Open Economy IS/LM Model: Floating Exchange Rates

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Equilibrium: Outline

We need to clear

1. the goods market: IS
2. the money market: LM
3. the foreign exchange market: UIP

Endogenous variables: Y, i, E

We take as given:

1. P and P^* (short run assumption)
2. M: controlled by the Fed
3. E^e: the expected future exchange rate

Equilibrium: Equations

$$IS: Y = C(Y-T) + I(Y,i) + G + NX(\underset{-,+,-}{Y, Y^*, \varepsilon}) \tag{1}$$

$$LM: M/P = YL(i) \tag{2}$$

$$UIP: E = \frac{1+i^*}{1+i} E^e \tag{3}$$

with $\varepsilon = P/EP^*$.

These solve for Y, i, E.

Note: E is in \$/¥. High E means weak dollar.

Digression

What would happen if capital were completely immobile?

Modified IS Curve

We combine IS and UIP into a new IS curve

- It clears goods and FX markets

Then we have 2 equilibrium conditions again

The equilibrium graph looks a lot like a closed economy

The main difference:

- additional variables shift IS (Y^* and what's in the real exchange rate: E, E^e, i^*).

Modified IS Curve

Start from IS

$$Y = C(Y-T) + I(Y,i) + G + NX(\underset{-,+,-}{Y, Y^*, \varepsilon}) \tag{4}$$

Use UIP $(E = [1+i^*]/[1+i]E^e)$ to substitute out the real exchange rate

$$\varepsilon = P/(EP^*) \tag{5}$$

$$= \frac{1+i}{1+i^*}\frac{1}{E^e} \times \frac{P}{P^*} \tag{6}$$

Modified IS Curve

We can write

$$NX(Y, Y^*, \varepsilon) = NX\left(Y, Y^*, \frac{1+i}{1+i^*}\frac{1}{E^e}\right) \tag{7}$$

prices (P/P^*) are omitted arguments (constant here)

$NX \downarrow$

- when dollar appreciates $(\varepsilon \uparrow)$
- i.e., when $i \uparrow$ or $E^e \downarrow$

