



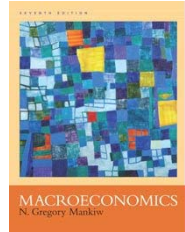
# Intermediate Macroeconomics

ECON 302

Professor Yamin Ahmad

## Lecture 11: The Small Open Economy

- Mundell-Fleming Model
- Floating vs. Fixed Rates
- Aggregate Demand in the Open Economy
- Interest Rate Parity



## Key Concepts...

- the Mundell-Fleming model (*IS-LM* for the small open economy)
- causes and effects of interest rate differentials
- arguments for fixed vs. floating exchange rates
- how to derive the aggregate demand curve for a small open economy

Note: These lecture notes are incomplete without having attended lectures



## The Mundell-Fleming model

- **Key assumption:**  
Small open economy with perfect capital mobility.

$$r = r^*$$

- **Goods market equilibrium** – the *IS\** curve:

$$Y = C(Y - T) + I(r^*) + G + NX(e)$$

where

**e** = nominal exchange rate  
= foreign currency per unit domestic currency

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## The *IS\** curve: Goods market eq'm

$$Y = C(Y - T) + I(r^*) + G + NX(e)$$

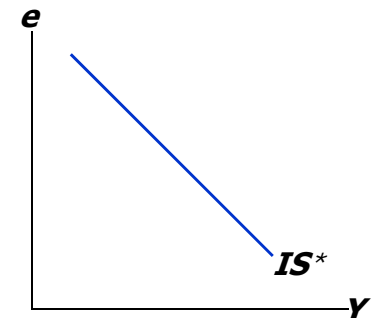
The *IS\** curve is drawn for a given value of  $r^*$ .

Intuition for the slope:

$$\downarrow e \Rightarrow \uparrow NX \Rightarrow \uparrow Y$$

We could derive this using the “Keynesian cross”.

Remember, the *IS* curve incorporates the multiplier effect.



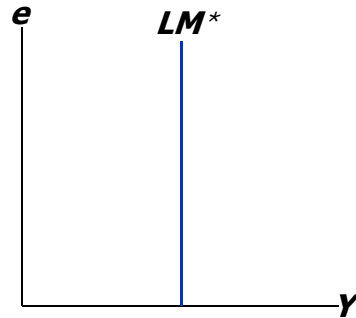
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### The $LM^*$ curve: Money market eq'm

$$M/P = L(r^*, Y)$$

The  $LM^*$  curve

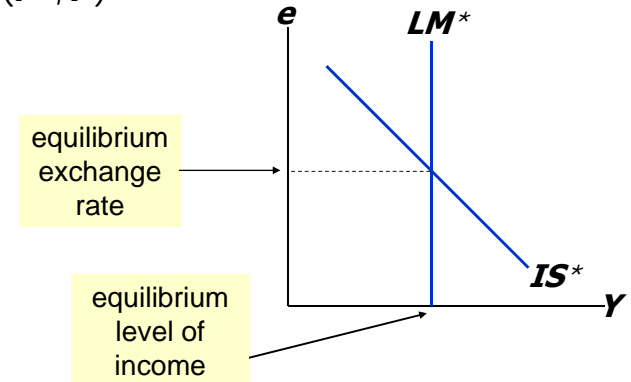
- is drawn for a given value of  $r^*$ .
- is vertical because: given  $r^*$ , there is only one value of  $Y$  that equates money demand with supply, regardless of  $e$ .



### Equilibrium in the Mundell-Fleming model

$$Y = C(Y - T) + I(r^*) + G + NX(e)$$

$$M/P = L(r^*, Y)$$



### Floating & fixed exchange rates

- In a system of **floating exchange rates**,  $e$  is allowed to fluctuate in response to changing economic conditions.
- In contrast, under **fixed exchange rates**, the central bank trades domestic for foreign currency at a predetermined price.
- Next, policy analysis –
  - first, in a floating exchange rate system
  - then, in a fixed exchange rate system

### Fiscal policy under floating exchange rates

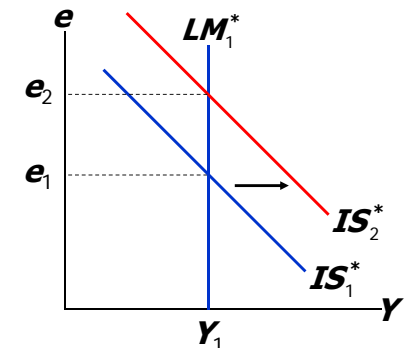
$$Y = C(Y - T) + I(r^*) + G + NX(e)$$

$$M/P = L(r^*, Y)$$

At any given value of  $e$ , a fiscal expansion increases  $Y$ , shifting  $IS^*$  to the right.

