

# Introduction to Macroeconomics

## TOPIC 4: The IS-LM Model

Annaïg Morin  
CBS - Department of Economics

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# The IS-LM Model

In topic 2 The Goods Market, we isolated the goods market from the financial one by assuming that investment was not a function of the interest rate.

In topic 3 The Financial Market, we studied the interest rate and how it is determined on the financial market.

Now, lets go back to the goods market and see what changes with the new assumption that investment is a function of the interest rate. *Lets study the goods and the financial market together.*

# The IS-LM Model

Road map:

- The goods market: the IS curve
- The financial market: LM curve
- Equilibrium: IS-LM
- Fiscal and monetary policies

# 1. The goods market

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## 1. The goods market

- 1.1. What we remember from Topic 2
- 1.2. Investment
- 1.3. Determining output
- 1.4. The IS relation
- 1.5. Shifts of the IS curve

# 1.1. The goods market - What we remember

Remember topic 2 The Goods Market:

- Demand for goods:  $C(Y_D) + I + G$   
where  $Y_D = Y - T$  is the disposable income
- Supply of goods:  $Y$
- Equilibrium:  $Y = C(Yd) + I + G$

## 1.2. The goods market - Investment

Investment is not constant. It depends primarily on two factors:

- Production (+)
- Interest rate (-):  
the higher the interest rate, the more expensive it is to borrow in order to invest, the lower the level of investment.

Investment function:  $I = I(\underbrace{Y, i}_{(+, -)})$

## 1.3. The goods market - Determining output

The demand for goods is:  $C \underbrace{(Y, T)}_{(+,-)} + I \underbrace{(Y, i)}_{(+,-)} + G$

↪ the demand for goods is increasing in  $Y$  (income/production).



## 1.3. The goods market - Determining output

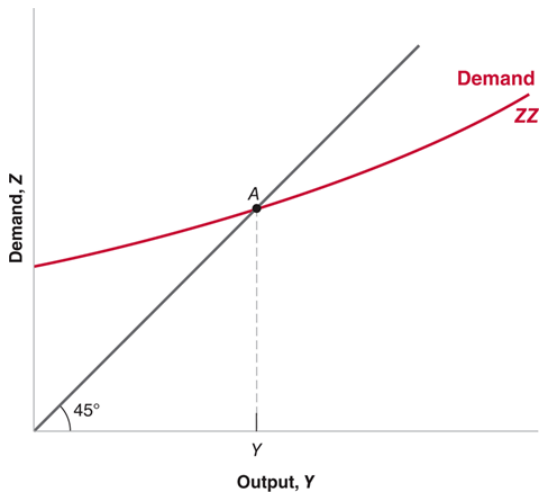


Figure: Equilibrium in the goods market

## 1.4. The goods market - IS relation

$$\text{Equilibrium: } Y = \underbrace{C(Y, T)}_{(+,-)} + \underbrace{I(Y, i)}_{(+,-)} + G$$

This equilibrium condition is called the **IS relation**.

## 1.4. The goods market - IS relation

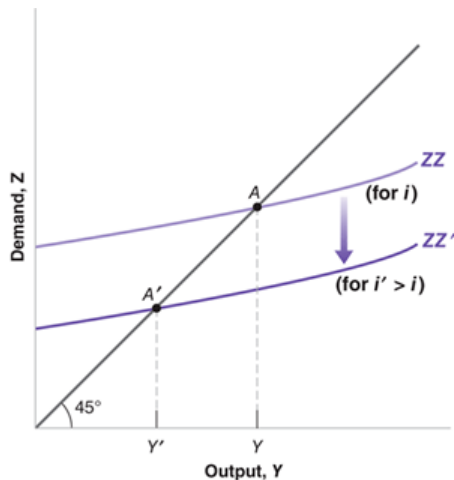


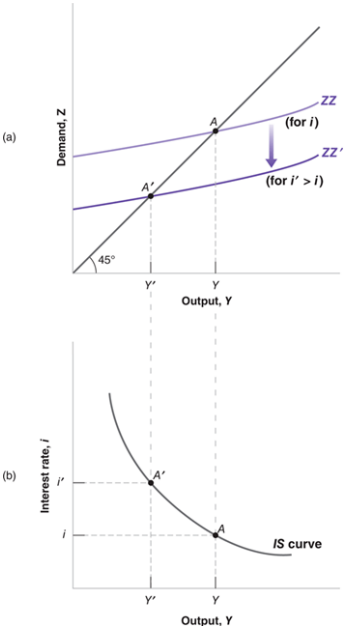
Figure: Effect on the equilibrium level of production of an increase in the interest rate

## 1.4. The goods market - IS relation

If the interest rate increases, investment drops which pushes down the demand for goods. The equilibrium level of output is lower.