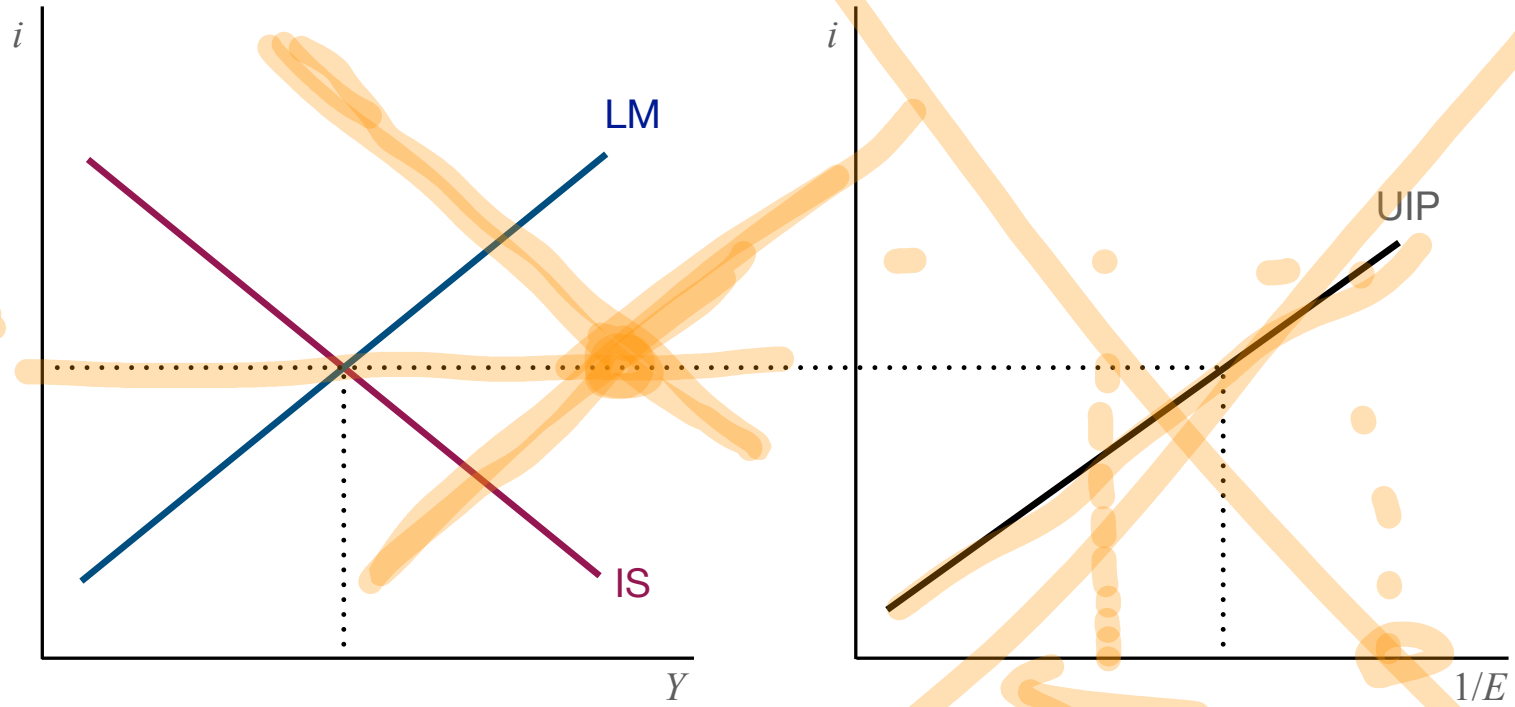
Modified IS Curve

$$IS: Y + C(Y-T) + I(Y,i) + G + NX\left(Y, Y^*, \frac{1+i}{1+i^*}E^e\right) \qquad (8)$$

Properties:

- downward sloping: $i \uparrow \Longrightarrow Y \downarrow$
- shifters: as closed economy *plus* anything that increases NX

IS-LM Graph



UIP: $E = \frac{1+i^*}{1+i} E^e$. Higher $i \implies$ stronger dollar $(E \downarrow)$.

What Has Changed

Relative to a closed economy:

1. the interest rate has an additional effect on IS:
   $i \uparrow \Longrightarrow E \downarrow \Longrightarrow NX \downarrow$
   this is driven by capital mobility (UIP)
   more mobile capital $\Longrightarrow$ flatter IS curve
2. additional shifters of IS: i^*, Y^*, E^e

Model Summary

$$IS: Y = C(Y-T) + I(Y,i) + G + NX\left(Y, Y^*, \frac{1+i}{1+i^*}\frac{1}{E^e}\right) \quad (9)$$

