

# Exchange Rates and International Finance

— Week 12 —

Vivaldo Mendes

Dep. of Economics — Instituto Universitário de Lisboa

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# Summary

- 1 Exchange Rates in the Long Run
- 2 Exchange Rates in the Short Run
- 3 Fixed Exchange Rates
- 4 The Open Economy in the Short-Run Model
- 5 Exchange Rate Regimes
- 6 The Policy Trilemma
- 7 Required reading

# I – Exchange Rates in the Long Run

## The Nominal Exchange Rate (E)

- ① Normally, the exchange rate is the price of **foreign currency**: how many *Euros* we have to pay in order to have 1 unit of a foreign currency, e.g. one Yen?

$$E = \frac{\text{Number of } \text{€}}{\text{¥1}}$$

- ② In the US, the problem is put the other way around: **it's the price of the dollar**

How many ¥ we have to pay in order to have 1 Dollar?

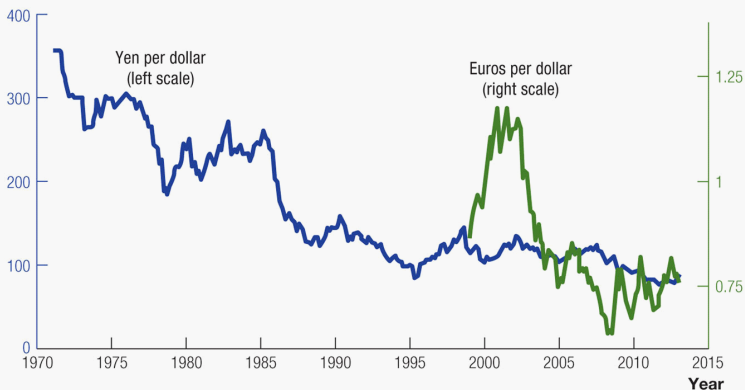
- ③ A depreciation of the dollar:
- ① Decline in the price of the dollar
  - ② Decline in the exchange rate

$$E = \frac{\text{Number of } \text{¥}}{\text{\$1}}$$

# Exchange rate of the dollar versus the Yen and the Euro

FIGURE 20.1

The U.S. Exchange Rate versus the Yen and the Euro



# The Law of One Price

- ① Says in the long run goods must sell for the same price in all countries
- ② Implies that the exchange rate times the domestic price must equal the foreign price
- ③ If prices were different, the opportunity for arbitrage exists.

$$EP = P^w$$

Exchange rate
Price of goods in U.S.
World price

- Law may not hold exactly: different taxes, tariffs, and transportation costs
- If it holds, it gives the level of the nominal Exchange rate

# The Law of One Price

- If it holds, it gives the level of the nominal Exchange rate

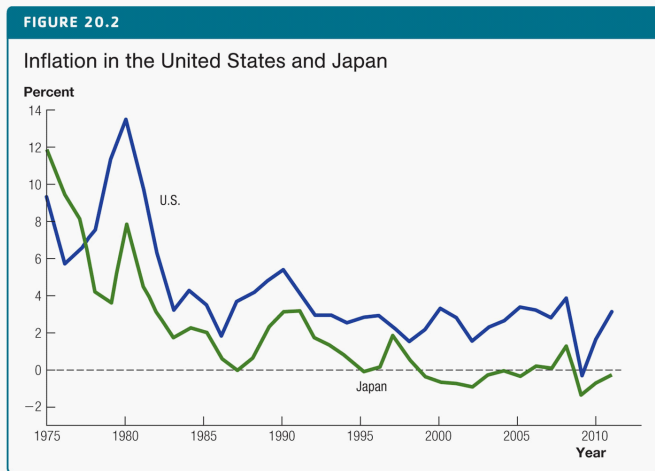
$$\begin{array}{ccc} \text{Nominal} & & \\ \text{Exchange} & \longrightarrow & \bar{E} = \frac{\bar{P}^w}{\bar{P}} \\ \text{Rate} & & \longleftarrow \text{Long run} \\ & & \text{price ratio} \end{array}$$

- In the long run: the exchange rate is determined by the amount of money in one country relative to another.
- Why? Because Prices are determined by the amount of money in each country according to the Quantity Theory of Money
- If the dollar depreciates:

$$\downarrow E = \downarrow \left( \frac{\text{Number of } \text{¥}}{\$1} \right) = \downarrow \left( \frac{P^w}{P} \right)$$

# Inflation in the US and Japan

- Higher inflation in the United States than in Japan is one reason for the depreciation of the dollar relative to the yen since the 1970s.





