



Soochow University International Programs

2021 SCUIP Winter Session I
ECON202



Lecture 11: Open-Economy Macroeconomics: Basics

ECON202: Macroeconomics
Soochow University



Prerequisites

- Things you need to know before you see the rest of this topic:
 - ▷ The national income identity: $Y = C + I + G + NX$
 - ▷ The definition of national saving: $S = Y - C - G$
 - ▷ The quantity theory of money
 - ▷ The nominal interest rate, the real interest rate, and the difference between them
 - > $\text{real interest rate} = \text{nominal interest rate} - \text{inflation}$

Definitions

- Closed and open economies
- Exports, imports, net exports
- Trade balance, trade surplus, trade deficit, balanced trade
- Capital outflow, capital inflow, net capital outflow
- Later ...
- Exchange rates
- Real exchange rates

Definitions (Cont'd)

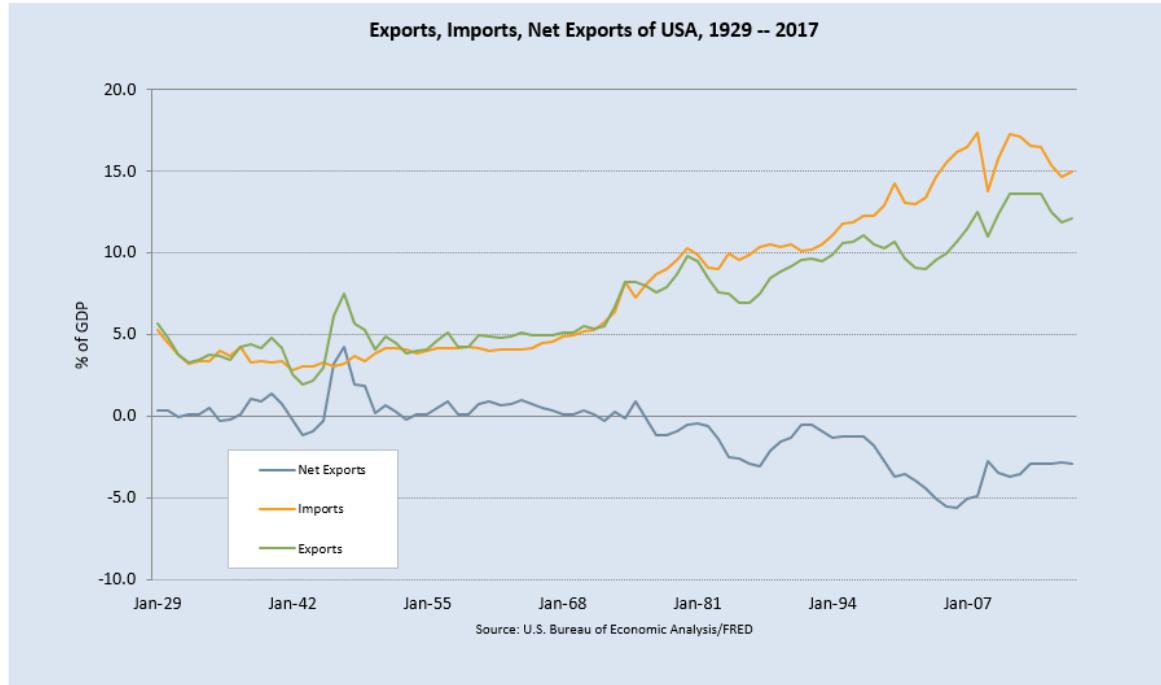
- A **closed economy** is an economy that has no economic interactions with other economies.
- An **open economy** is an economy whose residents have regular economic interactions with residents of other economies.
 - ▷ There are cross-border purchases and sales of goods and services.
 - ▷ There are cross-border purchases and sales of financial assets such as stocks and bonds.
 - ▷ Some degree of migration may also occur.