Results:

$$\Delta e > 0, \Delta Y = 0$$





## Lessons about fiscal policy

- In a small open economy with perfect capital mobility, fiscal policy cannot affect real GDP.
- “Crowding out”
  - *closed economy*: Fiscal policy crowds out investment by causing the interest rate to rise.
  - *small open economy*: Fiscal policy crowds out net exports by causing the exchange rate to appreciate.

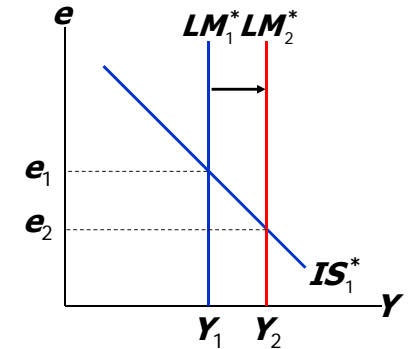


## Monetary policy under floating exchange rates

$$Y = C(Y - T) + I(r^*) + G + NX(e)$$

$$M/P = L(r^*, Y)$$

An increase in  $M$  shifts  $LM^*$  right because  $Y$  must rise to restore eq'm in the money market.



Results:

$$\Delta e < 0, \Delta Y > 0$$



## Lessons about monetary policy

- Monetary policy affects output by affecting the components of aggregate demand:
  - closed economy:  $\uparrow M \Rightarrow \downarrow r \Rightarrow \uparrow I \Rightarrow \uparrow Y$
  - small open economy:  $\uparrow M \Rightarrow \downarrow e \Rightarrow \uparrow NX \Rightarrow \uparrow Y$
- Expansionary mon. policy does not raise world agg. demand, it merely shifts demand from foreign to domestic products.
- So, the increases in domestic income and employment are at the expense of losses abroad.

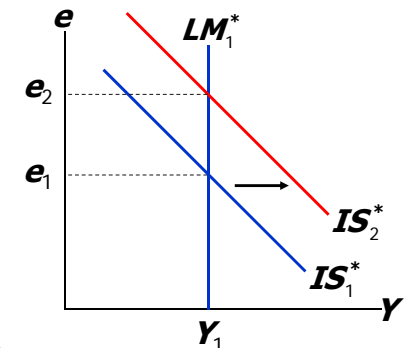


## Trade policy under floating exchange rates

$$Y = C(Y - T) + I(r^*) + G + NX(e)$$

$$M/P = L(r^*, Y)$$

At any given value of  $e$ , a tariff or quota reduces imports, increases  $NX$ , and shifts  $IS^*$  to the right.



Results:

$$\Delta e > 0, \Delta Y = 0$$

$NX$  does not change! Why?



## Lessons about trade policy

- Import restrictions cannot reduce a trade deficit.
- Even though  $NX$  is unchanged, there is less trade:
  - the trade restriction reduces imports.
  - the exchange rate appreciation reduces exports.
- Less trade means fewer “gains from trade.”

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## Lessons about trade policy, *cont.*

- Import restrictions on specific products save jobs in the domestic industries that produce those products, but destroy jobs in export-producing sectors.
- Hence, import restrictions fail to increase total employment.
- Also, import restrictions create “sectoral shifts,” which cause frictional unemployment.

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## Fixed exchange rates

- Under fixed exchange rates, the central bank stands ready to buy or sell the domestic currency for foreign currency at a predetermined rate.
- In the Mundell-Fleming model, the central bank shifts the  $LM^*$  curve as required to keep  $e$  at its preannounced rate.
- This system fixes the nominal exchange rate. In the long run, when prices are flexible, the real exchange rate can move even if the nominal rate is fixed.

