Macroeconomics: The Open Economy

Sumit Mishra
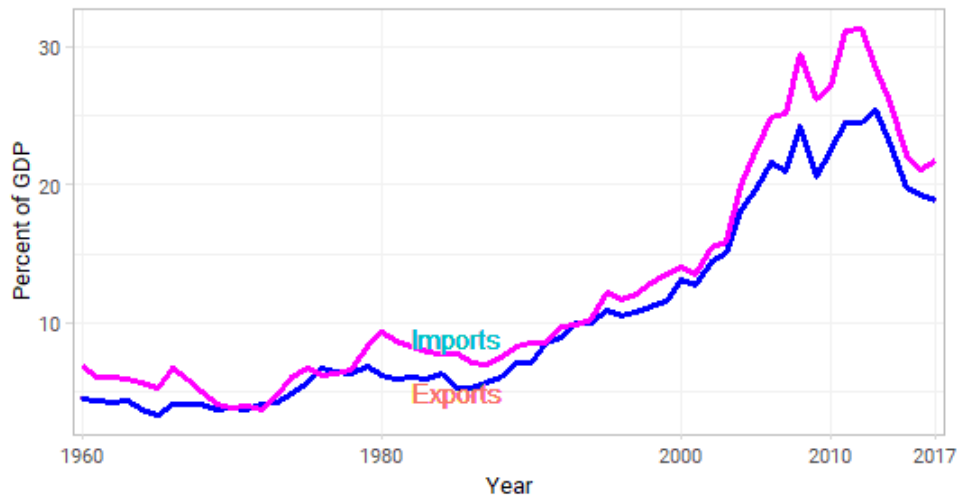
IFMR, Sri City

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Chapter 18

Exports and Imports as Ratios of GDP

India: 1960-2017

Source: World Bank Database

Nominal & Real Exchange Rates

- **Nominal Exchange Rate**: Price of domestic currency in terms of foreign currency. (E)

  - **Appreciation**: Increase in the value of the domestic currency.
  - **Depreciation**: Fall in the value of the domestic currency.

- **Real Exchange Rate**: Adjust the nominal exchange rate by the relative price levels.

$$\epsilon = \frac{EP}{P*}$$

  - P is the price index in the local economy.
  - $P*$ is the price index for the foreign country.

The Balance of Payments

Trade Flows + Financial Flows

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- **Current Account**:
    - Exports and imports.
    - Net transfers received.
- **Capital Account**: Difference between foreign holdings of domestic assets and domestic holdings of foreign assets.

The Choice between Domestic and Foreign Assets

- Let's say that you have the choice between Indian and Turkish bonds.
    - Suppose that you choose Indian bond.
    - Let i_t be the nominal one-year interest rate. You will get ₹$(1 + i_t)$ next year.

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    - Suppose you choose the Turkish bond.
    - You must purchase Turkish lira. Let exchange rate be E_t.
    - Let i_t^* be the interest rate on the Turkish bond. You will get: $E_t \times (1 + i_t^*)$.
    - Convert this into ₹: $E_t \times (1 + i_t^*) \times (1/E_{t+1}^e)$

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    - Convert this into ₹: $E_t \times (1 + i_t^*) \times (1/E_{t+1}^e)$
- The choice depends upon:
    1. Difference between interest rates.
    2. Expected nominal exchange rate in future.
    3. Nominal exchange rate today.

Uncovered Interest Parity

Recall our discussions on choosing between bonds. We assumed that people just care about the expected rate of returns. Therefore, the following relation must hold:

$$(1 + i_t) = E_t \times (1 + i_t^*) \times \left(\frac{1}{E_{t+1}^e} \right)$$

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$$(1 + i_t) = E_t \times (1 + i_t^*) \times \left(\frac{1}{E_{t+1}^e} \right)$$

This ignores:
- Transaction costs involved.
- Cross-country differential in risk.

Interest Rates and Exchange Rates

We can rewrite

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as

$$(1 + i_t) = \frac{(1 + i_t^*)}{[1 + (E_{t+1}^e - E_t)/E_t]}$$

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$$i_t \approx i_t^* - \frac{E_{t+1}^e - E_t}{E_t}$$

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The domestic interest rate must be equal to the foreign interest rate minus the expected appreciation rate of the domestic currency.

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Buying Brazilian Bonds

- Monthly interest rate on Brazilian bond = 36%
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- The rate of appreciation of Brazilian currency = 34.6%
- The expected returns look much more modest now (1.6% per month).

