

Advanced International Economics

ECON 758

Professor Yamin Ahmad

Lecture 10:

- Price Levels and the Exchange Rate in the Long Run



In This Lecture

- Law of one price
- Purchasing power parity
- Long run model of exchange rates: monetary approach
- Relationship between interest rates and inflation: Fisher effect
- Shortcomings of purchasing power parity
- Long run model of exchange rates: real exchange rate approach
- Real interest rates

Note: These lecture notes are incomplete without having attended lectures.

10-2

The Behavior of Exchange Rates

- What models can predict how exchange rates behave?
 - In last lecture we developed a short run model and a long run model that used movements in the money supply.
 - In this lecture, we develop 2 more models, building on the long run approach from last lecture.
 - **Long run** means that prices of goods and services and factors of production that build those goods and services adjust to supply and demand conditions so that their markets and the money market are in equilibrium.
 - **Because prices are allowed to change, they will influence interest rates and exchange rates in the long run models.**

Note: These lecture notes are incomplete without having attended lectures.

10-3

The Behavior of Exchange Rates (cont.)

- Note: The long run models are not intended to be completely realistic descriptions about how exchange rates behave, but ways of generalizing how market participants form expectations about future exchange rates.

Note: These lecture notes are incomplete without having attended lectures.

10-4

Law of One Price

- The **law of one price** simply says that the **same** good in different competitive markets must sell for the same price, when transportation costs and barriers between markets are not important.
 - Why? Suppose the price of pizza at one restaurant is \$20, while the price of the same pizza at a similar restaurant across the street is \$40.
 - What do you predict to happen?
 - Many people would buy the \$20 pizza, few would buy the \$40.

Note: These lecture notes are incomplete without having attended lectures.

10-5

Law of One Price (cont.)

- Due to the increased demand, the price of the \$20 pizza would tend to increase.
 - Due to the decreased demand, the price of the \$40 pizza would tend to decrease.
 - People would have an incentive to adjust their behavior and prices would tend to adjust to reflect this changed behavior until one price is achieved across markets (restaurants).
- In other words: **arbitrage** would occur

Note: These lecture notes are incomplete without having attended lectures.

10-6

Law of One Price (cont.)

- Consider a pizza restaurant in Seattle one across the border in Vancouver.
- The law of one price says that the price of the same pizza (using a common currency to measure the price) in the two cities must be the same if barriers between competitive markets and transportation costs are not important:

$$P^{pizza}_{US} = (E_{US\$/Canada\$}) \times (P^{pizza}_{Canada})$$

P^{pizza}_{US} = price of pizza in Seattle

P^{pizza}_{Canada} = price of pizza in Vancouver

$E_{US\$/Canada\$}$ = US dollar/Canadian dollar exchange rate

Note: These lecture notes are incomplete without having attended lectures.

10-7

Purchasing Power Parity (PPP)

Two definitions:

- A doctrine that states that goods must sell at the same (currency-adjusted) price in all countries.
- The nominal exchange rate adjusts to equalize the cost of a basket of goods across countries.

Reasoning:

- arbitrage, the law of one price

Note: These lecture notes are incomplete without having attended lectures.

10-8

Purchasing Power Parity

- **Purchasing power parity** is the application of the law of one price across countries for **all goods and services**, or for representative groups (“baskets”) of goods and services.

$$P_{US} = (E_{US\$/Canada\$}) \times (P_{Canada})$$

P_{US} = price level of goods and services in the US

P_{Canada} = price level of goods and services in Canada

$E_{US\$/Canada\$}$ = US dollar/Canadian dollar exchange rate

Purchasing Power Parity (PPP)

- PPP: $E \times P_{Canada} = P_{US}$
 - Cost of a basket of domestic goods, in domestic currency.

Cost of a basket of domestic goods, in foreign currency.

Cost of a basket of foreign goods, in foreign currency.

- Solve for E : $E = P_{US} / P_{Canada}$
- PPP implies that the nominal exchange rate between two countries equals the ratio of the countries' price levels.

Purchasing Power Parity (cont.)

