

Chapter 20
**Exchange Rates
and International
Finance**
By Charles I. Jones

Media Slides Created By

Dave Brown

Penn State University

20.1 Introduction

- In this chapter, we learn:
 - How nominal and real exchange rates are determined, in both the short run and the long run.
 - The key role played by the law of one price in determining exchange rates.
 - How to incorporate exchange rates and a richer theory of the open economy into our short-run model.

- About international financial systems:
 - The gold standard
 - The Bretton Woods system
 - The current system of floating exchange rates
- The lessons from recent financial crises in Mexico, Asia, Argentina, and Europe.

- 
- International trade of goods and services exceeds 20 percent of GDP in most countries.
- 

20.2 Exchange Rates in the Long Run

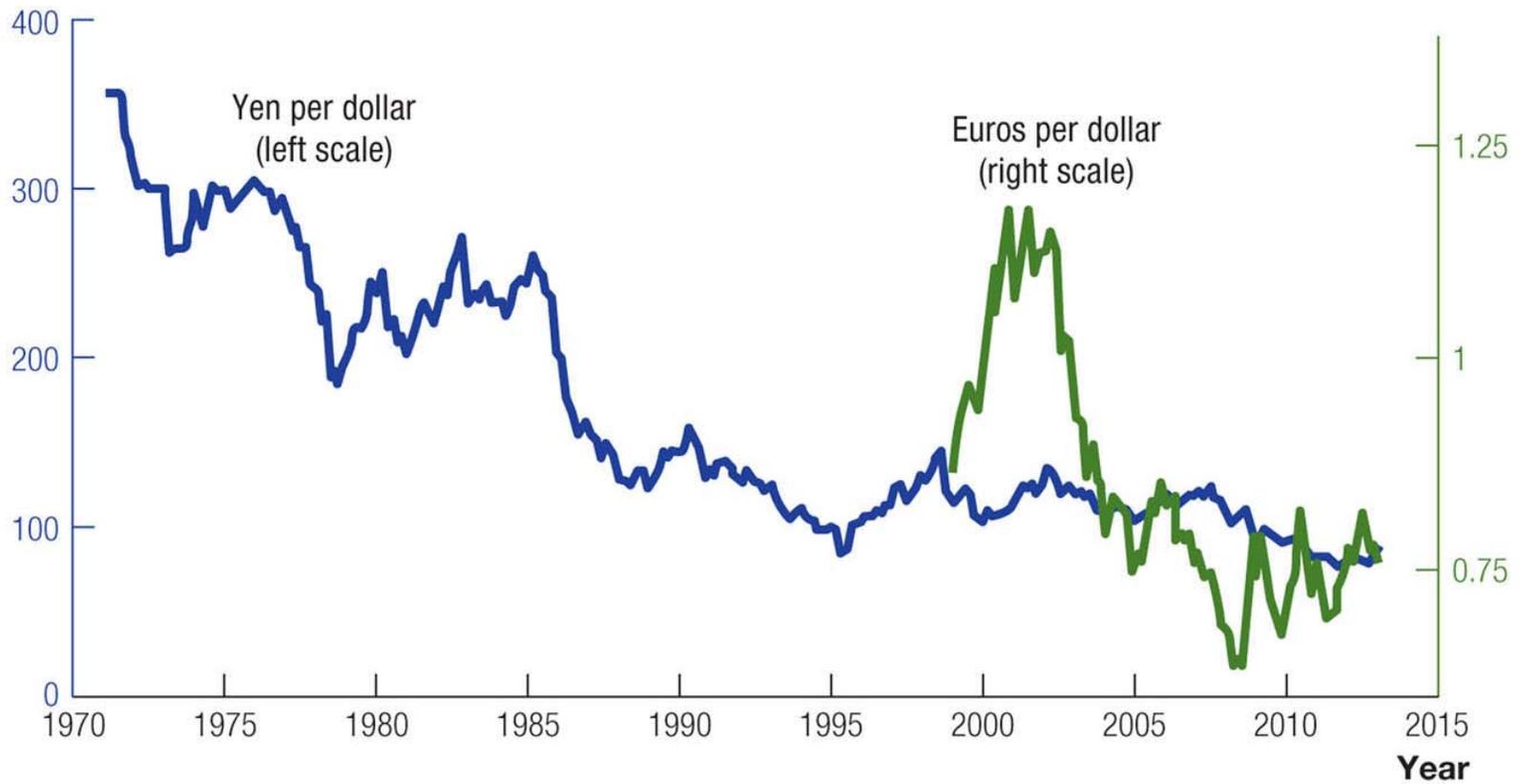
The Nominal Exchange Rate

- The nominal exchange rate:
 - Is the rate that a currency trades for another
 - Is simply the price of the dollar