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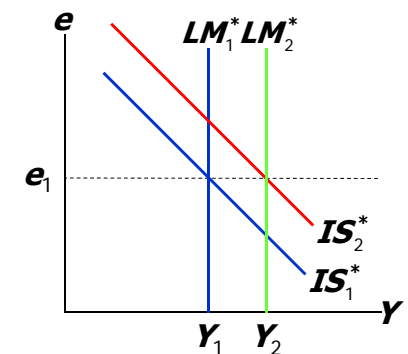
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## Fiscal policy under fixed exchange rates

Under floating rates, fiscal policy is ineffective at changing output.

Under fixed rates, fiscal policy is very effective at changing output.



Results:

$$\Delta e = 0, \Delta Y > 0$$

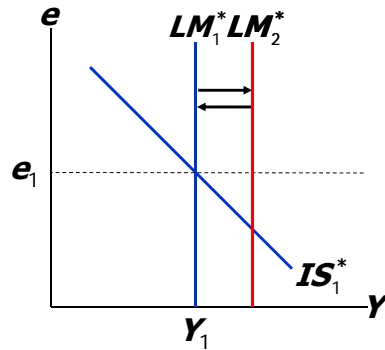
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### Monetary policy under fixed exchange rates

Under floating rates, monetary policy is very effective at changing output.  
 Under fixed rates, monetary policy cannot be used to affect output.



Results:

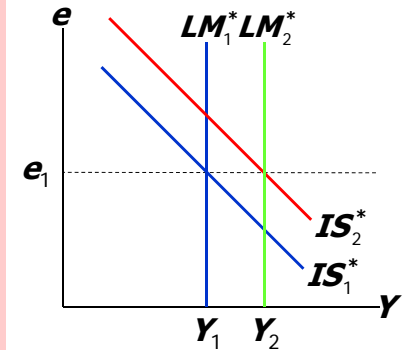
$$\Delta e = 0, \Delta Y = 0$$

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### Trade policy under fixed exchange rates

Under floating rates, import restrictions do not affect  $Y$  or  $NX$ .  
 Under fixed rates, import restrictions increase  $Y$  and  $NX$ .  
 Is this policy desirable? Why or why not?



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### Summary of policy effects in the Mundell-Fleming model

Policy	type of exchange rate regime:					
	floating			fixed		
	impact on:					
	Y	e	NX	Y	e	NX
fiscal expansion	0	↑	↓	↑	0	0
mon. expansion	↑	↓	↑	0	0	0
import restriction	0	↑	0	↑	0	↑

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### Floating vs. fixed exchange rates

#### Argument for floating rates:

- allows monetary policy to be used to pursue other goals (stable growth, low inflation).

#### Arguments for fixed rates:

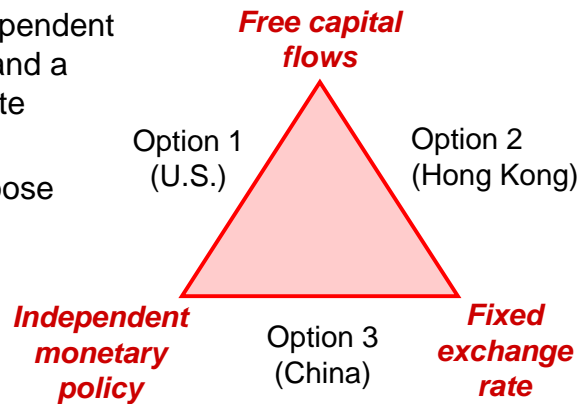
- avoids uncertainty and volatility, making international transactions easier.
- disciplines monetary policy to prevent excessive money growth & hyperinflation.

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## The Impossible Trinity

A nation cannot have free capital flows, independent monetary policy, and a fixed exchange rate simultaneously.

A nation must choose one side of this triangle and give up the opposite corner.



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## CASE STUDY: The Chinese Currency Controversy

- 1995-2005: China fixed its exchange rate at 8.28 yuan per dollar, and restricted capital flows.
- Many observers believed that the yuan was significantly undervalued, as China was accumulating large dollar reserves.
- U.S. producers complained that China's cheap yuan gave Chinese producers an unfair advantage.
- President Bush asked China to let its currency float; Others in the U.S. wanted tariffs on Chinese goods.

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## CASE STUDY: The Chinese Currency Controversy

- If China lets the yuan float, it may indeed appreciate.
- However, if China also allows greater capital mobility, then Chinese citizens may start moving their savings abroad.
- Such capital outflows could cause the yuan to depreciate rather than appreciate.