- PPP implies that

$$E_{US\$/Canada\$} = P_{US} / P_{Canada}$$

- The price levels adjust to determine the exchange rate.
- If the price level in the US is US\$200 per basket, while the price level in Canada is C\$400 per basket, PPP implies that the US\$/C\$ exchange rate should be US\$200/C\$400 = US\$ 1/C\$ 2
- Purchasing power parity says that each country's currency has the **same purchasing power**: 2 Canadian dollars buy the same amount of goods and services as does 1 US dollar, since prices in Canada are twice as high.

Purchasing Power Parity (cont.)

- Purchasing power parity comes in 2 forms:
- **Absolute PPP**: purchasing power parity that has already been discussed. Exchange rates equal price *levels* across countries.

$$E_{\$/\epsilon} = P_{US} / P_{EU}$$

- **Relative PPP**: *changes* in exchange rates equal *changes* in prices (inflation) between two periods:

$$(E_{\$/\epsilon,t} - E_{\$/\epsilon,t-1}) / E_{\$/\epsilon,t-1} = \pi_{US,t} - \pi_{EU,t}$$

where π_t = inflation rate from period $t-1$ to t

Monetary Approach to Exchange Rates

- **Monetary approach to the exchange rate:** uses monetary factors to predict how exchange rates adjust in the long run.
 - It uses the absolute version of PPP.
 - It assumes that prices adjust in the long run.
 - In particular, price levels adjust to equate real (aggregate) money supply with real (aggregate) money demand. This implies:

$$P_{US} = M_{US}^s / L(R_{\$}, Y_{US})$$

$$P_{EU} = M_{EU}^s / L(R_{\text{€}}, Y_{EU})$$

Note: These lecture notes are incomplete without having attended lectures.

10-13

Monetary Approach to Exchange Rates (cont.)

- To the degree that PPP holds and to the degree that prices adjust to equate real money supply with real money demand, we have the following prediction:
- **The exchange rate is determined in the long run by prices, which are determined by the relative supply of money across countries and the relative real demand of money across countries.**

Note: These lecture notes are incomplete without having attended lectures.

10-14

Monetary Approach to Exchange Rates (cont.)

Predictions about changes in:

1. **Money supply:** a permanent rise in the domestic money supply
 - causes a proportional increase in the domestic price level,
 - causing a proportional depreciation in the domestic currency (through PPP).
 - same prediction as long run model without PPP
2. **Interest rates:** a rise in the domestic interest rate
 - lowers domestic money demand,
 - increasing the domestic price level,
 - causing a proportional *depreciation* of the domestic currency (through PPP).

Note: These lecture notes are incomplete without having attended lectures.

10-15

Monetary Approach to Exchange Rates (cont.)

3. **Output level:** a rise in the domestic output level
 - raises domestic money demand,
 - decreasing the domestic price level,
 - causing a proportional appreciation of the domestic currency (through PPP).
- **All 3 changes affect money supply or money demand, thereby causing prices to adjust to maintain equilibrium in the money market, thereby causing exchange rates to adjust to maintain PPP.**

Note: These lecture notes are incomplete without having attended lectures.

10-16

Monetary Approach to Exchange Rates (cont.)

- A change in the **level of the money supply** results in a change in the **price level**.
- A change in the **money supply growth rate** results in a change in the **growth rate of prices (inflation)**.
 - Other things equal, a constant growth rate in the money supply results in a persistent growth rate in prices (persistent inflation) at the same constant rate.
 - Inflation does not affect the productive capacity of the economy and real income from production in the long run.
 - Inflation, however, does affect nominal interest rates. How?

Note: These lecture notes are incomplete without having attended lectures.

10-17

The Fisher Effect

- The **Fisher effect** (named affect Irving Fisher) describes the relationship between nominal interest rates and inflation.
 - Derive the Fisher effect from the interest parity condition: $R_{\$} - R_{\text{€}} = (E_{\$/\text{€}}^e - E_{\$/\text{€}}) / E_{\$/\text{€}}$
 - If financial markets expect (relative) PPP to hold, then expected exchange rate changes will equal expected inflation between countries: $(E_{\$/\text{€}}^e - E_{\$/\text{€}}) / E_{\$/\text{€}} = \pi^e_{\text{US}} - \pi^e_{\text{EU}}$
 - $R_{\$} - R_{\text{€}} = \pi^e_{\text{US}} - \pi^e_{\text{EU}}$
 - The Fisher effect: **a rise in the domestic inflation rate causes an equal rise in the interest rate on deposits of domestic currency in the long run, with other things constant.**

Note: These lecture notes are incomplete without having attended lectures.