- A depreciation of the dollar:
 - Decline in the price of the dollar
 - Decline in the exchange rate
- An appreciation of the dollar:
 - The dollar rises in value.
 - The exchange rate rises.

FIGURE 20.1

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



The Law of One Price

- The law of one price:
 - Says in the long run goods must sell for the same price in all countries
 - Implies that the exchange rate times the domestic price must equal the foreign price
 - If prices were different, the opportunity for arbitrage exists.

- In other words:

$$EP = P^w$$

Exchange rate

Price of goods in U.S.

World price

- Units on the exchange rate are foreign currency per domestic currency.
- Law may not hold exactly.
 - Different taxes, tariffs, and transportation costs

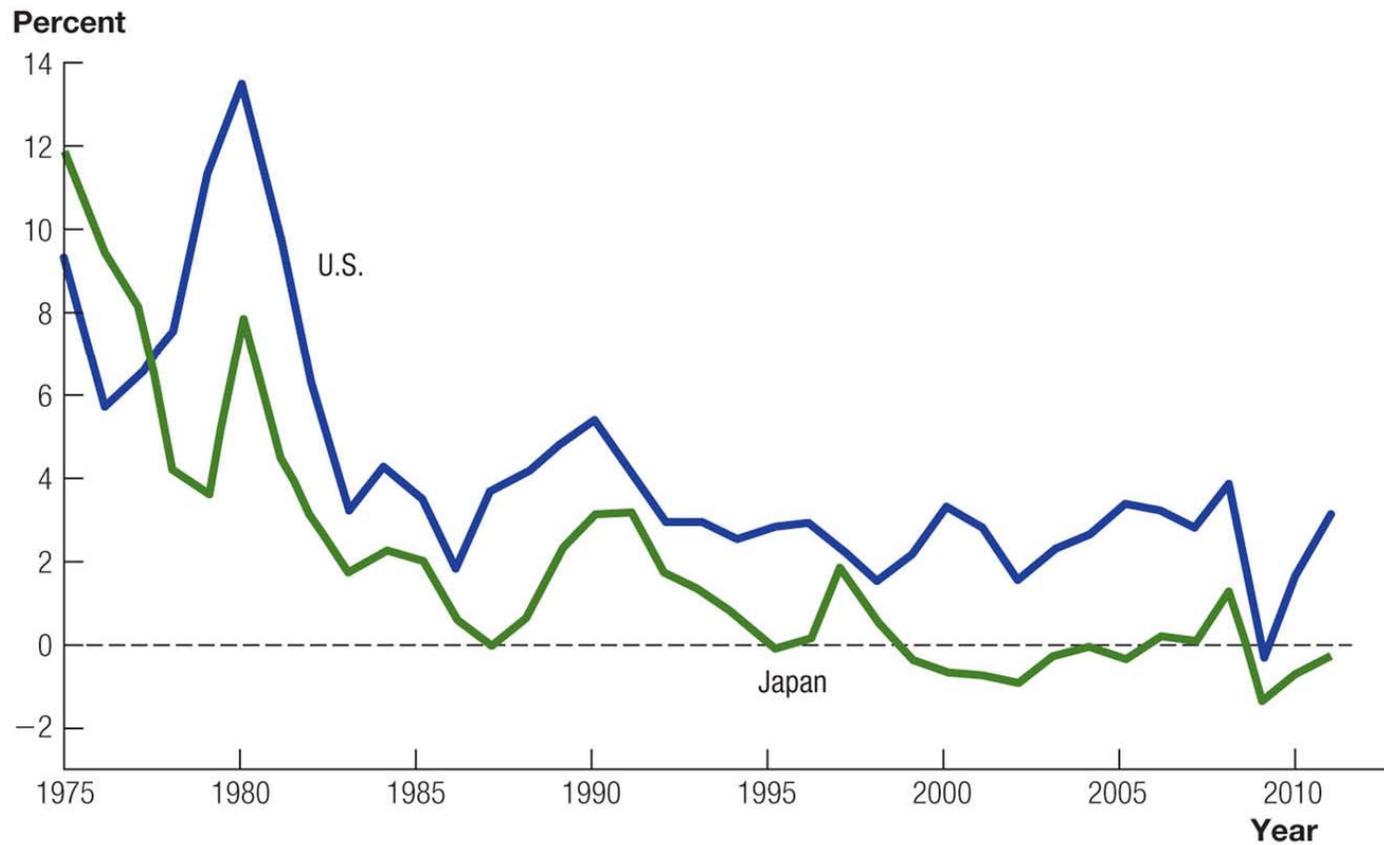
- The quantity theory of money
 - Pins down the price levels in the long run
- The law of one price
 - Pins down the exchange rate
- The nominal exchange rate:

Nominal Exchange Rate \longrightarrow $\bar{E} = \frac{\bar{P}^w}{\bar{P}}$ \longleftarrow Long run price ratio

- In the long run
 - The exchange rate is determined by the amount of money in one country relative to another.
- If the dollar depreciates
 - The price level in the foreign country must rise more slowly than in the United States
 - Inflation was higher in the domestic country than it was in the foreign country.

FIGURE 20.2

Inflation in the United States and Japan



Case Study: The Big Mac Index

- The law of one price fails to hold for Big Macs because:
 - If a currency is undervalued
 - the price will appear lower
 - While if a currency is overvalued
 - the price will appear higher
 - Real estate and labor are cheap in countries like China.
 - The law of one price applies only to goods that can easily be traded.

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)
 - Computed by adjusting the nominal exchange rate by the relative price levels

$$\text{real exchange rate} \equiv \frac{EP}{P^w}$$

- The units of the RER are foreign goods per domestic (U.S.) goods:

$$\frac{EP}{P^w} = E \frac{\text{euros}}{\text{dollar}} \times \frac{P \text{ dollars}}{\text{U.S. good}} \times \frac{1}{P^w \frac{\text{euros}}{\text{foreign good}}} = \frac{\text{foreign good}}{\text{U.S. good}}$$

- Equal to the number of foreign goods required to purchase a single unit of the same U.S. good

- The nominal exchange rate
 - Gives the price at which currencies are exchanged
- The real exchange rate
 - Is the price at which goods are exchanged
 - If the law of one price holds, the real exchange rate should equal 1.

$$R\bar{E}R = \frac{\bar{E}\bar{P}}{\bar{P}^w} = 1$$

Short Summary

- Real exchange rate
 - Pinned down by the law of one price in the long run
 - implies the long-run value of the RER is 1
- Nominal exchange rate
 - The long-run value follows from the law of one price and the quantity theory of money.
 - A key determinant is the relative supplies of different currencies.