$$LM: M/P = Y \times L(i) \quad (10)$$

$$UIP: E_{\$/¥} = \frac{1+i^*}{1+i}E^e \quad (11)$$

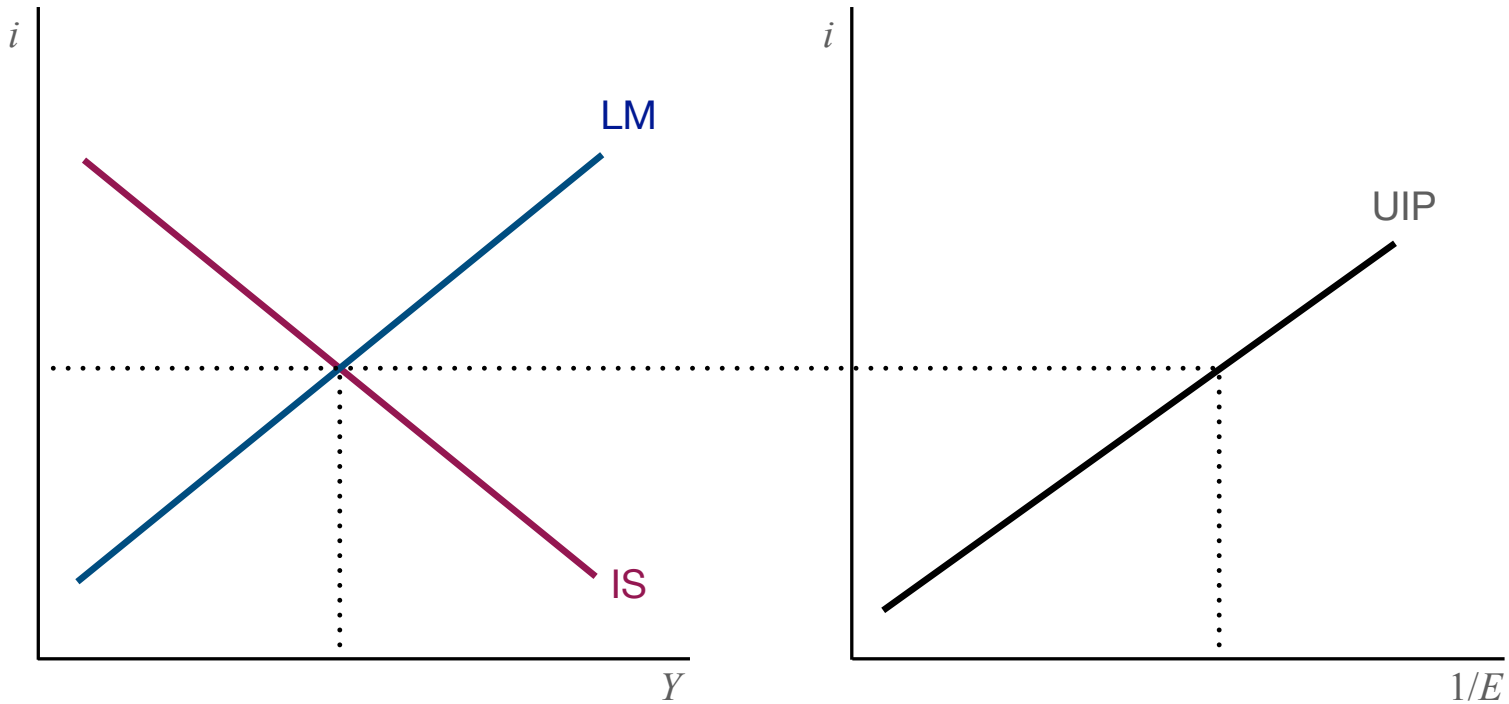
Exogenous: P, P^*, Y^*, E^e, G, T

Endogenous: Y, i, E

Key: $IS + LM$ solve for Y and i.