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## Mundell-Fleming and the *AD* curve

- So far in M-F model,  $P$  has been fixed.
- Next: to derive the *AD* curve, consider the impact of a change in  $P$  in the M-F model.
- We now write the M-F equations as:

$$(IS^*) \quad Y = C(Y - T) + I(r^*) + G + NX(\epsilon)$$

$$(LM^*) \quad M/P = L(r^*, Y)$$

(Earlier in this chapter,  $P$  was fixed, so we could write  $NX$  as a function of  $e$  instead of  $\epsilon$ .)

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## Deriving the AD curve

Why AD curve has negative slope:

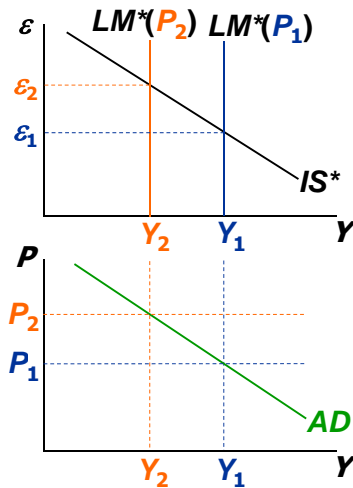
$$\uparrow P \Rightarrow \downarrow (M/P)$$

$\Rightarrow$  LM shifts left

$\Rightarrow \uparrow \epsilon$

$\Rightarrow \downarrow NX$

$\Rightarrow \downarrow Y$



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## From the short run to the long run

If  $Y_1 < \bar{Y}$ , then there is downward pressure on prices.

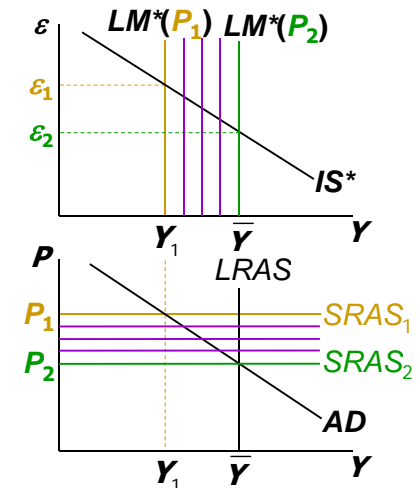
Over time,  $P$  will move down, causing

$$(M/P) \uparrow$$

$\epsilon \downarrow$

$NX \uparrow$

$Y \uparrow$



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## Interest-rate differentials

Two reasons why  $r$  may differ from  $r^*$

➤ **country risk:** The risk that the country's borrowers will default on their loan repayments because of political or economic turmoil.

Lenders require a higher interest rate to compensate them for this risk.

➤ **expected exchange rate changes:** If a country's exchange rate is expected to fall, then its borrowers must pay a higher interest rate to compensate lenders for the expected currency depreciation.

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## Expected change in exchange rates

- When a foreigner buys a domestic bond, they really earn more than just  $r$ , the interest rate.
- They are holding a dollar asset. Foreigners gain if the dollar itself gains value relative to the foreign currency.
- The expected appreciation of the dollar:

$$\frac{e_{+1} - e}{e}$$

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## Interest parity

- The total expected return for a foreigner is

$$r + \frac{e_{+1}^e - e}{e}$$

- “Interest parity” says that the return on the home country’s bonds equal the foreign interest rate:

$$r + \frac{e_{+1}^e - e}{e} = r^*$$



## Interest rates and exchange rates

- We can rewrite the interest parity equation to get a relationship that says the exchange rate is determined by home and foreign interest rates, and the expected future exchange rate:

$$e = \frac{e_{+1}^e}{1 + r^* - r}$$

- Home currency is stronger if:
  - Home interest rate,  $r$ , rises
  - Foreign interest rate,  $r^*$ , falls
  - Expected exchange rate increases



## IS-LM again

- Let’s write the equation for exchange rates as

$$\text{➤ } e = e(r, r^*, e^e)$$

- Now let’s go back to our IS equation:

$$\begin{aligned} \text{➤ } Y &= C(Y - T) + I(r) + G + NX(e) \\ &= C(Y - T) + I(r) + G + NX(e(r, r^*, e^e)) \end{aligned}$$

- We have solved out for the exchange rate.
  - IS depends on the interest rate,  $r$ .
  - IS is shifted by changes in  $r^*$  and  $e^e$



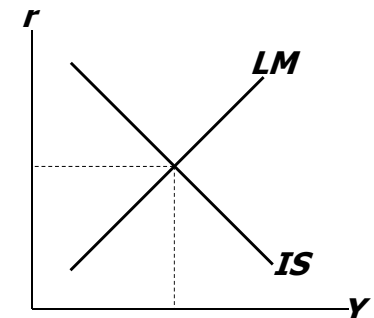
## The short-run equilibrium

The **LM** curve is unchanged.