Chapter 19

The *IS* Relation in the Open Economy

- The demand for domestic goods:

$$Z \equiv C + I + G - IM/\epsilon + X$$

- The determinants of C, I, G:
    - There shouldn't be any sizeable impact of ϵ on any of these variables.
    - There is no direct (or obvious) link between these variables (C and E or ϵ).

$IM = IM(Y, \epsilon)$

- $\uparrow Y \Rightarrow \uparrow IM$
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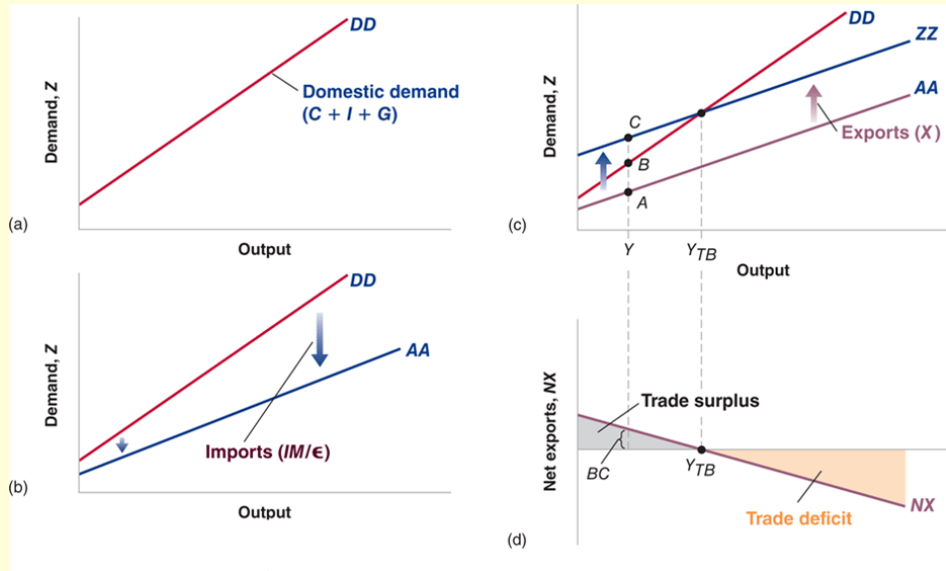   - There is no direct (or obvious) link between these variables (C and E or ϵ).

$IM = IM(Y, \epsilon)$ $X = X(Y^*, \epsilon)$ [Y^*: Foreign Income]

- $\uparrow Y \Rightarrow \uparrow IM$ - $\uparrow Y^* \Rightarrow \uparrow X$

- $\uparrow \epsilon \Rightarrow \uparrow IM$ - $\uparrow \epsilon \Rightarrow \downarrow X$
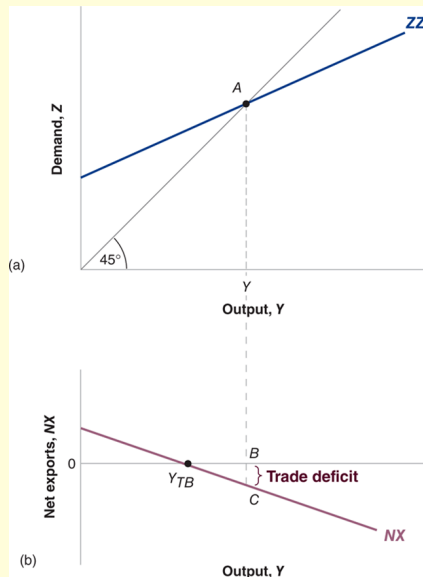
Putting the Components Together