10-18

Monetary Approach to Exchange Rates

- Suppose that the Federal Reserve unexpectedly increases the money supply growth rate at time t_0 .
- Suppose also that the inflation rate is π in the US before t_0 and $\pi + \Delta\pi$ after this time. Suppose inflation is consistently 0% in Europe.
- The interest rate adjusts according to the Fisher effect to reflect this higher inflation rate.

Note: These lecture notes are incomplete without having attended lectures.

10-19

Monetary Approach to Exchange Rates (cont.)

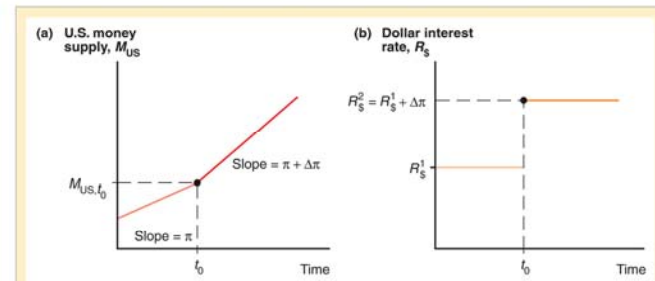


Figure 15-1

Long-Run Time Paths of U.S. Economic Variables After a Permanent Increase in the Growth Rate of the U.S. Money Supply

After the money supply growth rate increases at time t_0 in panel (a), the interest rate (in panel (b)), price level (in panel (c)), and exchange rate (in panel (d)) move to new long-run equilibrium paths. (The money supply, price level, and exchange rate are all measured on a *natural logarithmic* scale, which makes variables that change at constant proportional rates appear as straight lines when they are graphed against time. The slope of the line equals the variable's proportional growth rate.)

Note: These lecture notes are incomplete without having attended lectures.

10-20

Monetary Approach to Exchange Rates (cont.)

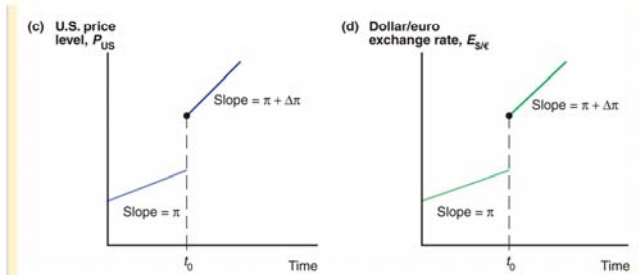


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10-21

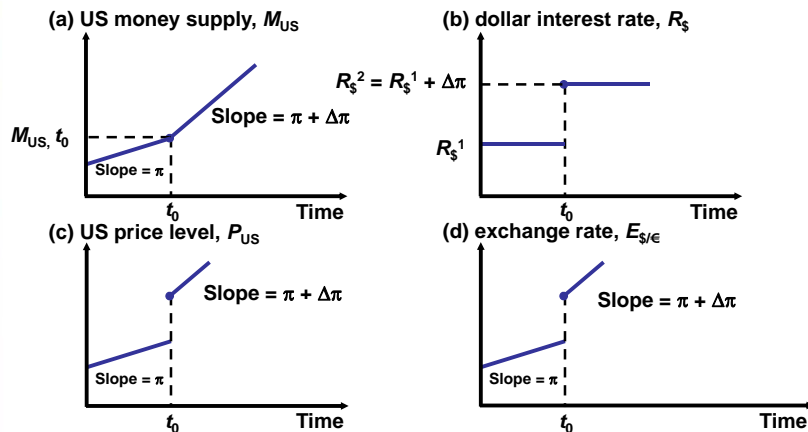
Monetary Approach to Exchange Rates (cont.)

- The increase in nominal interest rates decreases real money demand.
- To maintain equilibrium in the money market, prices must jump so that $P_{US} = M^s_{US}/L(R_{\$}, Y_{US})$.
- To maintain PPP, the exchange rate will then jump (the dollar will depreciate): $E_{\$/€} = P_{US}/P_{EU}$
- Thereafter, the money supply and prices grow at rate $\pi + \Delta \pi$ and the domestic currency depreciates at the same rate.