Analyzing Shocks

Government Spending Rises



Government Spending Rises

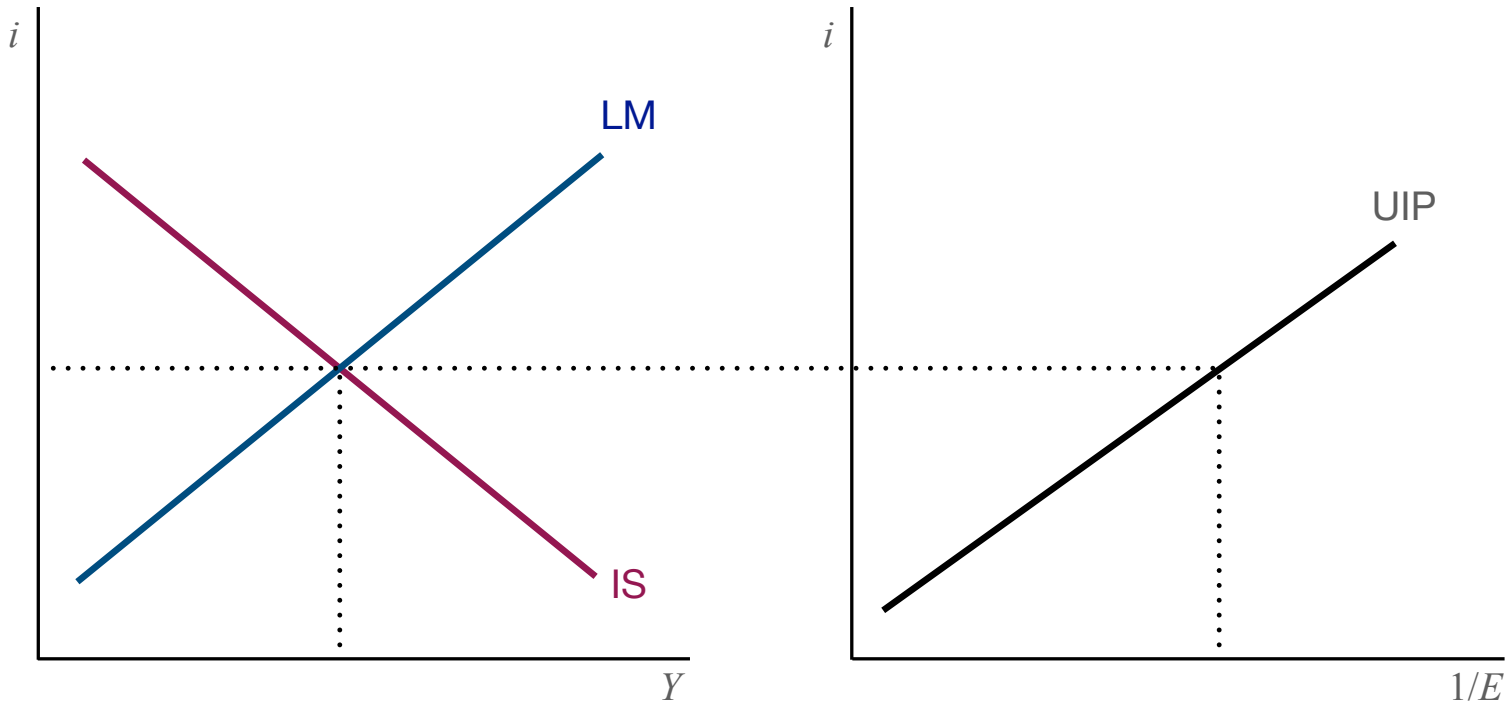
Higher G leads to:

1. higher Y and i
2. capital inflows (attracted by higher i)
3. dollar appreciation $(E\downarrow)$ (due to capital inflows)
4. lower NX (due to higher Y and lower E)

Consistency check: $NX = (Y - T - C) + (T - G) - I$

- $NX\downarrow$ primarily because public saving falls.

Monetary Contraction



Monetary Contraction

Lower M leads to:

1. lower Y, but higher i
2. capital inflows
3. dollar appreciation $(E \downarrow)$

Net exports: $NX = \underbrace{(Y - T - C)}_{\text{falls}} + (T - G) \underbrace{-I}_{\text{rises}}$

- private saving falls (lower Y)
- I falls (lower Y and higher i)
- change in NX is **ambiguous**
- but empirically I tends to be more responsive than S^p

Combining Monetary and Fiscal Policy

	Y	i	NX	E
$G\uparrow$	$\uparrow$	$\uparrow$	$\downarrow$	$\downarrow$
$M\uparrow$	$\uparrow$	$\downarrow$	$\uparrow$?	$\uparrow$

In principle, monetary and fiscal policy can be used jointly to increase output without affecting the trade balance.

But keep in mind: this is for the short run only (prices are fixed).

International Spillovers

How we manage recessions spills over to the rest of the world.

Policy option 1: **monetary expansion**:

- Dollar depreciates: $NX \uparrow$ likely
- we borrow demand from foreign countries
- we export our recession

Policy option 2: **fiscal expansion**:

- Dollar appreciates $(NX \downarrow)$
- we export demand to foreign countries
- we export the stimulus

Trade Restrictions

Do tariffs fix the trade deficit?

> *The most important economic truth to grasp about the U.S. trade deficit is that it has virtually nothing to do with trade policy. A nation's trade deficit is determined by the flow of investment funds into or out of the country. And those flows are determined by how much the people of a nation save and invest — two variables that are only marginally affected by trade policy. – Daniel Griswold, 1998*

How is it possible that making foreign goods more expensive does not reduce imports?