Definitions: Exports, Imports, Net Exports

- Households, businesses, and government entities in open economies trade goods and services with foreigners.
- **Exports** = The market value of goods and services that are produced domestically and sold abroad
- **Imports** = The market value of goods and services that are produced abroad and sold domestically
- **Net exports** = Exports – Imports
 - ▷ Net exports is also called the **trade balance**.
 - ▷ Could be positive, negative, or zero.



Exports, Imports, Balanced Trade



- Trade surplus
 - Net exports > 0
 - Exports > Imports
- Trade deficit
 - Net exports < 0
 - Exports < Imports
- Balanced trade
 - Net exports = 0
 - Exports = Imports

Capital Outflow, Capital Inflow, Net Capital Outflow

- Households, businesses, and governments entities in open economies trade financial and other assets with foreigners.
- **Capital outflow** = value of foreign assets purchased by domestic residents
- **Capital inflow** = value of domestic assets purchased by foreign residents
- **Net capital outflow** = capital outflow - capital inflow
 - ▷ NCO for short.
 - ▷ Also called **net foreign investment**.
 - ▷ Could be positive or negative or zero.

An Accounting Identity: $NX = NCO$

- It turns out that net exports and net capital outflow must always be equal.
 - ▷ You can't get something for nothing, right?
 - ▷ The same is true for countries.
 - ▷ A country can't buy more goods, services, and assets from other countries than it sells to other countries.
 - ▷ This is the basic reason why NX and NCO must always be equal.



An Accounting Identity: $NX = NCO$ (Cont'd)

- For every country, the value of goods and services purchased from other countries + the value of assets purchased from other countries = the value of goods and services sold to other countries + the value of assets sold to other countries
- Therefore, rearranging the terms, we see that the value of assets purchased from other countries – the value of assets sold to other countries = the value of goods and services sold to other countries – the value of goods and services purchased from other countries
- Therefore, net capital outflow = net exports!



An Accounting Identity: $S = I + NCO$

- I assume that you are aware of the following important macroeconomic ideas:
 - ▷ The national income identity: $Y = C + I + G + NX$
 - ▷ The definition of national saving: $S = Y - C - G$
- The **national income identity** says this:
 - ▷ A country's GDP (denoted Y) is the market value of the total output of final goods and services, and is therefore also the total expenditure on final goods and services.
 - ▷ This total expenditure must be the sum of consumption spending by household (C), investment spending mainly by businesses (I), government purchases (G), and net exports (NX).

An Accounting Identity: $S = I + NCO$ (Cont'd)

- The **definition of saving** says this:
 - ▷ GDP, being total expenditure – as we just saw – is also total income.
 - ▷ Income (Y) minus consumption by households (C) and consumption by the government (G) is the natural way to measure national saving (S).
 - ▷ Therefore, $S = Y - C - G$

An Accounting Identity: $S = I + NCO$ (Cont'd)

- We can rewrite the national income identity as: $Y - C - G = I + NX$
- Using the definition of national saving, this becomes: $S = I + NX$
- And we have seen in only the previous slide that $NX = NCO$
- Therefore, we can write $S = I + NCO$.

An Accounting Identity: $S = I + NCO$ (Cont'd)

- $S = I + NCO$
- This makes sense:
 - ▷ A nation's saving must end up being loaned to domestic borrowers or foreign borrowers.
 - ▷ The loan made to domestic borrowers will end up as investment spending mainly by domestic firms (I).
 - ▷ And the loans made to foreigners will be net capital outflow (NCO).
 - ▷ Therefore, $S = I + NCO$.

Exchange Rates, Nominal and Real

- We discussed exports, imports, and net exports earlier.
- These are influenced by many factors including international prices.
- The two most important international prices are
 - ▷ the **nominal exchange rate** and
 - ▷ the **real exchange rate**



Nominal Exchange Rates

- The **nominal exchange rate** is the rate at which a person can trade the currency of one country for the currency of another.
- The nominal exchange rate is expressed in two ways:
 - ▷ In units of foreign currency per one U.S. dollar.
 - ▷ And in units of U.S. dollar per one unit of the foreign currency.