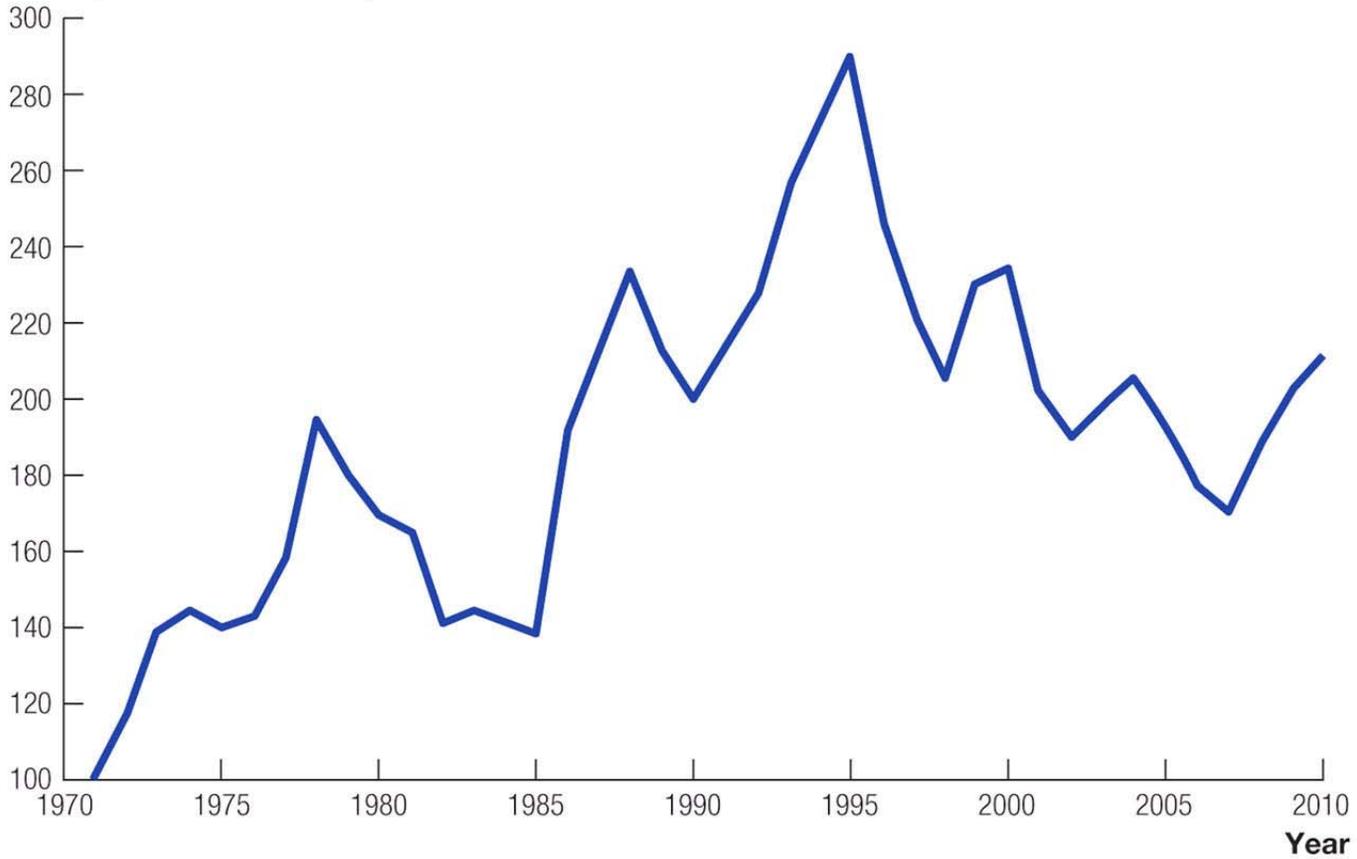
Case Study: Long-Run Trends in the Real Exchange Rate

- The nominal exchange rate for the dollar/yen depreciates by more than the differences in inflation would seem to explain, up until 1995.
- Contradiction of the law of one price?

FIGURE 20.3

The Real Exchange Rate for Japan

Index (value in 1971 = 100)



- Answer: We must consider that some goods are more easily traded than others.
 - Law of one price may not hold for nontraded goods
- Balassa-Samuelson effect
 - Low land and labor prices in poor countries lead to lower prices of nontraded goods.

20.3 Exchange Rates in the Short Run

The Nominal Exchange Rate

- Why trade currencies?
 - To facilitate international trade
 - Traders in financial markets demand currencies in order to make financial transactions.
 - The average foreign exchange traded around the world is \$4 trillion per day.

- The supply of currency
 - Given by central banks
- The demand of currency
 - Created by international and financial market transactions
- The nominal exchange rate between currencies
 - Pinned down by the trading of foreign exchange in the global market

- When the Federal Reserve increases interest rates in the United States:
 - Foreign investors are attracted to purchase U.S. bonds.
 - Foreign traders need dollars to make these purchases.
 - Demand for dollars increases.
 - The exchange rate then appreciates.
 - The value of the dollar increases.

