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

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

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

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

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

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

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

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 $NX \downarrow$
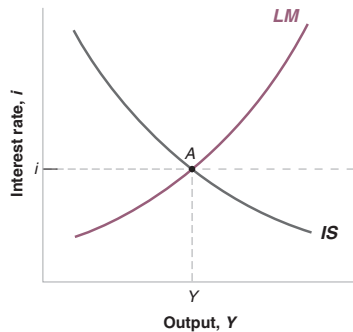
Modified IS Curve

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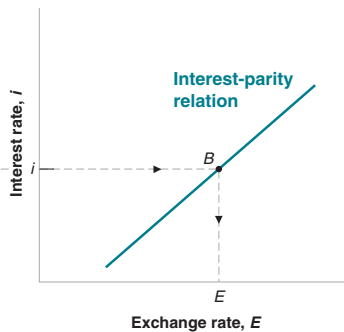
Properties:

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

IS-LM Graph

(a)

(b)

LM

IS

Interest-parity relation

Interest rate, *i*

Interest rate, *i*

i

i

A

B

Y

E

Output, Y

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

$$IS : Y = C(Y - T) + I(Y, i) + G + NX\left(Y, Y^*, \frac{1+i}{1+i^*}E^e\right) \quad (8)$$
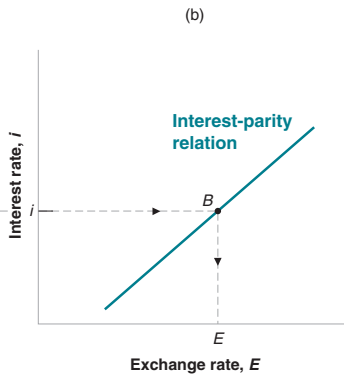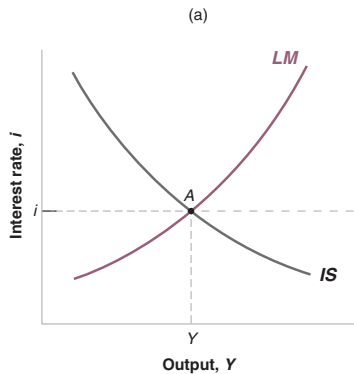
$$LM : M/P = YL(i) \quad (9)$$

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

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

Endogenous: Y, i, E

Analyzing Shocks

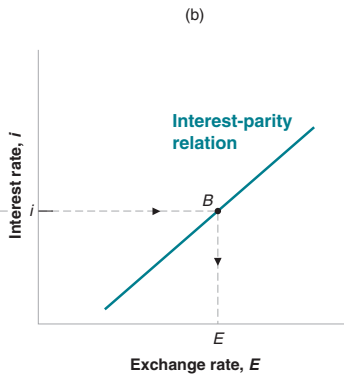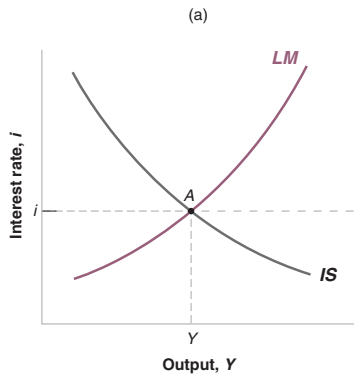# Government Spending Rises

(a)

(b)

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)

Monetary Contraction

(a)

LM

Interest rate, i

i ⌐ ⌐ ⌐ ⌐ ⌐ ⌐ ⌐ ⌐ ⌐ ⌐ A

IS

Y

Output, Y

(b)

Interest-parity relation

Interest rate, i

i ⌐ ⌐ ⌐ ⌐ ⌐ → B

E

Exchange rate, E

Monetary Contraction

Lower M leads to:

1. lower Y, but higher i
2. capital inflows
3. dollar appreciation ($E \uparrow$)
4. lower NX (b/c we have capital inflows)

Combining Monetary and Fiscal Policy

	Y	i	NX	E
$G\uparrow$	↑	↑	↓	↑
$M\uparrow$	↑	↓	↑	↓
Both	↑	–	–	–

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

Intuition:

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

International Spillovers

Suppose that the U.S. is in recession.

Policy option 1: **monetary expansion**:

- ▶ monetary expansion leads to depreciation ($NX \uparrow$)
- ▶ 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.
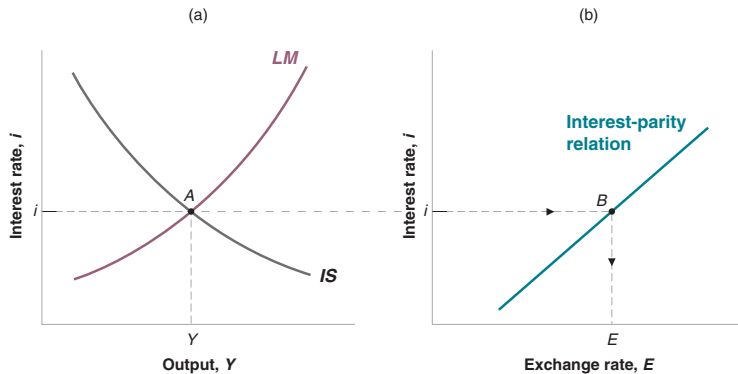
- ▶ "competitive devaluations"

Trade Restrictions

What is the effect of a tariff on imports?

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

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

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

Trade Restrictions

(a)

(b)

Result: tariffs work (but only in the short run…)

Reading

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