Nominal Exchange Rates (Cont'd)

- On March 27, 2016 the exchange rate between the Japanese yen (¥) and the U.S. dollar was:
 - ▷ \$1.00 = ¥113.16
 - ▷ ¥0.0088 = \$1.00



Nominal Exchange Rates (Cont'd)

- **Appreciation** is an increase in the value of a currency (as measured by the amount of foreign currency it can buy).
- **Depreciation** is a decrease in the value of a currency.

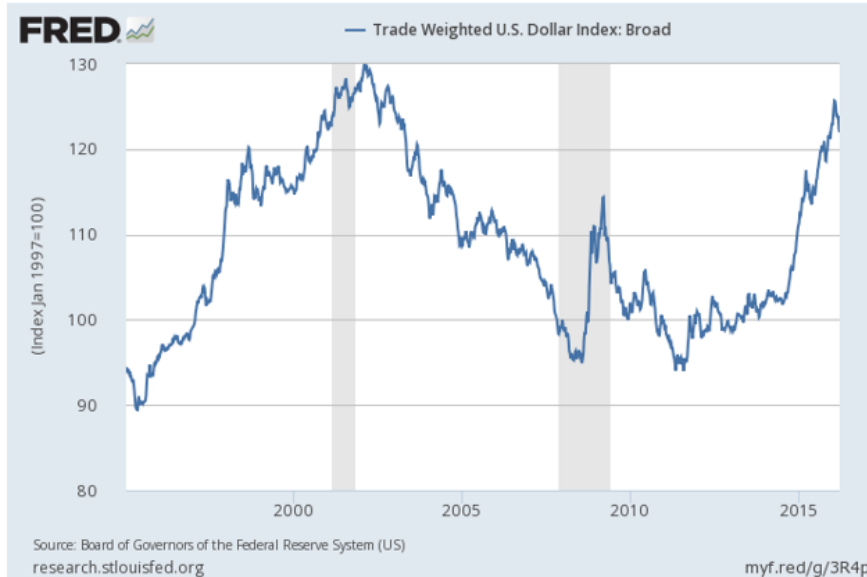


Nominal Exchange Rates (Cont'd)

- If the price of a dollar increases (say, from ¥100 to ¥120), it is an appreciation of the dollar.
- If the price of a dollar *decreases* (say, from ¥100 to ¥80), it is a *depreciation* of the dollar.



Data on Nominal Exchange Rates



- [FRED](#)
- Trade Weighted U.S. Dollar Index: Broad
<https://research.stlouisfed.org/fred2/series/TWEXB>

Real Exchange Rates

- The **real exchange rate** is the rate at a person can trade the **goods and services** of one country for the **goods and services** of another.
- The real exchange rate expresses the prices of domestic goods not in currency units but in units of foreign goods.
 - ▷ If a case of German beer is twice as expensive as American beer, the US real exchange rate is $\frac{1}{2}$ case of German beer per case of American beer.
 - ▷ Note that this expresses the price of a case of American beer in units of German beer.

Real Exchange Rates (Cont'd)

- Suppose
 - ▷ Price of U.S. wheat is $P = \$4.00$ per ton
 - ▷ Price of French wheat is $P^* = €2.00$ per ton
 - ▷ Price of a dollar is $e = €3.00$ per dollar
- Note that
 - ▷ Price of a ton of U.S. wheat is \$4.00 or, equivalently, €12.00 (because each dollar is worth 3 euros)
 - ▷ Therefore, one ton of U.S. wheat costs the same as six tons of French wheat.
 - ▷ Therefore, the real exchange rate = 6.