↔ **Decreasing** relation between the interest rate and equilibrium output.

Figure: Construction of the IS curve



## 1.4. The goods market - IS relation

The downward-sloping IS curve represents the negative relation between the interest rate and the equilibrium output.

All the points on this curve represents an equilibrium on the goods market.

## 1.5. The goods market - Shifts of the IS curve

*What happens if taxes increase?*

- Disposable income drops, consumption drops, demand drops
- Supply must drop too to maintain the equilibrium.
- For any level of interest rate, the corresponding level of equilibrium output is now lower

↔ leftward shift of the IS curve.

## 1.5. The goods market - Shifts of the IS curve

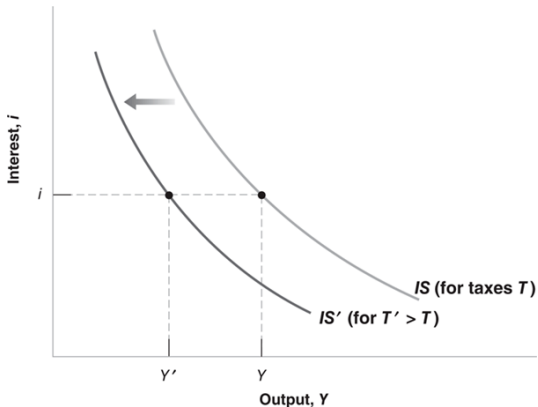


Figure: Effect on the IS curve of an increase in taxes



## 1.5. The goods market - Shifts of the IS curve

Any change (decrease in government consumption, increase in taxes, decrease in consumer confidence - proxied by  $c_0$ ) that, for a given interest rate, decreases the demand for goods creates a shift of the IS curve to the left.

Symmetrically, any change (increase in government consumption, decrease in taxes, increase in consumer confidence - proxied by  $c_0$ ) that, for a given interest rate, increases the demand for goods creates a shift of the IS curve to the right.

## 2. The financial market

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- 2.1. The LM relation
- 2.2. Shifts of the LM curve

## 2.1. The financial market - LM relation

Remember topic 3 The Financial Market:

- Equilibrium:  $M^S = M^D = M = \$YL(i)$

Now lets talk in real terms (because we want an analysis in terms of goods)

↔ We divide by the price level (GDP deflator, denoted by P):

- Equilibrium:  $\frac{M}{P} = YL(i)$

This equilibrium condition is called the **LM relation**.

## 2.1. The financial market - LM relation

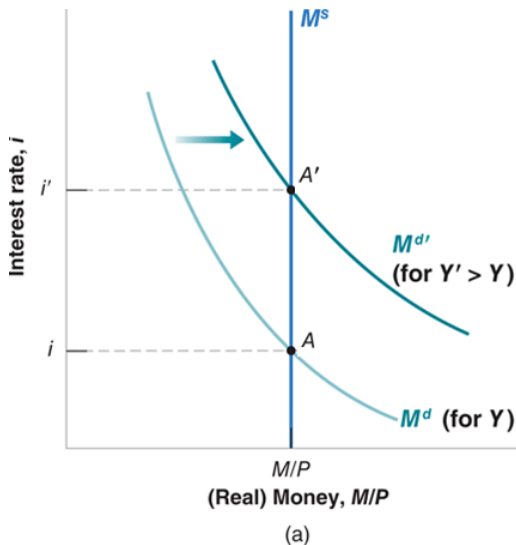


Figure: Effect on the interest rate of an increase in income

## 2.1. The financial market - LM relation

If income increases, the demand for money increases at any given interest rate. Given that the supply of money is fixed, the interest rate must increase to lower the demand for money and maintain the equilibrium.

↔ **Increasing** relation between the interest rate and output.

## 2.1. The financial market - LM relation

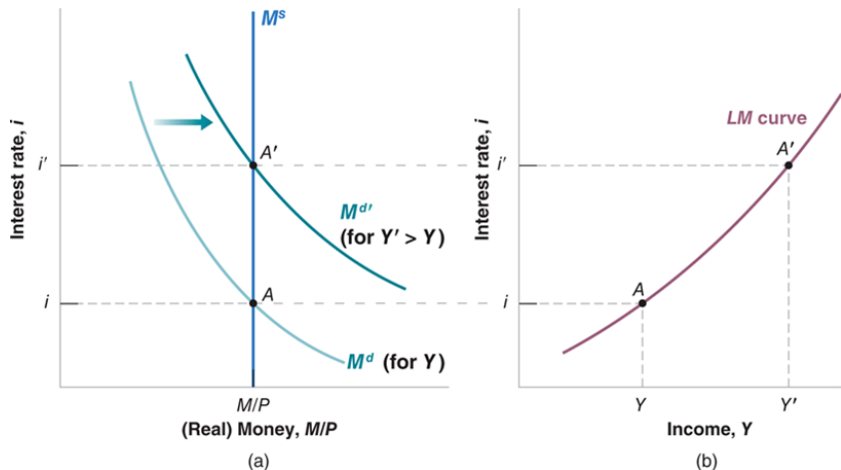


Figure: Construction of the LM curve

## 2.1. The financial market - LM relation

The upward-sloping LM curve represents the positive relation between the interest rate and output.

