

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

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

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

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

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

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

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

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Use UIP to substitute out the real exchange rate

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

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

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

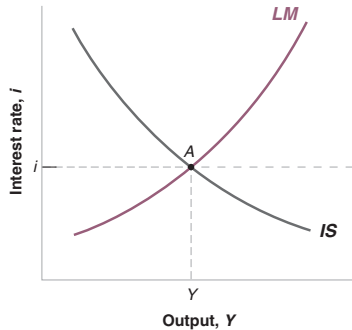
$$IS : Y + C(Y - T) + I(Y, i) + G + NX \left(Y, Y^*, \frac{1+i}{1+i^*} E^e \right) \quad (7)$$

Properties:

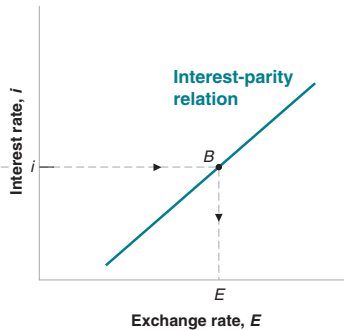
- ▶ downward sloping: $i \uparrow \implies Y \downarrow$
- ▶ shifters: as closed economy *plus* anything that increases NX

IS-LM Graph

(a)



(b)



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

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

$$LM : M/P = YL(i) \quad (9)$$

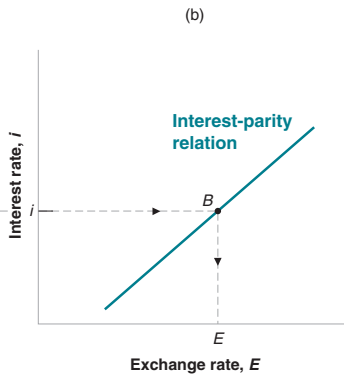
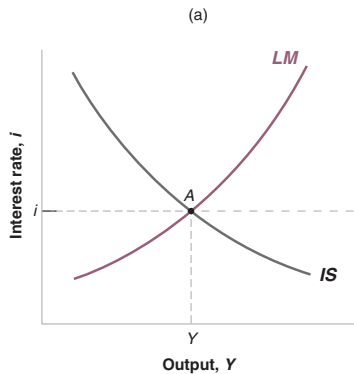
$$UIP : E = \frac{1+i}{1+i^*} E^e \quad (10)$$

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

Endogenous: Y, i, E

Analyzing Shocks

Government Spending Rises



Government Spending Rises

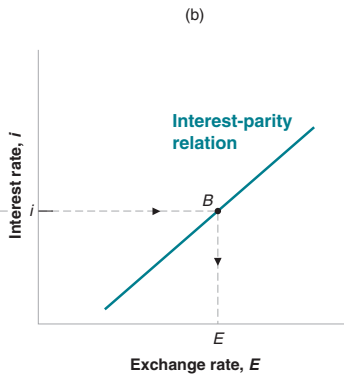
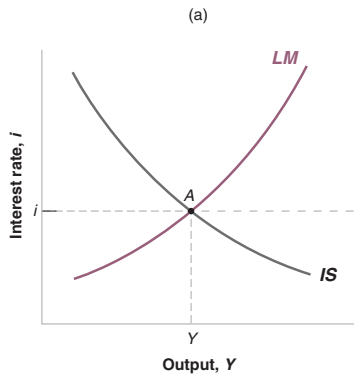
Higher G leads to:

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 \implies more import demand
- ▶ Changes in domestic interest rates \implies exchange rate changes

Some policies have positive spillovers; others negative.

- ▶ Gains from policy coordination.
- ▶ Potential 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.

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

The net effect on trade balances cancels out.

- ▶ “competitive devaluations”

Trade Restrictions

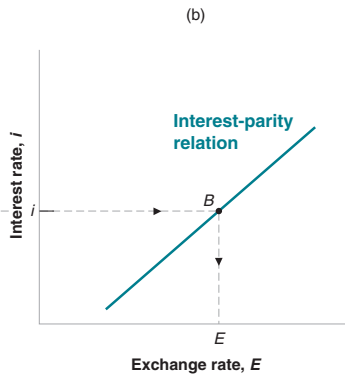
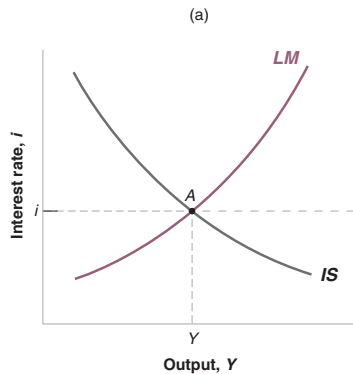
What is the effect of a tariff on imports?

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

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

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

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

- ▶ 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 $\Rightarrow IM \downarrow$
- ▶ 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