Note: These lecture notes are incomplete without having attended lectures.

10-22

Monetary Approach to Exchange Rates (cont.)



Note: These lecture notes are incomplete without having attended lectures.

10-23

The Role of Inflation and Expectations

In the model long run model without PPP

- changes in money supply *levels* lead to changes in price *levels*.
- There is no inflation in the long run, but only during the transition to the long run equilibrium.
- During the transition, inflation causes the nominal interest rate to increase to its long run rate.
- *Expectations of inflation* cause the expected return on foreign currency to increase, making the domestic currency *depreciate* before the transition period.

Note: These lecture notes are incomplete without having attended lectures.

10-24

The Role of Inflation and Expectations (cont.)

In the Monetary Approach (with PPP)

- the rate of inflation increases permanently because the *growth rate* of the money supply increases permanently.
- With persistent inflation (above foreign inflation), the monetary approach also predicts an increase in the nominal interest rate.
- *Expectations of higher domestic inflation* cause the purchasing power of foreign currency to increase relative to the purchasing power of domestic currency, thereby making the *domestic currency depreciate*.

Note: These lecture notes are incomplete without having attended lectures.

10-25

The Role of Inflation and Expectations (cont.)

- In the long run model without PPP, expectations of inflation cause the exchange rate to overshoot (cause the domestic currency to depreciate more than) its long run value.
- In the monetary approach (with PPP), the price level adjusts with expectations of inflation, causing the domestic currency to depreciate, but with no overshooting.

Note: These lecture notes are incomplete without having attended lectures.

10-26

Empirical Evidence on Law of One Price

Law of One Price for Hamburgers?

Big Mac prices (in U.S. dollars)			
United States	2.90	Malaysia	1.33
Argentina	1.48	Mexico	2.08
Australia	2.27	New Zealand	2.65
Brazil	1.70	Peru	2.57
Britain	3.37	Philippines	1.23
Canada	2.33	Poland	1.63
Chile	2.18	Russia	1.45
China	1.26	Singapore	1.92
Czech Republic	2.13	South Africa	1.86
Denmark	4.46	South Korea	2.72
Egypt	1.62	Sweden	3.94
Euro Area	3.28	Switzerland	4.90
Hong Kong	1.54	Taiwan	2.24
Hungary	2.52	Thailand	1.45
Indonesia	1.77	Turkey	2.58
Japan	2.33	Venezuela	1.48

Source: Economist, May 27, 2004.

Note: These lecture notes are incomplete without having attended lectures.

10-27

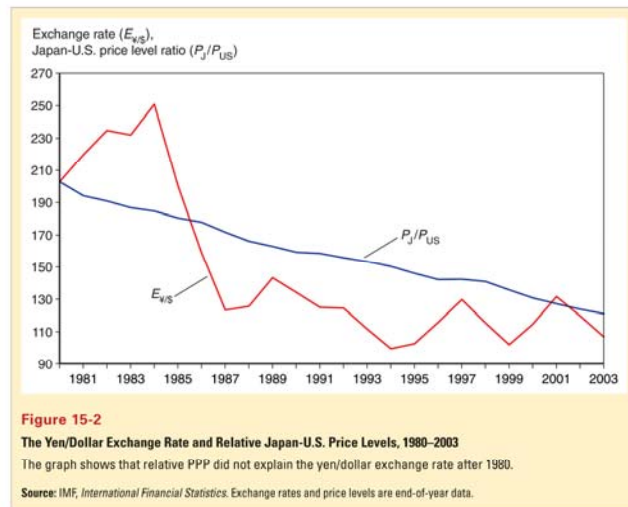
Shortcomings of PPP

- There is little empirical support for absolute purchasing power parity.
 - The prices of identical commodity baskets, when converted to a single currency, differ substantially across countries.
- Relative PPP is more consistent with data, but it also performs poorly to predict exchange rates.

Note: These lecture notes are incomplete without having attended lectures.

10-28

Shortcomings of PPP (cont.)



Note: These lecture notes are incomplete without having attended lectures.

10-29

Shortcomings of PPP (cont.)

Reasons why PPP may not be a good theory:

1. Trade barriers and non-tradable goods and services
2. Imperfect competition
3. Differences in price level measures

Note: These lecture notes are incomplete without having attended lectures.