All the points on this curve represents an equilibrium on the financial market.



## 2.2. The financial market - Shifts of the LM curve

*What happens if the nominal money supply increases?*

- Real money supply goes up
- Demand for money should go up too, to maintain equilibrium: the interest rate must decrease
- For any level of output, the corresponding level of interest rate is now lower

↔ downward shift of the LM curve.

## 2.2. The financial market - Shifts of the LM curve

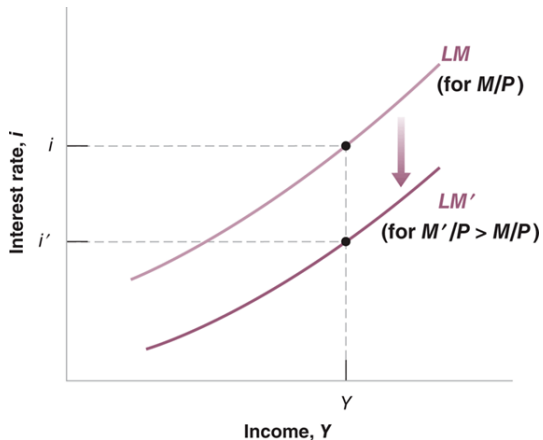


Figure: Effect on the LM curve of an increase in money supply

## 2.2. The financial market - Shifts of the LM curve

An increase in the money supply causes the LM curve to shift down.

Symmetrically, a decrease in the money supply causes the LM curve to shift up.

### 3. The IS-LM model

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### 3. The IS-LM model

- 3.1. An equilibrium concept
- 3.2. Fiscal policy
- 3.3. Monetary policy
- 3.4. Fiscal and monetary policies
- 3.5. Policy mix

## 3.1. The IS-LM model - An equilibrium concept

### **IS relation:**

the supply of goods must be equal to the demand for goods

### **LM relation:**

the supply of money must be equal to the demand for money

### 3.1. The IS-LM model - An equilibrium concept

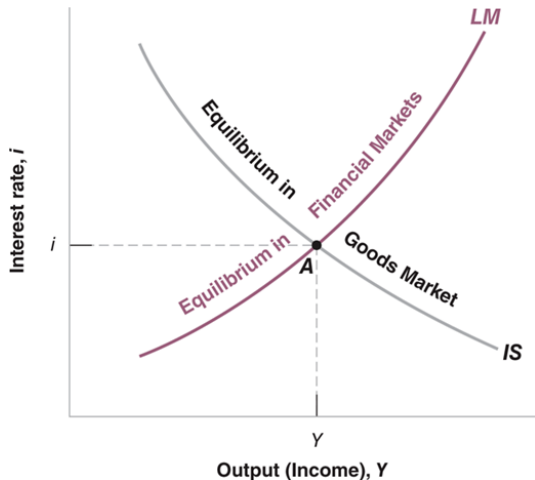


Figure: The IS-LM model

## 3.2. The IS-LM model - Fiscal policy

### Fiscal policy:

- Fiscal contraction (or fiscal consolidation): decrease in the budget deficit  $G - T$ 
  - decrease in government spending
  - increase in taxes
- Fiscal expansion: increase in the budget deficit  $G - T$ 
  - increase in government spending
  - decrease in taxes



## 3.2. The IS-LM model - Fiscal policy

*What happens when taxes increase?*

- Leftward shift of the IS curve. *Why?*
- No shift of the LM curve. *Why?*

The increase in taxes shifts the IS curve. The LM curve does not shift, the economy moves along the LM curve.

## 3.2. The IS-LM model - Fiscal policy

When taxes increase:

- Consumption goes down, leading to a decrease in output/income.
- The decrease in income reduces the demand for money. Given that the supply of money is fixed, the interest rate must decrease to push up the demand for money and maintain the equilibrium.

## 3.2. The IS-LM model - Fiscal policy

**NB:** the decrease in output is limited by the positive effect of a decrease in the interest rate on investment (even though we don't know if investment increases or decreases).

