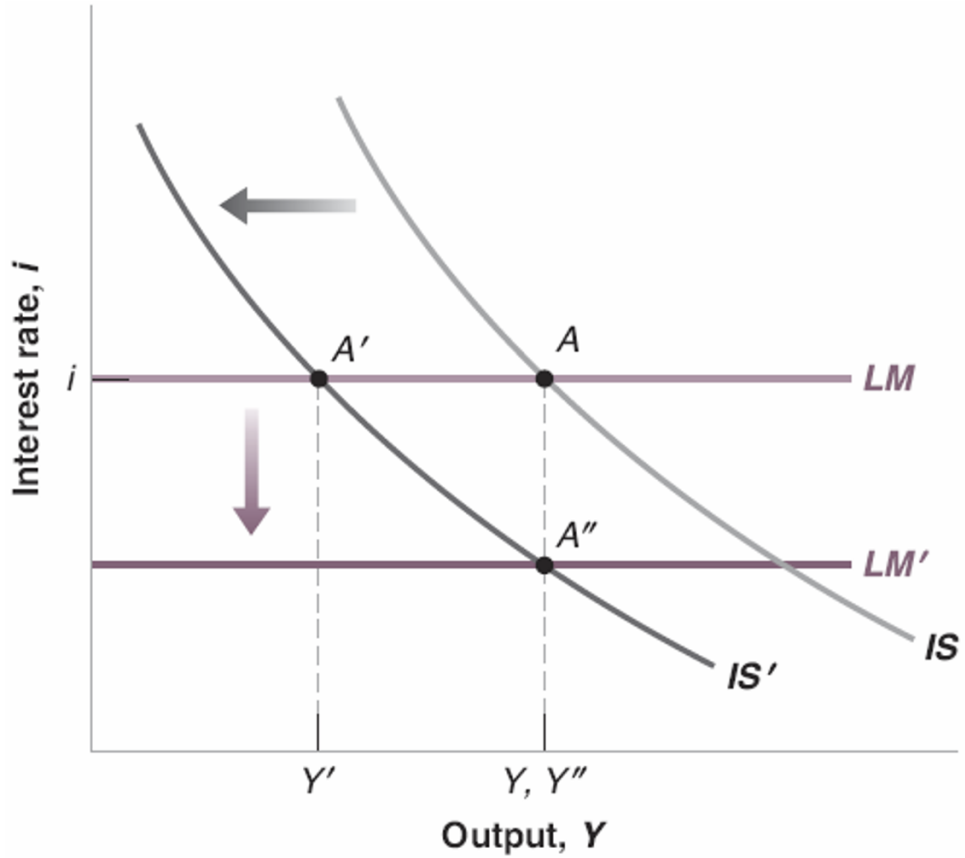


33 The Effects of a Combined Fiscal Consolidation and a Monetary Expansion



- The fiscal consolidation shifts the IS curve to the left.
- A monetary expansion shifts the LM curve down.

34 The Effects of a Combined Fiscal Consolidation and a Monetary Expansion



- Suppose the government is facing a budget deficit, and aims to mitigate it. However, there are concerns about the potential impact on output.
- A combined fiscal consolidation and a monetary expansion allows for the reduction in the deficit without a recession.
- Need to cooperate with the central bank.

Sample Question 3 (vevox ID: 191-984-461)

Suppose there is a simultaneous fiscal expansion and monetary contraction. We know with certainty that

- A) output will increase.
- B) output will decrease.
- C) the interest rate will increase.
- D) the interest rate will decrease.
- E) both output and the interest rate will increase.

35 Exit Ticket (vevox ID: 148-225-343)

- One idea you learned today that was surprising or interesting to you.

- Are there topics you wish had been covered in more detail, or questions you feel are unanswered?

- **Any questions?**

You can find me at guangzhi.ye@ntu.edu.sg or by scheduling an in-person meeting through https://calendly.com/guangzhiye24.