Real Exchange Rates (Cont'd)

- Recap: How did we get 6 as the real exchange rates?
 - ▷ We multiplied 3 and 4 and divided the result by 2.
 - ▷ That is, we calculated $e \times P / P^*$.
- Therefore, we see that, in general,
 - ▷ **Real Exchange Rate = $e \times P / P^*$.**



Real Exchange Rates (Cont'd)

- Real Exchange Rate = $e \times P / P^*$
- The real exchange rate depends on the nominal exchange rate and the prices of goods in the two countries, as measured in local currencies.
- The real exchange rate is a key determinant of how much a country exports and imports.

$$\text{Real exchange rate} = \frac{\text{Nominal exchange rate} \times \text{Domestic price}}{\text{Foreign price}}$$

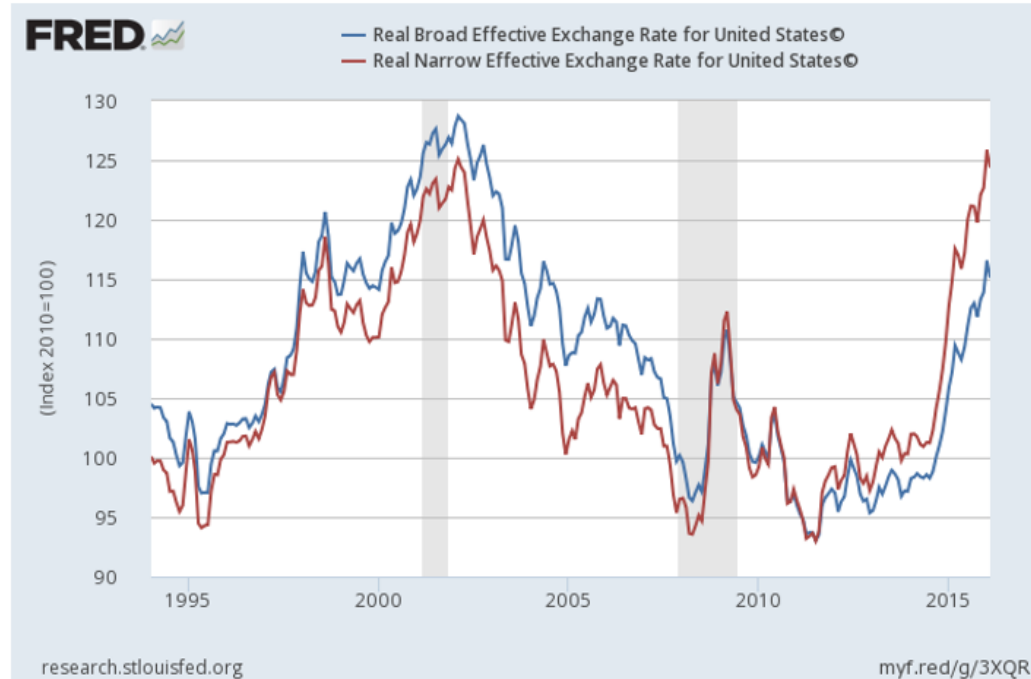
Data on Real Exchange Rates

Real Broad Effective Exchange Rate for United States:

<https://research.stlouisfed.org/fred2/series/RBUSBIS>

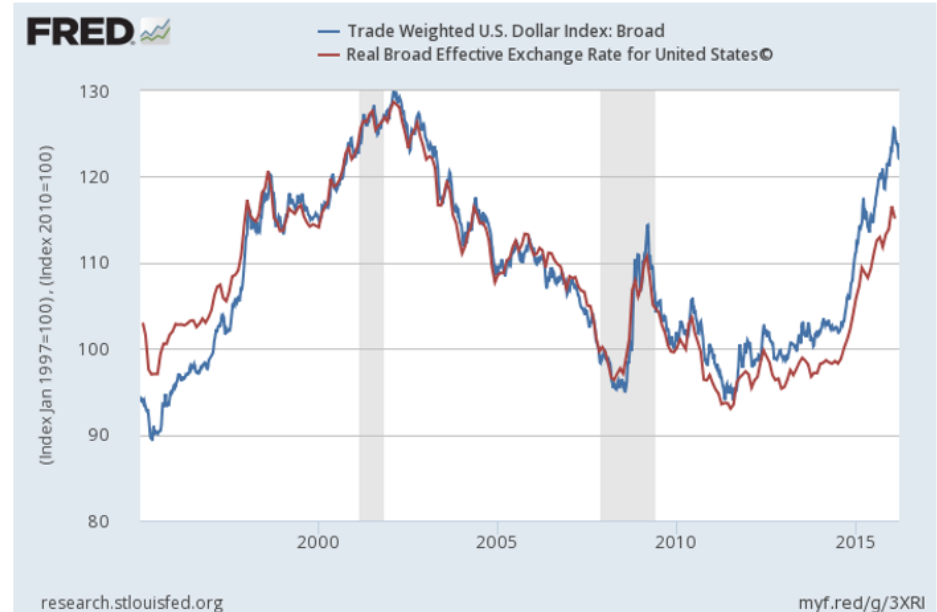
Real Narrow Effective Exchange Rate for United States:

<https://research.stlouisfed.org/fred2/series/RNUSBIS>



Real and Nominal Exchange Rates

- Note that these two exchange rates, one nominal and the other real, have been shown in earlier slides.
- And they tend to move in sync

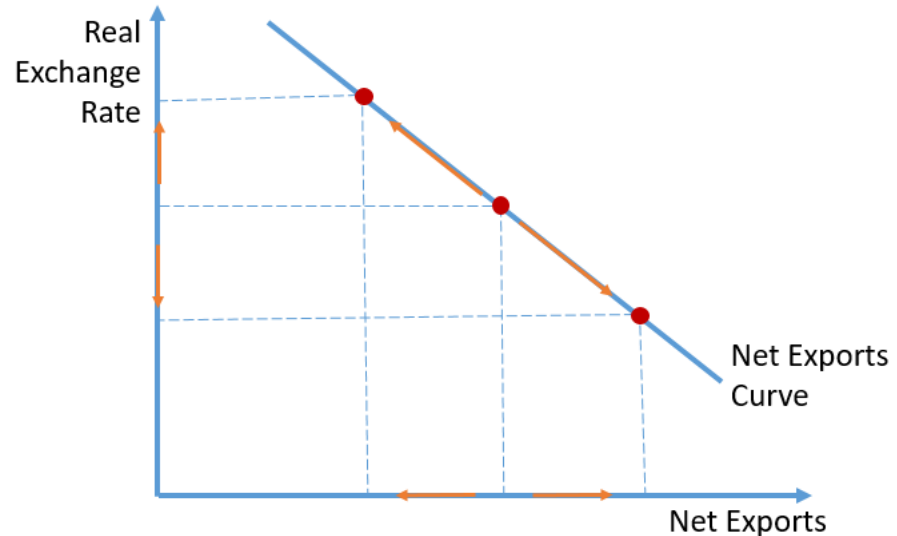


Effect of Real Exchange Rates on Net Exports

- A depreciation (fall) in the U.S. real exchange rate means that U.S. goods have become cheaper relative to foreign goods.
- This encourages consumers both at home and abroad to buy more U.S. goods and fewer goods from other countries.
- As a result, U.S. exports rise, and U.S. imports fall. Therefore,
- U.S. net exports increase.

Effect of Real Exchange Rates on Net Exports (Cont'd)

- Conversely, an *appreciation* in the U.S. real exchange rate means that U.S. goods have become more expensive compared to foreign goods.
- So U.S. *net exports fall*.



Purchasing Power Parity (PPP)

- The **purchasing power parity theory** is the simplest theory of exchange rates in the long run.