- Movements in the domestic nominal interest rate (holding the world interest rate constant) cause the nominal exchange rate to move in the same direction:

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

The Real Exchange Rate

- The nominal exchange rate (E)
 - Changes by the minute
- Sticky inflation implies that prices (P and P^W)
 - Adjust slowly over time
- Thus, in the short run
 - The real exchange rate can deviate from 1.
 - The law of one price need not hold.
- Arbitrage is not likely to occur with daily fluctuations.
 - Transportation costs are not zero.

- The assumption of sticky inflation means that unanticipated movements in the nominal exchange rate translate into movements in the real exchange rate in the short run:

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

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

20.4 Fixed Exchange Rates

- Fixed exchange rates
 - Systems where the exchange rate for one currency is pegged to a particular level for some period
- To fix an exchange rate
 - The money supply must change by the same amount as the money supply in the country to which the currency is fixed.

- If Argentina fixes its exchange rate to the dollar
 - The central bank in Argentina will follow the monetary policy dictated by the United States to maintain a fixed exchange rate.

$$E \frac{\text{pesos}}{\text{dollar}} =$$

- Why fix exchange rates?
 - In an attempt to “import” a disciplined monetary policy to overcome previous inflation problems
 - However, hyperinflations are usually caused by *fiscal* problems.

20.5 The Open Economy in the Short-Run Model

- Originally
 - The IS curve was derived assuming the trade balance was a constant fraction of potential output.
- Now
 - Movements in the real exchange rate can influence trade.

- If the RER is high and goods at home are expensive relative to goods abroad, then
 - Exports are likely to be low
 - Imports high
- Consumers buy goods from where they are cheapest.
 - Will purchase foreign goods

- Increases in the nominal interest rate in the United States will result in:
 - An increase in the real interest rate
 - an increase in the exchange rate
- Then, due to sticky inflation the real exchange rate rises.
 - Exports decline
 - Imports increase
 - Net exports fall

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

The New IS Curve

- We can rewrite the net exports equation to include the MPK.

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

MPK

The diagram shows the text 'MPK' centered above the equation. Two arrows originate from 'MPK': one points to the term $(R_t - \bar{r})$ and the other points to the term $(\bar{R}^w - \bar{r})$ in the equation.

- The MPK terms cancel out.
- The advantage of writing it below is that it now depends on $R_t - \bar{r}$, just as investment does.

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

- The national income identity can be written as:

$$S = I + NX.$$

- Domestic saving S can be used for domestic investment or invested abroad.

- 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:

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

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

- The aggregate demand parameter \bar{a}
 - Now involves a term depending upon the gap between the foreign real interest rate and the world MPK.
 - Still = 0 in the long run
- Changes in the real interest rate in the rest of the world now cause an aggregate demand shock.
- The math for the IS Curve (and AS/AD Framework) remains unchanged.

Event #1: Tightening Domestic Monetary Policy and the IS Curve

- What happens when the central bank raises nominal interest rates to tighten monetary policy?

- Sticky inflation causes the real interest rate to rise.
- Since the real interest rate exceeds the MPK
 - Firms reduce demand for investment, lowering short run output.

- The increase in the nominal interest rate also results in an increase in the demand for dollar-denominated financial assets:
 - This causes the real exchange rate to appreciate.
 - U.S. goods are now more expensive relative to foreign goods.
 - Net exports decline.
 - Short-run output falls even farther.