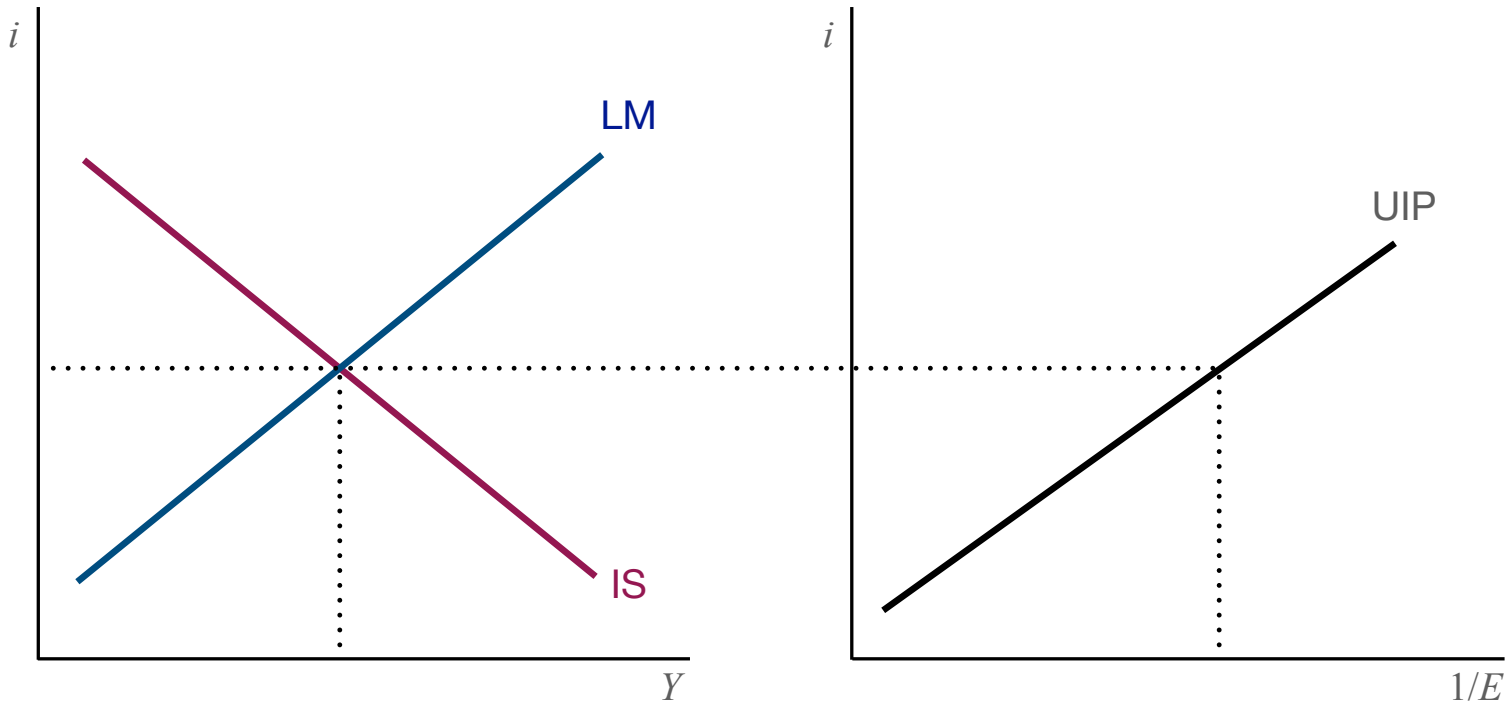
Trade Restrictions

Think of a tariff as improving NX for given (Y, Y^*, ε)

$$Y = C(Y-T) + I(Y,i) + G + NX\left(Y, Y^*, \frac{1+i^*}{1+i}\frac{1}{E^e}, \tau\right) \qquad (12)$$

It has exactly the same effects as a foreign expansion $(Y^* \uparrow)$.

Trade Restrictions



Trade restrictions

Result: tariffs work!

They improve the trade balance.

Doesn't that contradict our previous discussion?

Tariffs produce a short-run stimulus $(Y \uparrow)$.