# Case Study: The Big Mac Index

- ① The law of one price fails to hold for Big Mac

**TABLE 20.1**

## The Big Mac Index

	Big Mac price in local currency	Exchange rate per dollar (\$)	Big Mac price in dollars
United States	4.37 dollars	1.00 dollars/\$	4.37
Norway	42.96 kroner	5.48 kroner/\$	7.84
Euro area	3.61 euros	0.74 euros/\$	4.88
Japan	319.62 yen	91.06 yen/\$	3.51
Mexico	36.95 pesos	12.74 pesos/\$	2.90
China	15.99 yuan	6.22 yuan/\$	2.57
Russia	73.02 rubles	30.05 rubles/\$	2.43
South Africa	18.37 rand	9.05 rand/\$	2.03
India	89.18 rupees	53.40 rupees/\$	1.67

## The Real Exchange Rate

- The real exchange rate (RER)

$$RER = \frac{\frac{\text{Number of } \text{¥}}{P^{\text{¥}}}}{\frac{\$1}{P}} = \left( \frac{\text{Number of } \text{¥}}{\$1} \right) \left( \frac{P}{P^{\text{¥}}} \right) = E \left( \frac{P}{P^{\text{¥}}} \right)$$

- If the nominal exchange rate gives the power of a foreign currency to buy 1 US dollar
- The real exchange rate gives the power of a foreign currency to buy US goods
  - ▶ With 1000¥: "How many Big Macs in the US can I buy?"
  - ▶ Not, "How many dollars can I buy?"
- If the Law of one price holds, then

$$RER = E \left( \frac{P}{P^{\text{¥}}} \right) = \left( \frac{P^{\text{¥}}}{P} \right) \left( \frac{P}{P^{\text{¥}}} \right) = 1.$$

## II – Exchange Rates in the Short Run

# The Nominal Exchange Rate in the short run

- 1 Why trade currencies?
- 2 The average foreign exchange traded around the world is \$4 trillion per day.
- 3 Many reasons explain this flow:
  - 1 To facilitate international trade
  - 2 Traders in financial markets demand currencies in order to make financial transactions.
  - 3 Speculation in the currencies markets
- 4 So, the price of **two currencies may be determined by many factors in the short term**
- 5 By the interaction of demand vs supply

# When the Fed increases interest rates in the US

- ① Foreign investors are attracted to purchase U.S. bonds.
- ② Foreign traders need dollars to make these purchases.
- ③ Demand for dollars increases.
- ④ The exchange rate then appreciates: the value of the dollar increases

$$\boxed{\uparrow} i^{US} \Rightarrow \boxed{\uparrow} E, \text{ and } \boxed{\downarrow} i^{US} \Rightarrow \boxed{\downarrow} E$$

- $E$  changes by the minute.

## The Real Exchange Rate in the short run

- ① The *RER* changes slower than *E*
- ② Remember that the Real Exchange rate is

$$RER = E \left( \frac{P}{P^w} \right)$$

- ③ Sticky inflation implies that prices (*P* and *P<sup>w</sup>*) adjust slowly over time
- ④ Prices are revised not daily, but monthly, quarterly, etc..
- ⑤ So movements in the nominal exchange rate translate into movements in the real exchange rate in the short run:

$$\uparrow E \Rightarrow \uparrow \frac{EP}{P^w}$$

# How nominal and real exchange rates are determined

TABLE 20.2

## How the Exchange Rate Is Determined

		Long run	Short run
Nominal exchange rate	$E$	Pinned down by relative prices in the two economies; quantity theory of money	Supply and demand in currency markets; moves in the same direction as $i$
Real exchange rate	$\frac{EP}{P^w}$	Law of one price: $EP = P^w \Rightarrow \frac{EP}{P^w} = 1$	Sticky inflation means it moves with unanticipated changes in $E$

# III – Fixed Exchange Rates



# Fixed exchange rates

- 1 Systems where the exchange rate for one currency is pegged to a particular level for some period
- 2 The Central Bank must have enough foreign reserves to sustain the "fixing".
- 3 If the Central Bank exhausts the stock of foreign reserves, money supply in the countries diverge and the fixing is broken by the market pressure.
- 4 Why fix exchange rates? To control inflationary pressures, to reduce volatility.