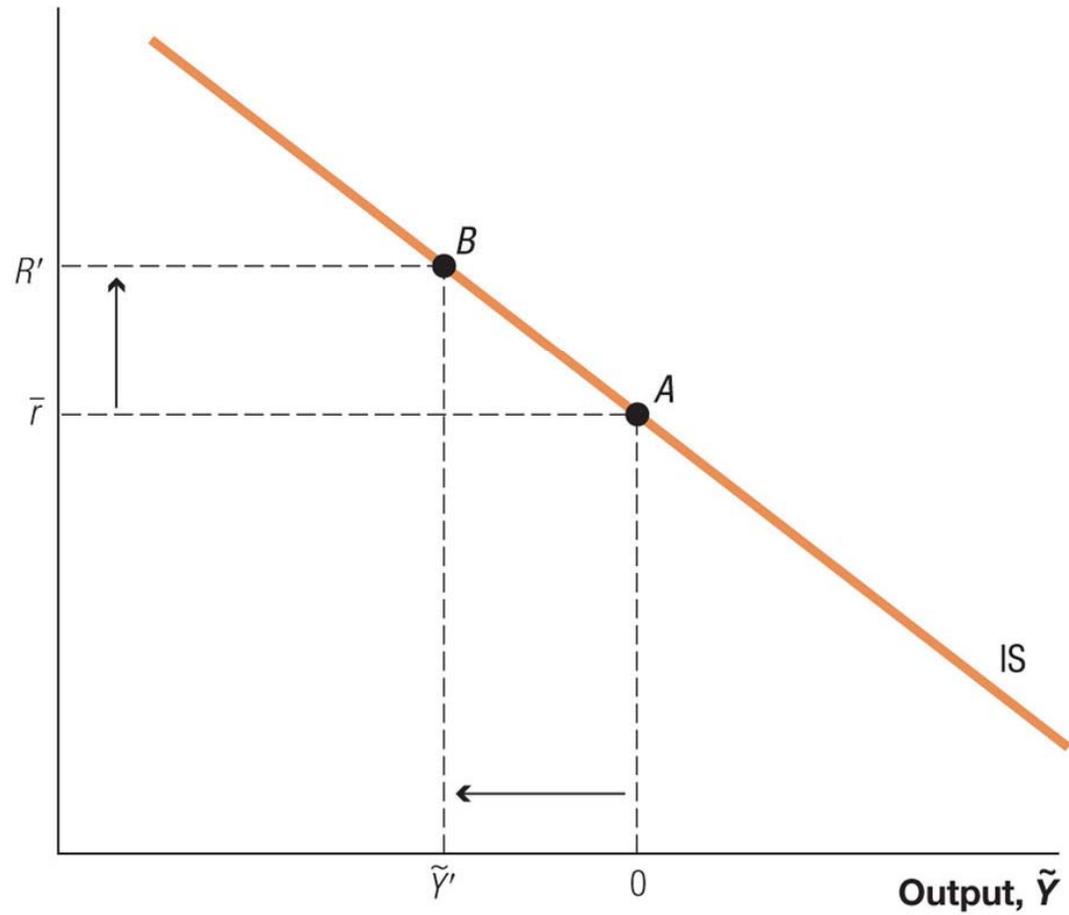
- The IS curve

- Now has an additional mechanism by which changes in the interest rate will influence short-run output.
- Is flatter in this new enriched model.

FIGURE 20.4

Increasing Interest Rates and the IS Curve

Real interest rate, R



Event #2: A Change in Foreign Interest Rates

- What is the effect on the United States if the European Central Bank raises interest rates in the euro area?
- Recall the net exports equation of the short run model:

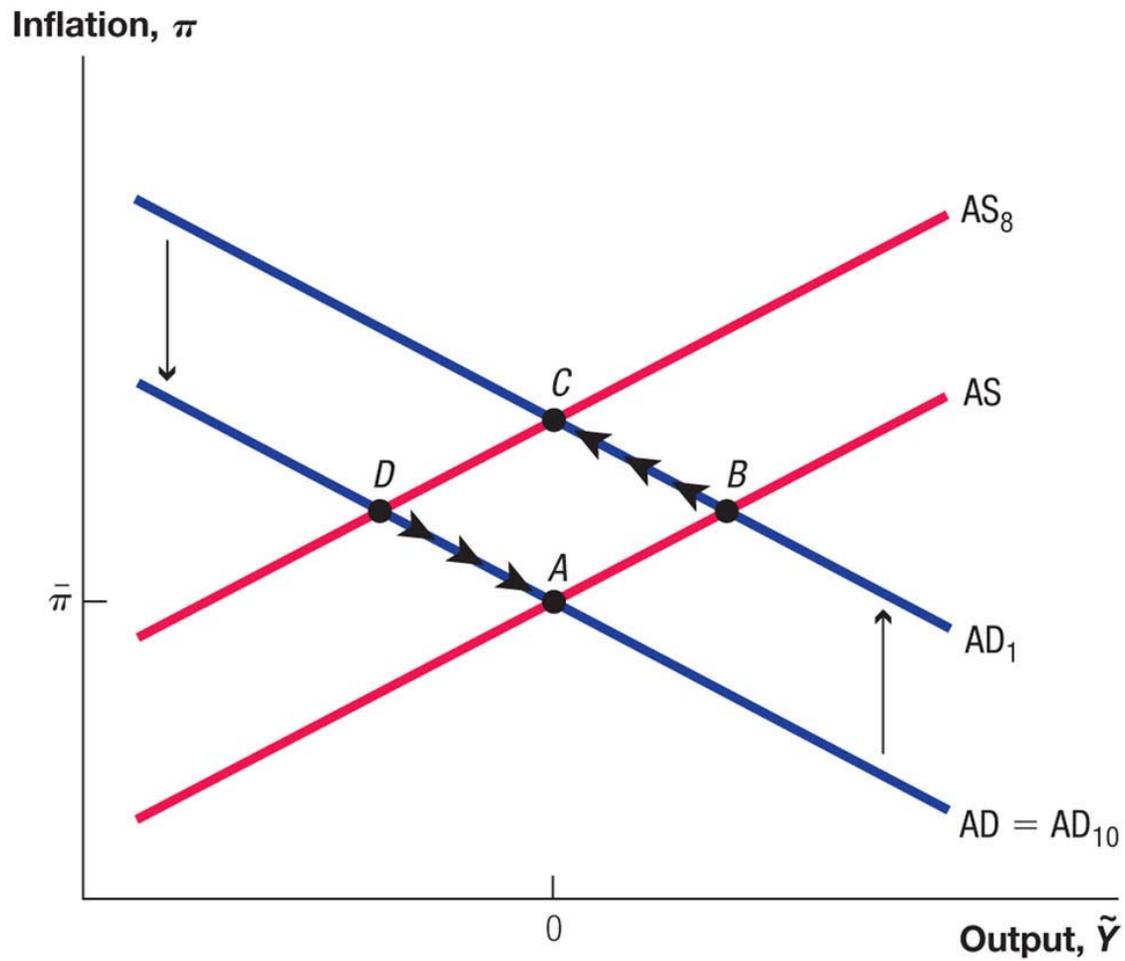
$$\frac{NX_t}{\bar{Y}_t} = \bar{a}_{nx} - \bar{b}_{nx}(R_t - \bar{r}) + \bar{b}_{nx}(\bar{R}^w - \bar{r})$$

- Investors will demand more euros and fewer dollars.
 - The euro will appreciate.
 - The dollar will depreciate.
 - The RER in the United States will depreciate.
 - As the price of U.S. goods declines, net exports will increase.
 - The IS curve shifts out as the aggregate demand parameter is shocked.

- 
- 
- The international transmission of monetary policy
 - Changes in interest rates in one region of the world have effects in other regions.

FIGURE 20.5

An Increase in Foreign Interest Rates



- The increase in the real interest rate works through the exchange rate.
 - U.S. economy is stimulated.
 - Europe: tight monetary policy may induce a recession.
 - Which may have a negative impact on U.S. net exports
 - If so, the effect of interest rate changes abroad is uncertain.