## 3.2. The IS-LM model - Fiscal policy

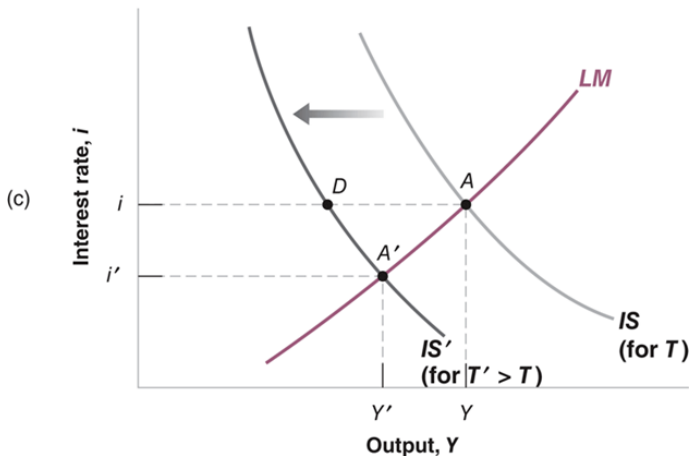


Figure: The effects of an increase in taxes

## 3.3. The IS-LM model - Monetary policy

### Monetary policy:

- **Monetary contraction** (or monetary tightening): decrease in the money supply
- **Monetary expansion**: increase in the money supply

### 3.3. The IS-LM model - Monetary policy

*What happens when the money supply increases?*

- No shift of the IS curve. *Why?*
- Downward shift of the LM curve. *Why?*

The increase in taxes shifts the LM curve. The IS curve does not shift, the economy moves along the IS curve.

### 3.3. The IS-LM model - Monetary policy

When money supply increases:

- To maintain the equilibrium, the demand for money should go up. For that to happen, the interest rate must decrease.
- The decrease in the interest rate favor investment, demand for goods and equilibrium output.

### 3.3. The IS-LM model - Monetary policy

**NB:** the decrease in the interest rate is limited by the positive effect of an increase in output on investment, and therefore on output.



### 3.3. The IS-LM model - Monetary policy

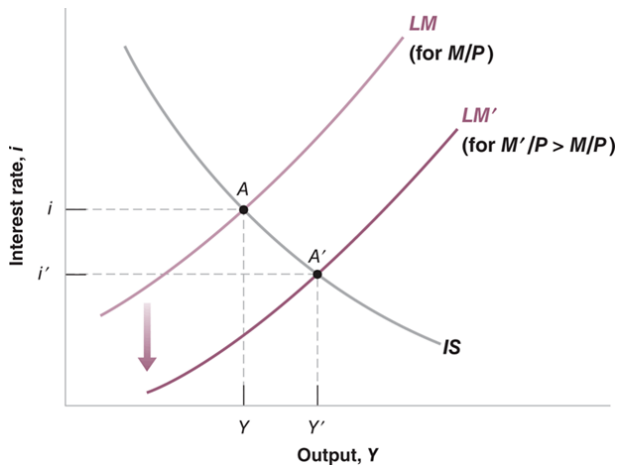


Figure: The effects of an increase in money supply

## 3.4. The IS-LM model - Fiscal and monetary policies

	Shift of <i>IS</i>	Shift of <i>LM</i>	Movement in Output	Movement in Interest Rate
Increase in taxes	left	none	down	down
Decrease in taxes	right	none	up	up
Increase in spending	right	none	up	up
Decrease in spending	left	none	down	down
Increase in money	none	down	up	down
Decrease in money	none	up	down	up

Figure: The effects of fiscal and monetary policy

## 3.5. The IS-LM model - Policy Mix

The combination of monetary and fiscal policies is called the **policy mix**.

- Bigger impact on output
- Allows a change in the output level without a too large change in the interest rate.

## 3.5. The IS-LM model - Policy Mix

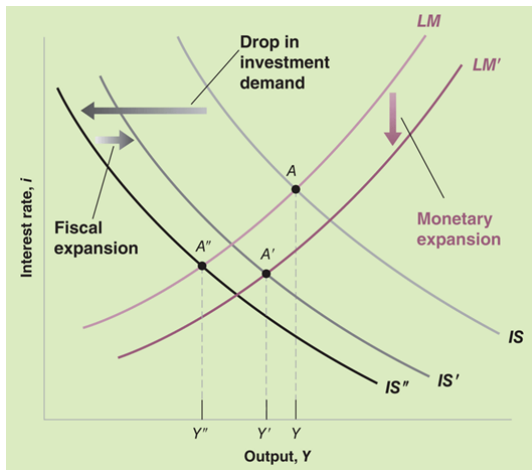


Figure: The policy mix against the recession of 2001

# Conclusion

We studied the goods and financial markets separately and together. But until now, we made a big assumption: we ignored the possible interactions between an economy and the rest of the world, on the goods and the financial markets.

Now, lets relax this assumption and analyze an *open economy*.