10-30

Shortcomings of PPP (cont.)

- **Trade barriers and non-tradables**
 - Transport costs and governmental trade restrictions make trade expensive and in some cases create non-tradable goods or services.
 - Services are often not tradable: services are generally offered within a limited geographic region (e.g., haircuts).
 - The greater the transport costs, the greater the range over which the exchange rate can deviate from its PPP value.
 - One price need not hold in two markets.

Note: These lecture notes are incomplete without having attended lectures.

10-31

Shortcomings of PPP (cont.)

- **Imperfect competition** may result in price discrimination: “pricing to market”.
 - A firm sells the same product for different prices in different markets to maximize profits, based on expectations about what consumers are willing to pay.
- **Differences in price level measures**
 - price levels differ across countries because of the way representative groups (“baskets”) of goods and services are measured.
 - Because measures of goods and services are different, the measure of their prices need not be the same.

Note: These lecture notes are incomplete without having attended lectures.

10-32

Recall: The Nominal Exchange rate

E = nominal exchange rate,
the relative price of
domestic currency
in terms of foreign currency
(e.g. Dollar per Sterling)

The Real Exchange Rate

q = real exchange rate,
the relative price of
domestic goods
in terms of foreign goods
(e.g. U.S. Big Macs per UK Big Mac)

Understanding the units of q

$$\begin{aligned}
 q &= \frac{E \times P^*}{P} \\
 &= \frac{(\$ \text{ per } \pounds) \times (\pounds \text{ per unit U.K. goods})}{\$ \text{ per unit U.S. goods}} \\
 &= \frac{\text{Dollars per unit U.K. goods}}{\text{Dollars per unit US goods}} \\
 &= \text{Units of US goods} \\
 &= \text{per unit of U.K. goods}
 \end{aligned}$$

~ McZample ~

- one good: Big Mac
- price in UK:
 $P^* = \pounds 2.00$
- price in USA:
 $P = \$2.50$
- nominal exchange rate
 $E = \$2 \text{ per sterling}$



$$\begin{aligned}
 q &= \frac{E \times P^*}{P} \\
 &= \frac{2 \times \pounds 2.00}{\$2.50} = 1.6
 \end{aligned}$$

To buy a U.K. Big Mac,
someone from the US
would have to pay an
amount that could buy
1.6 American Big Macs.

q in the real world & our model

- *In the real world:*
We can think of q as the relative price of a basket of domestic goods in terms of a basket of foreign goods
- *In our model:*
There's just one good, "output."
So q is the relative price of one country's output in terms of the other country's output

Note: These lecture notes are incomplete without having attended lectures.

10-37

The Real Exchange Rate Approach to Exchange Rates

- Because of the shortcomings of PPP, economists have tried to generalize the monetary approach to PPP.
- The **real exchange rate** is the *rate of exchange for real goods and services across countries*.
- It is the dollar price of a European group of goods and services relative to the dollar price of an American group of goods and services:

$$q_{US/EU} = (E_{\$/\epsilon} \times P_{EU})/P_{US}$$

Note: These lecture notes are incomplete without having attended lectures.

10-38

The Real Exchange Rate Approach to Exchange Rates (cont.)

$$q_{US/EU} = (E_{\$/\epsilon} \times P_{EU})/P_{US}$$

- If the EU basket costs €100, the US basket costs \$120 and the nominal exchange rate is \$1.20 per euro, then the real exchange rate is 1 US basket per EU basket.
- A real depreciation of the value of US goods means a fall in a dollar's purchasing power of EU products relative to a dollar's purchasing power of US products.
- This implies that US goods become less expensive and less valuable relative to the EU goods.
- This implies that the value of US goods relative to value of EU goods falls.

Note: These lecture notes are incomplete without having attended lectures.

10-39

The Real Exchange Rate Approach to Exchange Rates (cont.)

$$q_{US/EU} = (E_{\$/\epsilon} \times P_{EU})/P_{US}$$

- A real appreciation of the value of US goods means a rise in a dollar's purchasing power of EU products relative to a dollar's purchasing power of US products.
- This implies that US goods become more expensive and more valuable relative to EU goods.
- This implies that the value of US goods relative to value of EU goods rises.

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10-40

The Real Exchange Rate Approach to Exchange Rates (cont.)