The Basic Logic of Purchasing Power Parity

- According to the purchasing power parity theory, **a unit of any given currency should buy the same quantity of goods in all countries.**
- If a dollar buys 2 grams of gold in India and 5 grams of gold in Canada, one could buy 5 grams of gold in Canada with a dollar, sell 2 grams of gold in India and get back the dollar that was spent in Canada, and still have 3 grams of gold left over!
- All this buying in Canada and selling in India will eventually make the price of gold the same in the two countries.

The Basic Logic of PPP (Cont'd)

- The theory of purchasing power parity is based on a principle called the **law of one price**.
 - ▷ According to the law of one price, a good must sell for the same price in all locations, once the prices are all expressed in the same currency.
 - ▷ Consequently, a unit of any given currency should buy the same quantity of goods in all countries.



The Basic Logic of PPP (Cont'd)

- If the law of one price were not true, unexploited profit opportunities would exist.
- If the same good sold at different prices in different countries, you could make money by simply buying the good where it is cheap and selling it where it is expensive.
- The process of taking advantage of differences in prices in different markets is called **arbitrage**.

The Basic Logic of PPP (Cont'd)

- Price of a commodity in USA in \$ \times ¥ per \$ exchange rate = Price of the commodity in USA in ¥
- If arbitrage occurs, eventually prices in two markets, expressed in the same currency, must become equal. Therefore:
- Price of a commodity in USA in \$ \times ¥ per \$ exchange rate = Price of the commodity in Japan in ¥

- $$\frac{\text{Price of a commodity in US in \$} \times \text{¥ per \$ exchange rate}}{\text{Price of the commodity in Japan in ¥}} = 1$$

- Or,
$$\frac{e \times P}{P^*} = 1$$



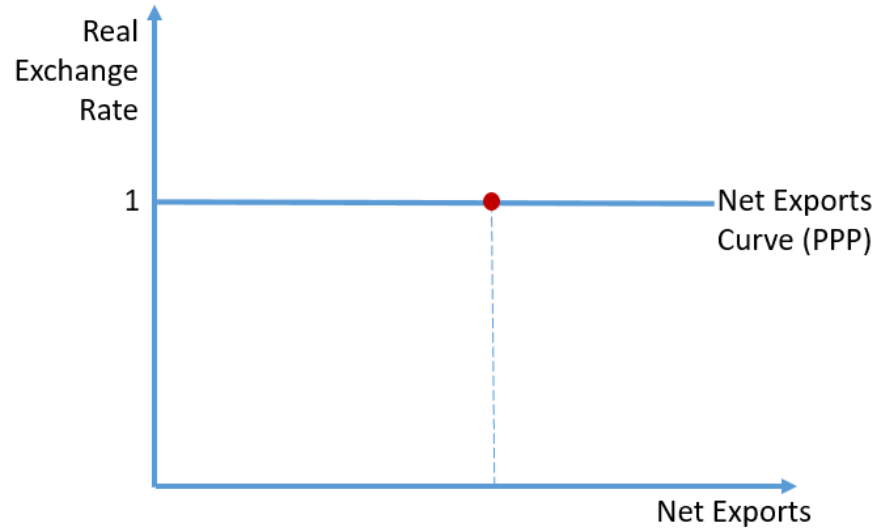
The Basic Logic of PPP (Cont'd)

- We just saw that under purchasing power parity, $\frac{e \times P}{P^*} = 1$.
- But we've seen that $e \times \frac{P}{P^*}$ is the real exchange rate!
- So, the purchasing power parity theory says the real exchange rate must be equal to one.



Purchasing Power Parity (Cont'd)

- The theory of purchasing-power parity says that **the real exchange rate, which is the price of domestic goods in units of foreign goods, must be equal to one**, in the long run.
- The net exports curve becomes horizontal at the long-run real exchange rate.