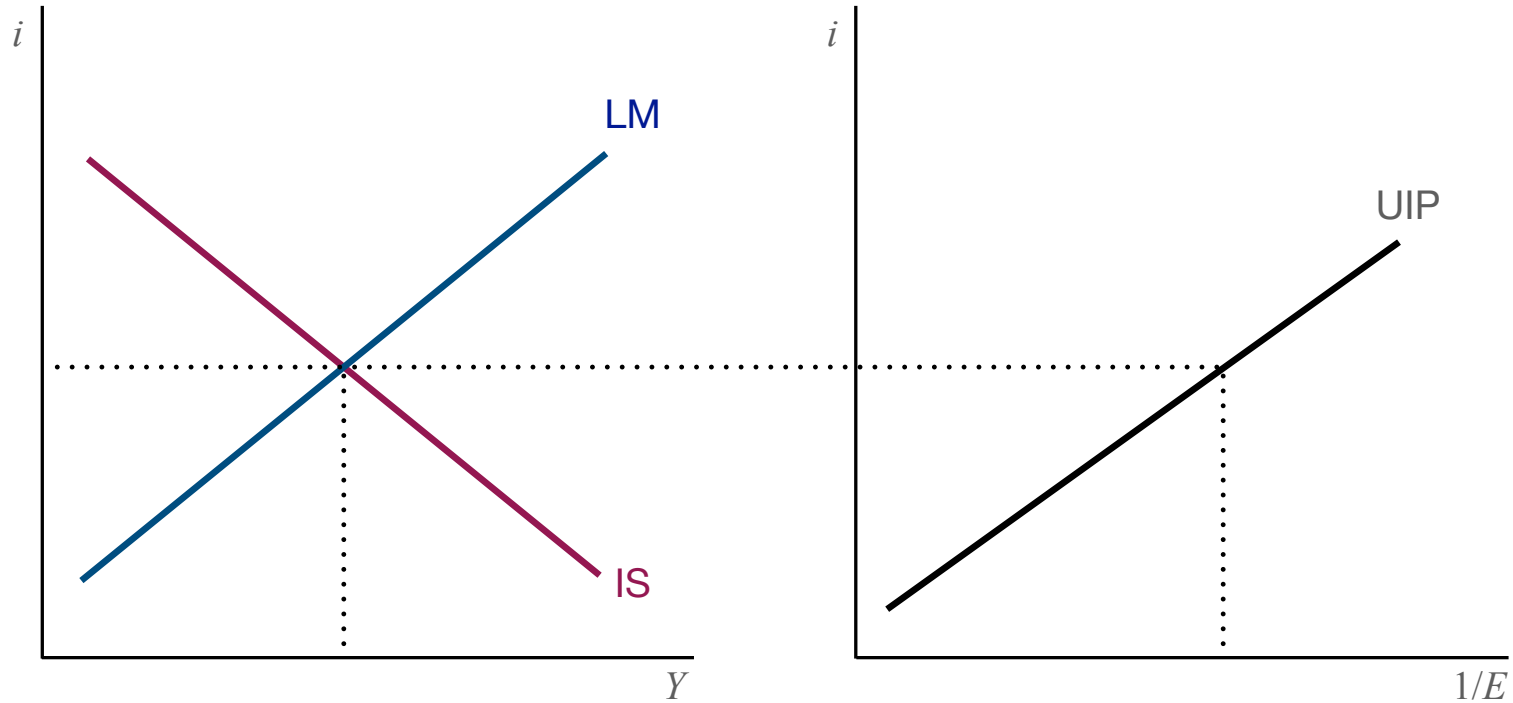
$NX \uparrow$ but whether $NX/Y \uparrow$ is not clear.

$$\frac{NX}{Y} = \underbrace{\frac{Y-T-C}{Y}}_{S^P/Y \text{ unchanged}} + \underbrace{\frac{T-G}{Y}}_{\text{unclear}} - \underbrace{\frac{I}{Y}}_{\text{ambiguous}} \tag{13}$$

The lesson remains: trade restrictions don't have a clear effect on NX/Y.

- and that's before we allow prices to change...

Final Example



What happens when the foreign CB raises i^*?

Reading

Blanchard / Johnson, Macroeconomics, 6th ed., ch. 19, 20