

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

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

$$LM : M/P = YL(i) \quad (2)$$

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

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

$$Y = C(Y - T) + I(Y, i) + G + NX(Y, Y^*, \varepsilon) \quad (4)$$

-, +, -

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

$$\varepsilon = P / (EP^*) \quad (5)$$

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

Modified IS Curve

We can write

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

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

$NX \downarrow$

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

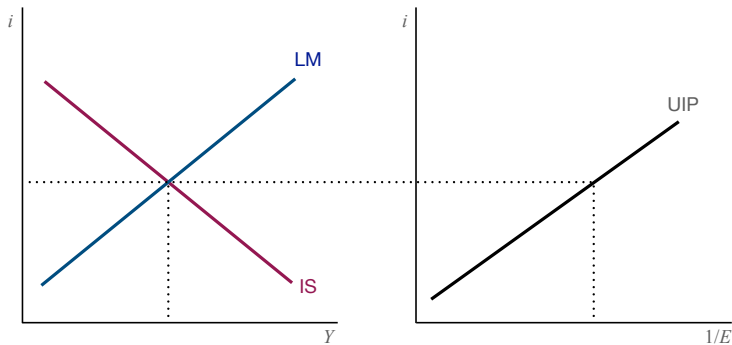
Modified IS Curve

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

Properties:

- ▶ downward sloping: $i \uparrow \implies Y \downarrow$
- ▶ 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:

$$i \uparrow \implies E \downarrow \implies NX \downarrow$$

this is driven by capital mobility (UIP)

more mobile capital \implies flatter IS curve

2. additional shifters of IS: i^*, Y^*, E^e

Model Summary

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

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

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

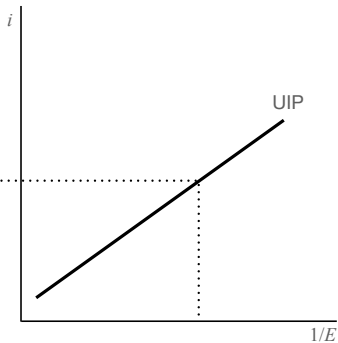
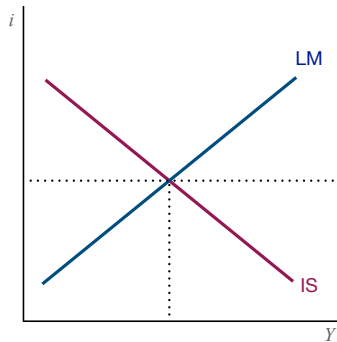
Exogenous: P, P^*, Y^*, E^e, G, T

Endogenous: Y, i, E

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

Analyzing Shocks

Government Spending Rises



Government Spending Rises

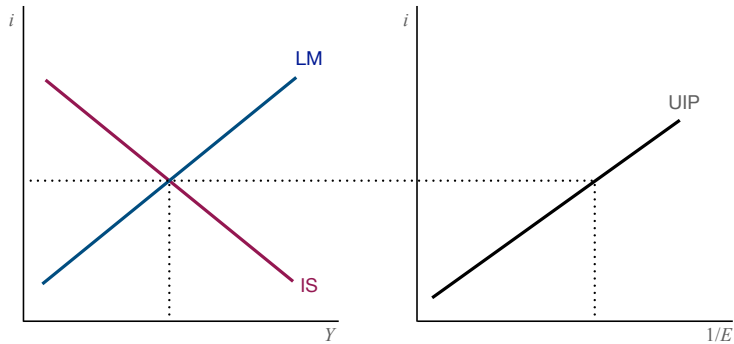
Higher G leads to:

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?

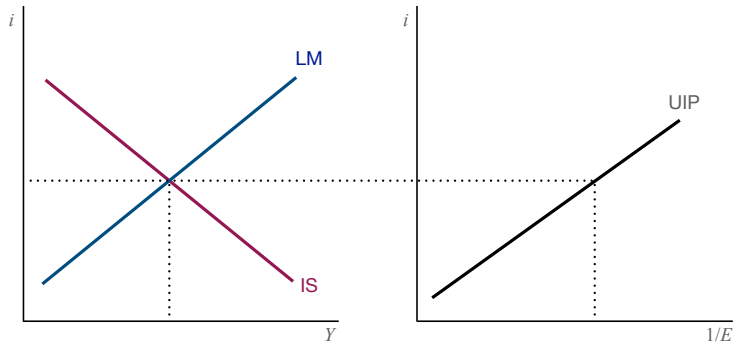
Trade Restrictions

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

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

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 ($Y \uparrow$).

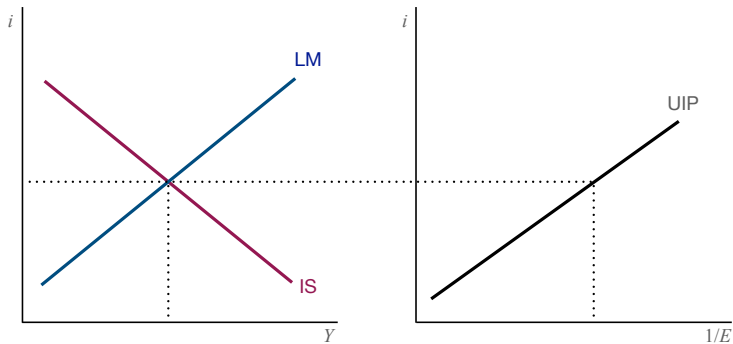
$NX \uparrow$ but whether $NX/Y \uparrow$ is not clear.

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

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