- According to PPP, exchange rates are determined by relative price ratios:

$$E_{\$/\epsilon} = P_{US}/P_{EU}$$

- According to the more general real exchange rate approach, exchange rates may also be influenced by the real exchange rate:

$$E_{\$/\epsilon} = q_{US/EU} \times P_{US}/P_{EU}$$

- What influences the real exchange rate?

The Real Exchange Rate Approach to Exchange Rates (cont.)

- A **change in relative demand** for US products
 - An increase in relative demand for US output causes the value (price) of US goods relative to the value (price) of foreign goods to rise.
 - A real appreciation of the value of US goods: P_{US} rises relative to $E_{\$/\epsilon} \times P_{EU}$
 - The real appreciation of the value of US goods makes US exports more expensive and imports into the US less expensive, thereby reducing relative quantity demanded.
 - A decrease in relative demand for US output leads to a real depreciation of the value of US goods.

The Real Exchange Rate Approach to Exchange Rates (cont.)

- A **change in relative supply** of US products
 - An increase in relative supply for US output (caused by an increase in US productivity) causes the price/cost of US goods relative to the price/cost of foreign goods to fall.
 - A real depreciation of the value of US goods: P_{US} falls relative to $E_{\$/\epsilon} \times P_{EU}$
 - The real depreciation of the value of US goods makes US exports less expensive and imports into the US more expensive, thereby increasing relative demand to match increased relative supply.
 - A decrease in relative supply for US output leads to a real appreciation of the value of US goods.

Determining the Long Run Real Exchange Rate

In the long run, the supply of goods and services in each country depends on factors of production like labor, capital and technology—not prices or exchange rates.

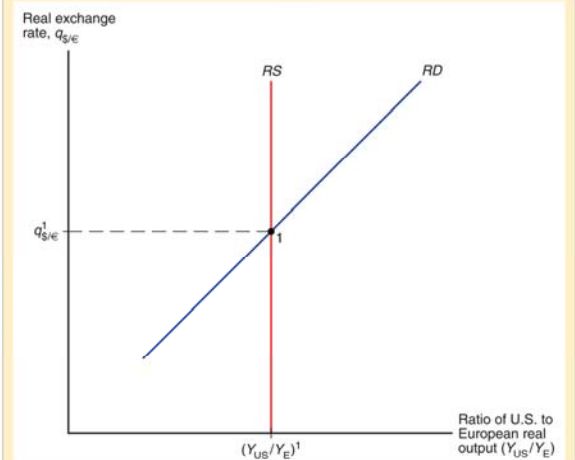


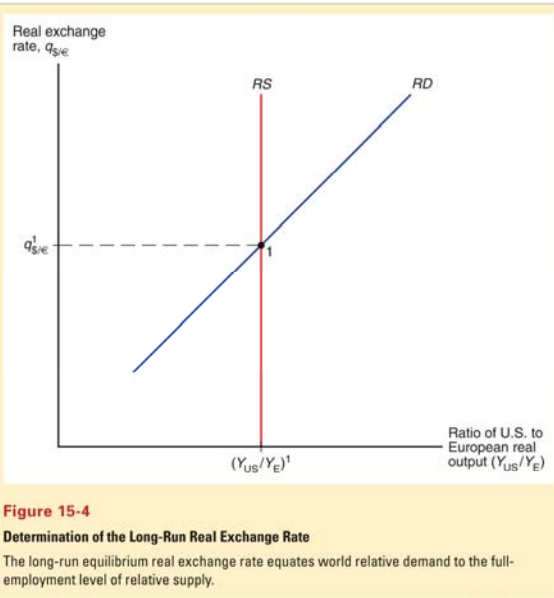
Figure 15-4

Determination of the Long-Run Real Exchange Rate

The long-run equilibrium real exchange rate equates world relative demand to the full-employment level of relative supply.

Determining the Long Run Real Exchange Rate (cont.)

The demand for US products relative to the demand for EU products depends on the relative price of these products, or the real exchange rate. When the real exchange rate, $q_{US/EU} = (E_{\$/\epsilon} P_{EU})/P_{US}$ is high, the relative demand for US products is high.