Implications of Purchasing Power Parity

- We've just seen that in the long run $\frac{e \times P}{P^*} = 1$
- This implies $e = \frac{P^*}{P}$
- Therefore, when $P \uparrow$ we have $e \downarrow$.
- That is, **when prices rise in a country, its currency will be worth less in terms of other currencies.**

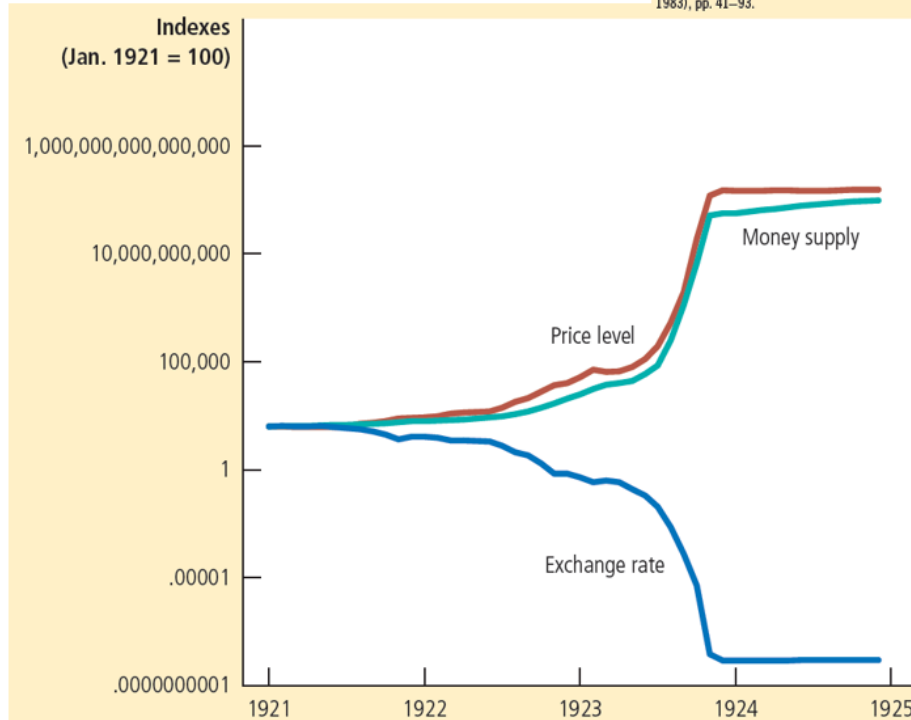
Implications of Purchasing Power Parity (Cont'd)

- I assume you are aware of the quantity theory of money.
 - ▷ It says that in the long run if the quantity of money in an economy increases faster than the output produced, then prices will rise.
- That is, when the central bank of a country prints large quantities of money, the country's money loses value in the sense that it buys fewer goods and services.
- Moreover, as we saw in the previous slide, the country's money also loses value in the sense that it buys smaller amounts of other currencies.



Money, Prices and Nominal Exchange Rate During Hyperinflation

Source: Adapted from Thomas J. Sargent, "The End of Four Big Inflations," in Robert Hall, ed., *Inflation* (Chicago: University of Chicago Press, 1983), pp. 41–93.



This figure shows the money supply, the price level, and the exchange rate (measured as U.S. cents per mark) for the German hyperinflation from January 1921 to December 1924. Notice how similarly these three variables move. When the quantity of money started growing quickly, the price level followed, and the mark depreciated relative to the dollar. When the German central bank stabilized the money supply, the price level and exchange rate stabilized as well.

Limitations of Purchasing Power Parity

- We will discuss another long-run theory of the real exchange rate later.
- The theory of purchasing power parity, though intuitive, doesn't fit the real world very well.
 - ▷ Many goods are not easily traded or shipped from one country to another.
 - ▷ Tradable goods are not always perfect substitutes when they are produced in different countries.



The Hamburger Standard

- See the web site for The Economist's Big Mac Currency Index:
<https://www.economist.com/content/big-mac-index>



What's Next?

- So far, we have seen a simple theory of the real exchange rate.
- We need a more realistic theory of the real exchange rate.
- Plus, we need a long-run theory of a country's net exports.



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