Equilibrium Output and the Trade Balance

- Domestic output must match the demand

$$Y \equiv Z$$

- Using the components of demand, we get

$$Y = C + I + G + X(Y^*, \epsilon) - IM(Y, \epsilon)$$

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Increase in Domestic Demand

- Rise in domestic demand pushes imports up.
  [Remember: $IM = IM(Y, \epsilon)$]
- The effect of government spending on output is smaller than it would be in a closed economy. Why?
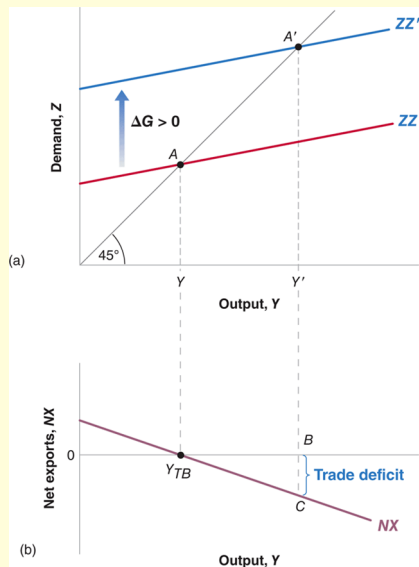
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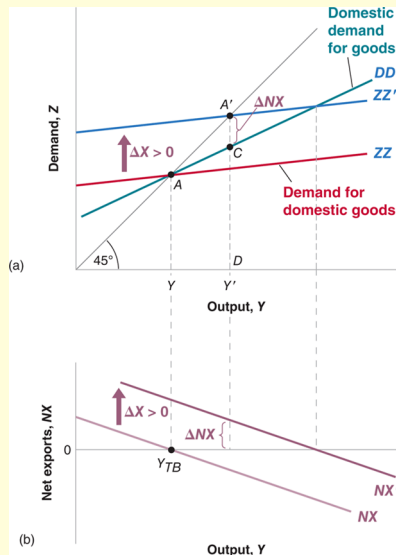
Summary: Fiscal Policy

- Changes in domestic fiscal policy:
    1. ↑ Domestic Demand ⇒ ↑ Domestic Output.
    2. ↑ Domestic Demand ⇒ ↓ Trade Balance.

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- Changes in domestic fiscal policy:
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- Shifts in foreign fiscal policy:
    1 ↑ Foreign Demand ⇒ ↑ Domestic Output.
    2 ↑ Foreign Demand ⇒ ↑ Trade Balance.

The Marshall Lerner Condition

$$NX = X(Y^*, \epsilon) - IM(Y, \epsilon)$$

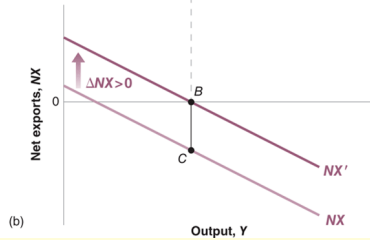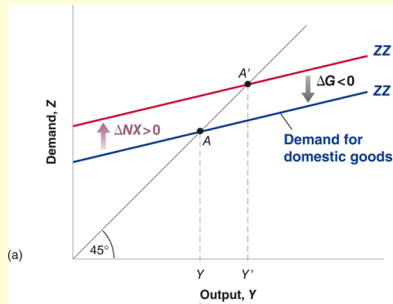Real depreciation affects trade balance through:

1. Exports rise.
2. Imports fall.
3. The relative price of foreign good in terms of domestic good $1/\epsilon$ increases.

Fiscal Policy + Exchange Rate Policy

Suppose that economy is running trade deficit, and the government wants to reduce the trade deficit without tinkering with the output.

- Step 1- Achieve a depreciation such that the net exports increase.
- Step 2- Reduce government spending to offset the rise in demand due to rising exports.

Depreciation + Fiscal Contraction worked.

(a)

Demand, Z

ZZ′

ΔG < 0

ZZ

A′

ΔNX > 0

A

Demand for domestic goods

45°

Y   Y′

Output, Y

(b)

Net exports, NX

0

ΔNX > 0

B

C

NX′

NX

Output, Y

Savings, Investments, and the Current Account Balance

Let's try to see how savings-investment relationship can change when you open up the economy.

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- Let's add two new terms for- net income from abroad (NI) and net transfers from abroad (NT).

$$(Y + NI + NT - T) - C = I + (G - T) + (NX + NI + NT)$$

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- $CA = S + (T - G) - I$.

Chapter 20

Equilibrium in the Good Market

$$Y = C(Y - T) + I(Y, r) + G - X(Y^*, \epsilon) + IM(Y, \epsilon)$$

We can rewrite the last term in the equation as $NX(Y, Y^*, \epsilon)$.

- $\uparrow r \Rightarrow \downarrow I \Rightarrow \downarrow$ demand for domestic goods
- $\uparrow \epsilon \Rightarrow \uparrow$ demand for foreign goods $\Rightarrow \downarrow NX \Rightarrow \downarrow Y$.

Let's do away with the distinction between the real and the nominal exchange rate (for now).