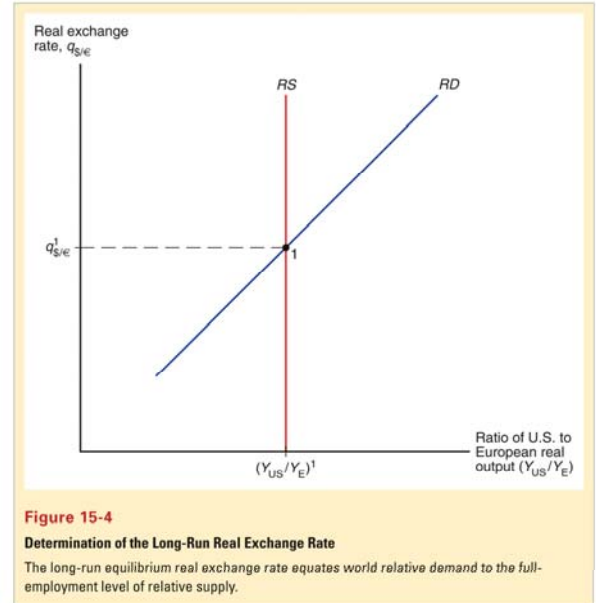


Note: These lecture notes are incomplete without having attended lectures.

10-45

Determining the Long Run Real Exchange Rate (cont.)

When the relative supply of US products matches the relative demand for US products, there is no tendency for the price of US products relative to EU products to change.



Note: These lecture notes are incomplete without having attended lectures.

10-46



The Real Exchange Rate Approach to Exchange Rates

- The real exchange rate is a more general approach to explain exchange rates. Both monetary factors and real factors influence nominal exchange rates:
 - 1a. changes in *monetary levels*, leading to temporary inflation and changes in expectations about inflation.
 - 1b. changes in *monetary growth rates*, leading to persistent inflation and changes in expectations about inflation.
 - 2a. changes in *relative demand*: increase in relative demand for domestic products leads to a real appreciation.
 - 2b. changes in *relative supply*: increase in relative supply for domestic products leads to a real depreciation.

Note: These lecture notes are incomplete without having attended lectures.

10-47



The Real Exchange Rate Approach to Exchange Rates (cont.)

- What are the effects on the nominal exchange rate?

$$E_{\$/\epsilon} = q_{US/EU} \times P_{US}/P_{EU}$$
- When only monetary factors change and PPP holds, we have the same predictions as before.
 - no changes in the real exchange rate occurs
- When factors influencing real output change, the real exchange rate changes.
 - With an increase in relative demand for domestic products, the real exchange rate adjusts to determine nominal exchange rates.
 - With an increase in relative supply of domestic products, the situation is more complex...

Note: These lecture notes are incomplete without having attended lectures.

10-48

The Real Exchange Rate Approach to Exchange Rates (cont.)

- With an increase in the relative supply of domestic products, the real exchange rate adjusts to make the price/cost of domestic goods depreciate, but also the relative amount of domestic output increases.

- This second effect increases the real money demand in the domestic economy relative to that in the foreign economy:

$$P_{US} = M_{US}^s / L(R_{\$}, Y_{US})$$

- The domestic price level decreases relative to the foreign price level.
- The effect on the nominal exchange rate is ambiguous:

$$E_{\$/\epsilon} = q_{US/EU} \times P_{US} / P_{EU}$$



Note: These lecture notes are incomplete without having attended lectures.

10-49

The Real Exchange Rate Approach to Exchange Rates (cont.)

- When economic changes are influenced only by monetary factors, and when the assumptions of PPP hold, nominal exchange rates are determined by PPP.
- When economic changes are caused by factors that affect real output, exchange rates are not determined by PPP only, but are also influenced by the real exchange rate.

Note: These lecture notes are incomplete without having attended lectures.

10-50

Interest Rate Differences

- A more general equation of differences in nominal interest rates across countries can be derived from:

$$(q_{US/EU}^e - q_{US/EU}) / q_{US/EU} = [(E_{\$/\epsilon}^e - E_{\$/\epsilon}) / E_{\$/\epsilon}] - (\pi_{US}^e - \pi_{EU}^e)$$

$$R_{\$} - R_{\epsilon} = (E_{\$/\epsilon}^e - E_{\$/\epsilon}) / E_{\$/\epsilon}$$

$$R_{\$} - R_{\epsilon} = (q_{US/EU}^e - q_{US/EU}) / q_{US/EU} + (\pi_{US}^e - \pi_{EU}^e)$$

- The difference in nominal interest rates across two countries is now the sum of:
 - The expected rate of depreciation in the value of domestic goods relative to foreign goods
 - The expected inflation difference between the domestic economy and the foreign economy

Note: These lecture notes are incomplete without having attended lectures.