For the open-economy, we can write an **IS-LM** model that is similar to the closed economy:

$$\begin{aligned} Y &= C(Y - \bar{T}) + I(r) + \bar{G} \\ &\quad + NX(e(r, r^*, e^e)) \end{aligned}$$

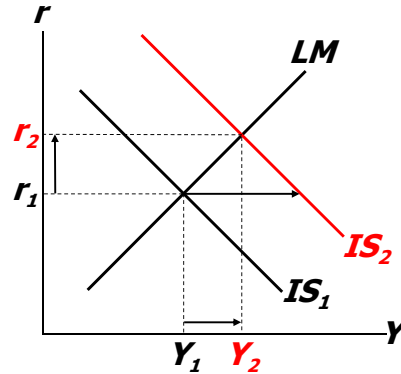
$$\bar{M}/\bar{P} = L(r, Y)$$



**IS** is flatter than in the closed economy. Why?

## An increase in government purchases

1.  $IS$  curve shifts right
2.  $r$  rises and  $Y$  rises
3.  $e$  rises, from interest parity
4.  $NX$  must fall.

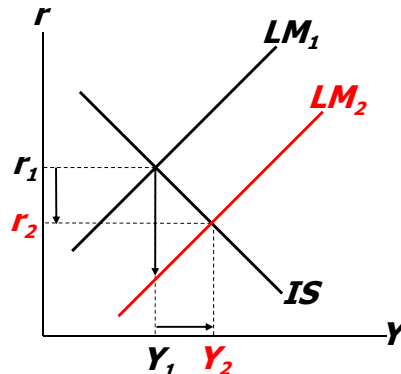


## Compare to model without expectations

- The home country interest rate can rise. We do not have to have  $r = r^*$
- There is crowding out – as  $G$  rises,  $NX$  falls.
  - But it is not complete crowding out.  $NX$  does not fall as much as  $G$  rises.
- So,  $Y$  rises when  $G$  rises.
  - Exogenous changes in demand can affect output.

## Monetary policy: An increase in $M$

1.  $\Delta M > 0$  shifts the  $LM$  curve down
2.  $r$  goes down,  $Y$  goes up
3.  $e$  goes down
4.  $NX$  goes up



## Compare to the model with no expectations

- A monetary expansion reduces the home interest rate,  $r$ , as in an open economy
- Investment demand and net exports are stimulated.
  - In the open economy, a monetary expansion has an extra kick.



## A change in expectations

- What if there is an increase in the expected future value of the currency?  $e^e$  rises.
  - From interest parity, this leads to an immediate appreciation:  $e$  rises.
  - This reduces net exports.
  - IS shifts to the left.
  - The interest rate,  $r$ , falls, and output,  $Y$ , falls.

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## Summary

- When we allow for expected changes in the value of the currency and use interest parity, the model is like the closed economy IS-LM.
- The IS curve is flatter because a drop in the interest rate also causes  $e$  to fall, which stimulates net exports.
- The expected exchange rate,  $e^e$ , and the foreign interest rate,  $r^*$ , can affect the IS curve.

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## Summary

1. Mundell-Fleming model
  - the IS-LM model for a small open economy.
  - takes  $P$  as given.
  - can show how policies and shocks affect income and the exchange rate.
2. Fiscal policy
  - affects income under fixed exchange rates, but not under floating exchange rates.

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## Summary

3. Monetary policy
  - affects income under floating exchange rates.
  - under fixed exchange rates, monetary policy is not available to affect output.
4. Interest rate differentials
  - exist if investors require a risk premium to hold a country's assets.

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## Summary

### 5. Fixed vs. floating exchange rates

- Under floating rates, monetary policy is available for can purposes other than maintaining exchange rate stability.
- Fixed exchange rates reduce some of the uncertainty in international transactions.