Equilibrium in the Financial Market

- Money demand is not a function of exchange rate movements.
- So, our good old equation hold true here as well

$$\frac{M}{P} = YL(i)$$

Domestic versus Foreign Bond

- The arbitrage condition (the interest parity condition) must hold

$$(1 + i_t) = (1 + i_t^*)\left(\frac{E_t}{E_{t+1}^e}\right)$$

- Let's reorganize this equation in terms of exchange rate.

$$E_t = \left(\frac{1 + i_t}{1 + i_t^*}\right) E_{t+1}^e$$
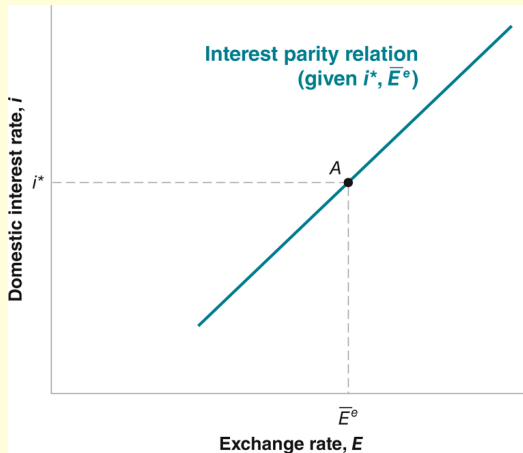
- Implications:
    - $\uparrow i \Rightarrow \uparrow E_t$
    - $\uparrow i^* \Rightarrow \downarrow E_t$
    - $\uparrow E_{t+1}^e \Rightarrow \uparrow E_t$

$$E_t = \left(\frac{1 + i_t}{1 + i_t^*} \right) E_{t+1}^e$$

- When domestic interest rate = foreign interest rate, $E_t = E_{t+1}^e$.
- The higher the domestic interest rate, the higher the exchange rate.

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$IS - LM$: Open Economy Version

- *IS* Relation:

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- *LM* Relation:

$$\frac{M}{P} = YL(i)$$

- Interest parity condition:

$$E = \left(\frac{1 + i}{1 + i^*} \right) E^e$$

Shifts in the *IS* Curve

When domestic interest rate rises:

- Direct Effect: $\downarrow I \Rightarrow \downarrow Z \Rightarrow \downarrow Y$.
- Indirect Effect $\uparrow E \Rightarrow \downarrow NX \Rightarrow Z \Rightarrow \downarrow Y$.

Fiscal Policy in Open Economy

↑ govt spending ⇒...

- ↑ Income (*IS* Curve shifts to the right).
- ? Investment.
- ↓ NX
    - ↑ Y ⇒↑ *IM*
    - ↑ i ⇒↓ *X*.

Monetary Policy in Open Economy

Consider the case of increase in money supply. $\Delta M > 0$.
- $\downarrow i \Rightarrow$

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Monetary Policy in Open Economy

Consider the case of increase in money supply. $\Delta M > 0$.

- $\downarrow i \Rightarrow$ foreign bonds become attractive.
- $\downarrow i \Rightarrow$ depreciation.
- Lower interest rate + depreciation $\Rightarrow \uparrow Y$.

Pegging the Exchange Rate

If the rate is pegged, the future exchange rate will also be expected remain at that value. ($E_t = E_{t+1}^e$) Therefore,

$$(1 + i_t) = (1 + i_t^*)$$

$$\Rightarrow i_t = i^*$$

Under a fixed exchange, the domestic interest rate must match the foreign interest rate.

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Under a fixed exchange, the domestic interest rate must match the foreign interest rate. Implication: The *LM* relation changes.

$$LM : \frac{M}{P} = YL(i^*)$$

Trade Policy under Floating Exchange Rate

Impose tariff/quota such that $\downarrow IM$.

- $\uparrow NX \Rightarrow$

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- $\uparrow NX \Rightarrow \uparrow Y$
- $\uparrow Y \Rightarrow \uparrow i$
- $\uparrow i \Rightarrow \uparrow E$
- Appreciation $\Rightarrow \downarrow X$

Net effect of trade policy: $\Delta Y = 0$.

Monetary Policy Under Fixed Exchange Rate

- Suppose because of increasing output, money demand goes up.
- The equilibrium interest rate increases.
- $i > i^*$.
- The currency might appreciate.
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Monetary Policy Under Fixed Exchange Rate

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- The currency might appreciate.
- To pull the interest rate down, the central bank must increase the money supply.

Bottomline: Under fixed exchange rate, the central bank gives up monetary policy as a policy instrument.

Fiscal Policy Under Fixed Exchange Rate

Reduce T.

- IS curve moves to the right.
- $i > i^*$.
- The LM curve must move downwards. (Why?)
- Net effect: $\uparrow Y$.

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Trade Policy under Fixed Exchange Rate

Impose tariff/quota such that $\downarrow$ *IM*.

- $\uparrow NX \Rightarrow \; \uparrow Y$
- $\uparrow Y \Rightarrow \; \uparrow i$
- $\uparrow i \Rightarrow$ LM Curve must shift to the right.

Net effect of trade policy: $\Delta Y > 0$.