# IV – The Open Economy in the Short-Run Model

## The exchange rate affects Net Exports

- Now: movements in the real exchange rate can influence trade.

$$\frac{NX_t}{\bar{Y}_t} = \bar{a}_{nx} - \bar{b}_{nx}(R_t - \bar{R}^w)$$

Domestic real interest rate
World real interest rate

↓
↓

↑
↑

Medium-run trade balance
Business cycle considerations

- Why? Remember we are thinking about the US

$$\uparrow i \Rightarrow \uparrow R \text{ and } \uparrow E \Rightarrow \uparrow \frac{EP}{P^w} \Rightarrow \downarrow \frac{EX}{\bar{Y}} \text{ and } \uparrow \frac{IM}{\bar{Y}} \Rightarrow \downarrow \frac{NX}{\bar{Y}}$$

## The New IS Curve

- The IS curve will take a similar form:

$$\text{IS curve: } \tilde{Y}_t = \bar{a} - \bar{b}(R_t - \bar{r})$$

- The aggregate demand parameters are defined differently:

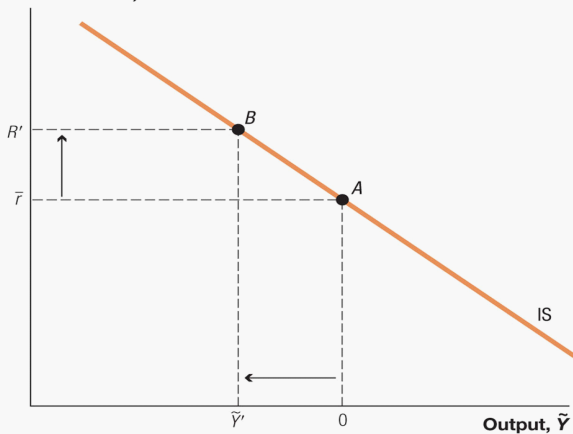
$$\bar{a} \equiv \bar{a}_c + \bar{a}_i + \bar{a}_g + \bar{a}_{nx} - 1 + \bar{b}_{nx}(\bar{R}^w - \bar{r})$$

$$\bar{b} \equiv \bar{b}_i + \bar{b}_{nx}$$

# Event #1: Tightening Domestic Monetary Policy

- 1 What happens when the central bank raises nominal interest rates to tighten monetary policy?
- 2 Sticky inflation causes the real interest rate to rise.
- 3 Firms reduce demand for investment, lowering short run output.
- 4 The demand for dollar-denominated financial assets increases, causing the real exchange rate to appreciate.
- 5 Net exports decline.
- 6 Short-run output falls even farther.

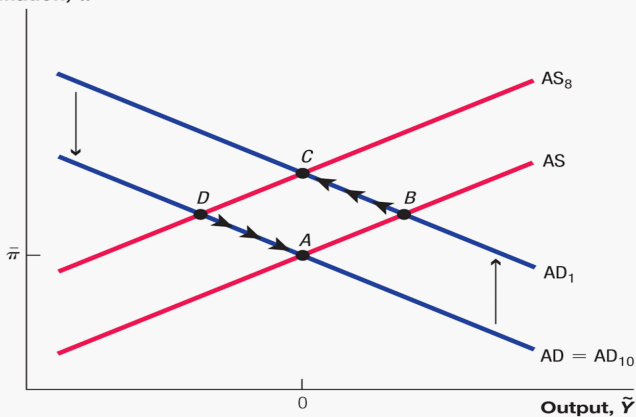
# An increase in the domestic interest rate

**FIGURE 20.4****Increasing Interest Rates and the IS Curve**Real interest rate,  $R$ 

## Event #2: A Change in Foreign Interest Rates

- 1 What is the effect on the United States if the European Central Bank raises interest rates in the euro area?
- 2 Investors will demand more euros and fewer dollars.
- 3 The euro will appreciate.
- 4 The US exports will become cheaper in the EuroZone
- 5 The IS curve shifts out as the aggregate demand parameter is shocked.
- 6 The aggregate demand increases

# The European Central Bank raises interest rates

**FIGURE 20.5**
**An Increase in Foreign Interest Rates**
**Inflation,  $\pi$** 




# V – Exchange Rate Regimes

# The three main phases

- 1 The era of the gold standard
- 2 The era of the Bretton Woods system
- 3 The modern era of floating exchange rates where exchange rates are allowed to move flexibly