10-51

Real Interest Rates

- Real interest rates are inflation-adjusted interest rates:

$$r^e = R - \pi^e$$

- where π^e represents expected inflation and R represents nominal interest rates.
- Real interest rates are measured in terms of real output: what quantity of real goods and services can you earn in the future by saving real resources today?
- What should be the differences in real interest rates across countries?

Note: These lecture notes are incomplete without having attended lectures.

10-52

Real Interest Rates (cont.)

- Real interest rate differentials are derived from

$$r^e_{US} - r^e_{EU} = (R_{\$} - \pi^e_{US}) - (R_{\epsilon} - \pi^e_{EU})$$

$$R_{\$} - R_{\epsilon} = (q^e_{US/EU} - q_{US/EU})/q_{US/EU} + (\pi^e_{US} - \pi^e_{EU})$$

$$r^e_{US} - r^e_{EU} = (q^e_{US/EU} - q_{US/EU})/q_{US/EU}$$

- The last equation is called **real interest parity**.
 - It says that the differences in real interest rates (return on saving in terms of real resources earned) between countries is equal to the expected change in the value/price/cost of goods and services between countries.

Note: These lecture notes are incomplete without having attended lectures.

10-53

Summary

- The law of one price says that the same good in different competitive markets must sell for the same price, when transportation costs and barriers between markets are not important.
- Purchasing power parity applies the law of one price for all goods and services among all countries.
 - Absolute PPP says that currencies of two countries have the same purchasing power.
 - Relative PPP says that changes in the nominal exchange rate between two countries equals the difference in the inflation rates between the two countries.

Note: These lecture notes are incomplete without having attended lectures.

10-54

Summary (cont.)

- The monetary approach to exchange rates uses PPP, real money supply and real money demand.
 - Changes in the growth rate of the money supply influence inflation and exchange rates.
 - Expectations about inflation influence the exchange rate.
 - The Fisher effect shows that differences in nominal interest rates are equal to differences in inflation rates.
- Empirical support for PPP is weak.
 - Trade barriers, non-tradable products, imperfect competition and differences in price measures may all have effects on the empirical shortcomings of PPP.

Note: These lecture notes are incomplete without having attended lectures.

10-55

Summary (cont.)

- The real exchange rate approach to exchange rates generalizes the monetary approach.
 - It defines the real exchange rate as the value/price/cost of domestic products relative to foreign products.
 - It allows relative demand and relative supply changes to influence real and nominal exchange rates.
 - Interest rate differences are explained by a more general concept: expected changes in the value of domestic products relative to the value of foreign products plus the difference of inflation rates between the domestic and foreign economies.

Note: These lecture notes are incomplete without having attended lectures.

10-56

Summary (cont.)

6. Real interest rates are inflation-adjusted interest rates.
7. Real interest parity shows that differences in real interest rates between countries equal expected changes in the real value of goods and services between countries.

Note: These lecture notes are incomplete without having attended lectures.

10-57

TABLE 15-1 Effects of Money Market and Output Market
Changes on the Long-Run Nominal Dollar/Euro Exchange Rate, $E_{\$/\text{€}}$

Change	Effect on the long-run nominal dollar/euro exchange rate, $E_{\$/\text{€}}$
Money market	
1. Increase in U.S. money supply level	Proportional increase (nominal depreciation of \$)
2. Increase in European money supply level	Proportional decrease (nominal depreciation of euro)
3. Increase in U.S. money supply growth rate	Increase (nominal depreciation of \$)
4. Increase in European money supply growth rate	Decrease (nominal depreciation of euro)
Output market	
1. Increase in demand for U.S. output	Decrease (nominal appreciation of \$)
2. Increase in demand for European output	Increase (nominal appreciation of euro)
3. Output supply increase in the United States	Ambiguous
4. Output supply increase in Europe	Ambiguous

Note: These lecture notes are incomplete without having attended lectures.

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