The Mundell-Fleming Model: Summary of Policy Effects

	Exchange Rate Regime					
	Floating			Fixed		
	Impact On					
Policy	Y	E	NX	Y	E	NX
Fiscal Expansion	o	↑	↓	↑	o	o
Monetary Expansion	↑	↓	↑	o	o	o
Import Restrictions	o	↑	o	↑	o	↑

This table shows the direction of impact of various economic policies on income *Y*, the exchange rate *e*, and the trade balance *NX*. A "↑" indicates that the variable increases; a "↓" indicates that it decreases; a "o" indicates no effect. Remember that the exchange rate is defined as the amount of foreign currency per unit of domestic currency (for example, 100 EUR per INR).

Chapter 21

Agenda

- Open economy in the medium run.
- Fixed Exchange Rates and Crises.
- Flexible Exchange Rates and Problems.
- Material: Chapter 21, Blanchard.

The Nominal and The Real Exchange Rate

$$\epsilon = E \times \frac{P}{P^*}$$

Real exchange rate adjustment can happen via:
  - The domestic price level change (P).
  - The foreign price level change (P^*).

The $AS - AD$ Model Under Fixed Exchange Rate

$$AD : Y = Y(\epsilon, G, T)$$

Note that M/P is missing. (Why?)

The $AS - AD$ Model Under Fixed Exchange Rate

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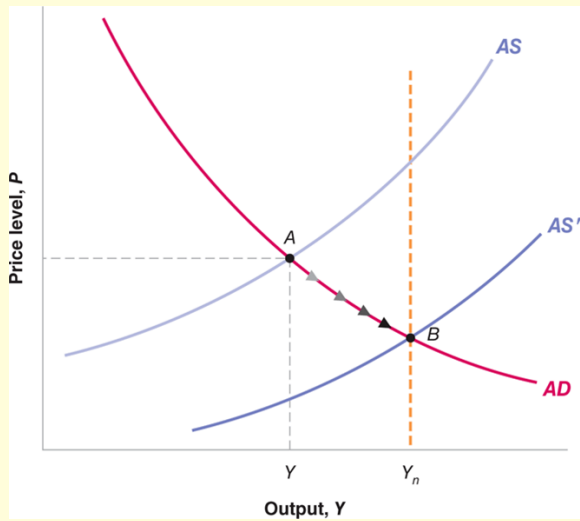Note that M/P is missing. (Why?)

$$AS : P = P^e(1+m)F\left(1 - \frac{Y}{L}, z\right)$$

Equilibrium with Fixed Exchange Rate

- $\uparrow P \Rightarrow \uparrow \epsilon$.
- $\uparrow \epsilon \Rightarrow \downarrow$ demand for domestic goods.

Let $Y < Y_n$. What happens in the medium run?

- The *AS* curve keeps moving downwards until $Y = Y_n$. (Old Channel)
- In this process, $\downarrow P$.
- $\downarrow P \Rightarrow \downarrow \epsilon$. (New Channel)
- The output keeps increasing until $Y = Y_n$.

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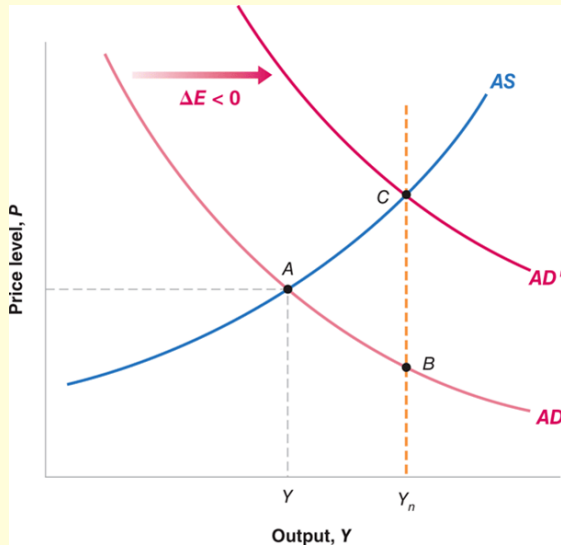
Exchange Rate Crises under Fixed Exchange Rate

- The real exchange rate may be too high. (Diagnosis: depreciation)
- Since interest rates are fixed to foreign levels, the country may be forced to devalue the currency.

What choices does the govt have?

- Devalue.
- Be prepared for very high interest rates.

Flexible Exchange Rate System: Problems

Current exchange rate depends on two sets of factors:
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- It was only in the mid-1970s that economists understood what we just learnt.
- Because the current exchange rate depends so much upon the future, economies with flexible exchange rate system should be prepared for huge fluctuations in the exchange rate.