# The three main phases

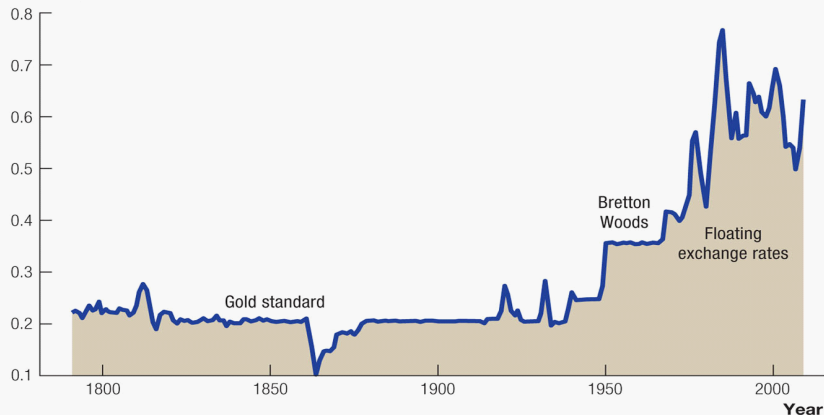
- 1 The gold standard:
  - 1 Countries specified a fixed price in which they were willing to trade their currency for gold.
- 2 The Bretton Woods system
  - 1 The United States pegged the dollar to a specified amount of gold.
  - 2 Other countries pegged their currencies to the dollar.
- 3 Floating exchange rates
  - 1 Supply and demand for foreign exchange determine the value of the nominal exchange rate.

# The UK vs US exchange rate

**FIGURE 20.6**

## The U.K.–U.S. Exchange Rate

Pounds per dollar



# VI – The Policy Trilemma

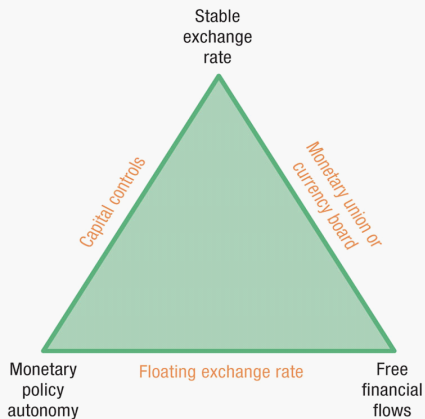
# The Policy Trilemma

- 1 The international monetary system has three main goals:
  - 1 Stable exchange rates
  - 2 Monetary policy autonomy
  - 3 Free flows of international finance
- 2 The policy trilemma:
  - 1 The principle that at most only two of the three goals can be achieved simultaneously within a country

# The Policy Trilemma

**FIGURE 20.7**

## The Policy Trilemma in Open Economies



## Which Side of the Triangle to Choose?

- 1 The costs and benefits of giving up a particular goal may differ across countries and time.
- 2 For example, individual countries in the EuroZone gave up autonomous monetary policy.
- 3 Argentina the same with the so called "dollarization" in the 1990s
- 4 The South East Asian economies decided to peg their currencies to the US dollar in the early 1990s: they gave up a relevant part of autonomous monetary policy as well
- 5 Giving up autonomous monetary policy may be very dangerous

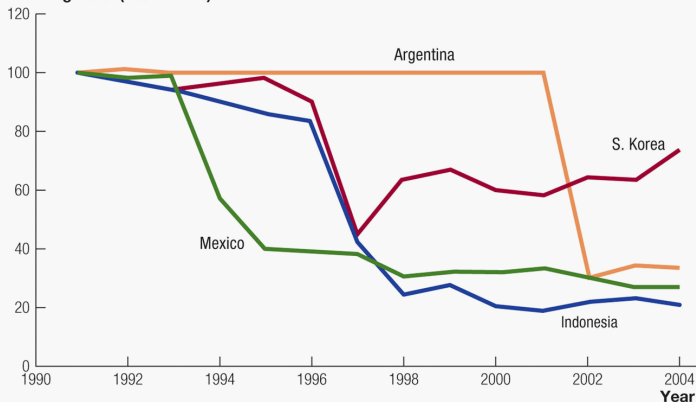


# The dangerous side of loosing autonomy

**FIGURE 20.8**

## Depreciations during Several Currency Crises, 1991–2004

Exchange rate (1991 = 100)



# VIII – Required readings

## Required reading

For this week you are required to read **Read Chapter 20** of our adopted textbook.



Charles I. Jones (2014). *Macroeconomics, Third Edition*, W. W. Norton & Company.