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 $\varepsilon = EP/P^*$.

These solve for Y, i, E.

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 to substitute out the real exchange rate

$$\begin{aligned} \varepsilon &= EP/P^* \qquad (5) \\ &= \frac{1+i}{1+i^*} E^e \times \frac{P}{P^*} \qquad (6) \end{aligned}$$

We can write $NX\left(Y, Y^*, \frac{1+i}{1+i^*}E^e\right)$

- $i\uparrow$ and $E^e\uparrow$ lead to dollar appreciation $(\varepsilon\uparrow)$ and $NX\downarrow$

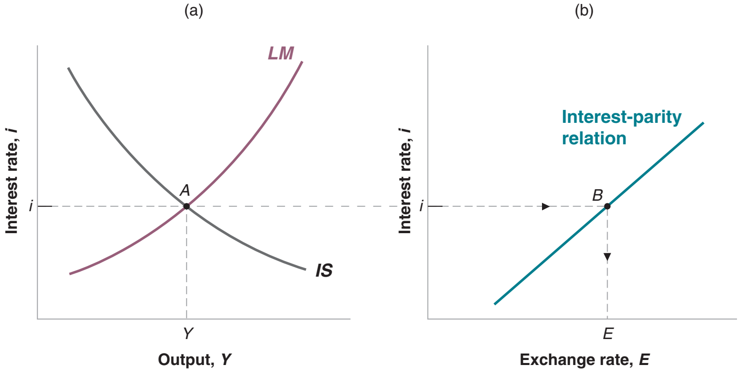
Modified IS Curve

$$IS: Y + C(Y-T) + I(Y,i) + G + NX\left(Y, Y^*, \frac{1+i}{1+i^*}E^e\right) \qquad (7)$$

Properties:

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

IS-LM Graph



(a)
(b)
LM
IS
A
B
i
Y
E
Interest rate, i
Output, Y
Interest-parity relation
Exchange rate, E

What Has Changed

Relative to a closed economy:

1. the interest rate has an additional effect on IS:
   $i \uparrow \implies E \uparrow \implies NX \downarrow$
   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

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

$$LM: M/P = YL(i) \tag{9}$$

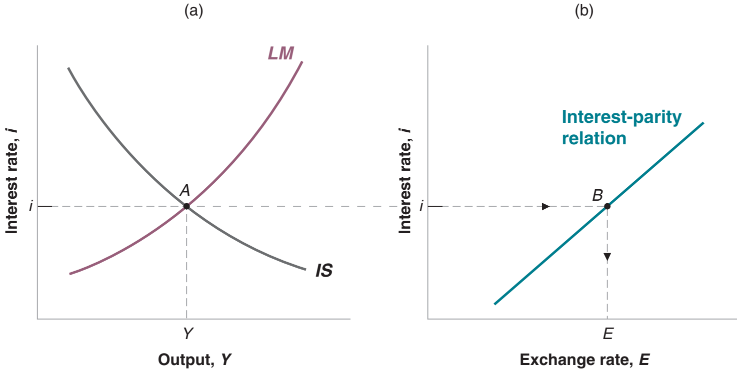
$$UIP: E = \frac{1+i}{1+i^*}E^e \tag{10}$$

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

Endogenous: Y, i, E

Analyzing Shocks

Government Spending Rises



Government Spending Rises

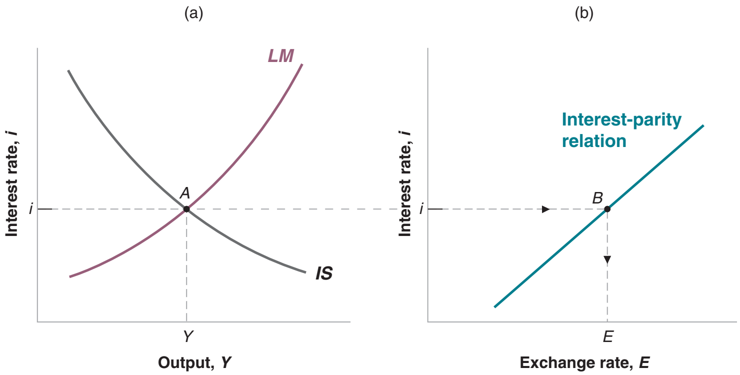
Higher G leads to:

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

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
$G\uparrow$	$\uparrow$	$\uparrow$	$\downarrow$	$\uparrow$
$M\uparrow$	$\uparrow$	$\downarrow$	$\uparrow$	$\downarrow$
Both	$\uparrow$	–	–	–

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

Domestic policies affect other countries through the trade balance.

- Domestic expansion $\Longrightarrow$ more import demand
- Changes in domestic interest rates $\Longrightarrow$ exchange rate changes

Some policies have positive spillovers; others negative.

- Gains from policy coordination.
- Potental for policy wars.

International Spillovers

Suppose that the U.S. is in recession.

Policy option 1: **monetary expansion**:

- Dollar depreciates $(NX \uparrow)$
- 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

Policy coordination

Countries can gain by coordinating their policies.

One country may be tempted to improve their trade balance through monetary expansion.

- avoid fiscal deficits

Foreign countries have an incentive to “retaliate” by expanding their money supplies.

The net effect on trade balances cancels out.

- “competitive devaluations”

Trade Restrictions

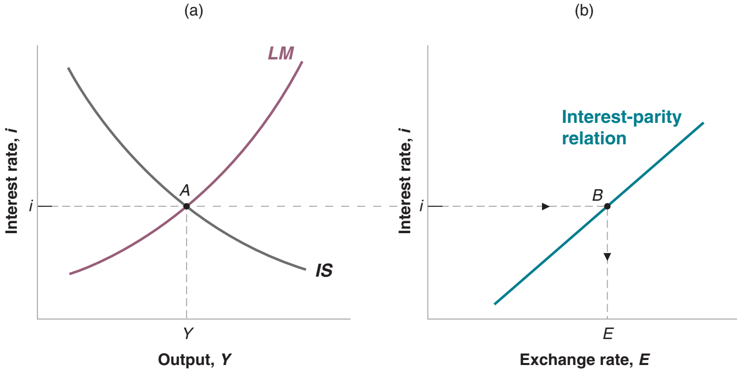
What is the effect of a tariff on imports?

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

$$Y = C(Y - T) + I(Y, i) + G + NX\left(Y, Y^*, \frac{1+i}{1+i^*}E^e, \tau\right) \tag{11}$$

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?

Recall

$$NX = \underbrace{(Y - T - C)}_{S^P\uparrow} + \underbrace{(T - G)}_{\text{unchanged}} - \underbrace{I}_{\text{ambiguous}} \tag{12}$$

- Private saving rises
  but we probably don't believe this beyond, perhaps, a very short run effect
- Investment could fall (but ambiguous)

Trade restrictions

What the model is missing: expenditure switching

- the dollar appreciates $\implies IM \downarrow$
- in the model: expenditure falls
- more likely: expenditure switches towards domestic C and I
- then the effect on NX is not clear

The lesson remains: trade restrictions don't have a clear effect on the trade balance.

Reading

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