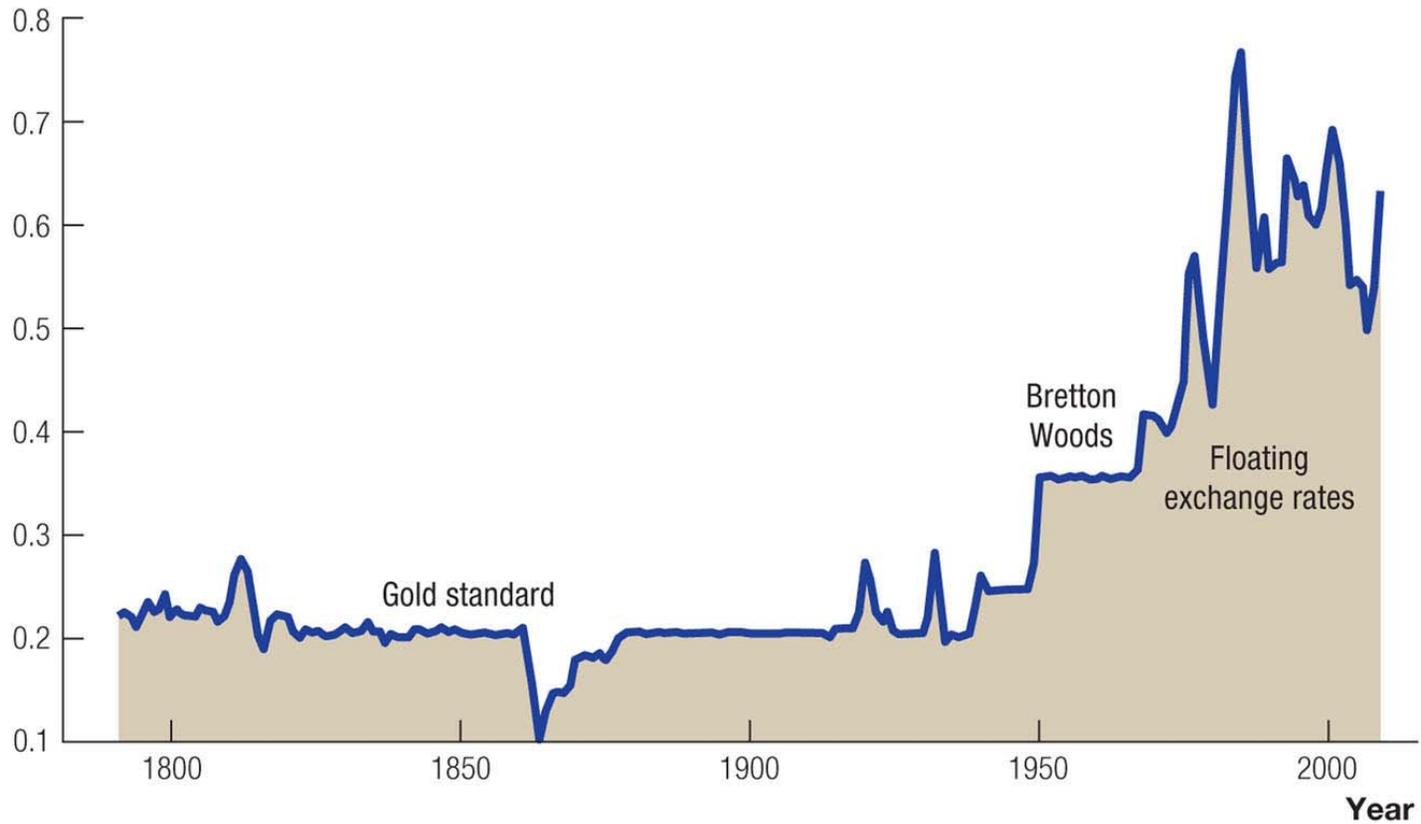
20.6 Exchange Rate Regimes

- Exchange rate regimes
 - The institutions that set exchange rates around the world
- The three main phases
 - The era of the gold standard
 - The era of the Bretton Woods system
 - The modern era of floating exchange rates where exchange rates are allowed to move flexibly

FIGURE 20.6

The U.K.–U.S. Exchange Rate

Pounds per dollar



- The gold standard
 - Countries specified a fixed price in which they were willing to trade their currency for gold.
- The Bretton Woods system
 - The United States pegged the dollar to a specified price of gold.
 - Other countries pegged their currencies to the dollar.

- Floating exchange rates
 - Monetary policies are not coordinated.
 - Supply and demand for foreign exchange determine the value of the nominal exchange rate.

Case Study: Does the Exchange Rate Matter in the Long Run?

- The nominal exchange rate is unimportant in the long run.

Case Study: Does the Exchange Rate Matter in the Long Run?

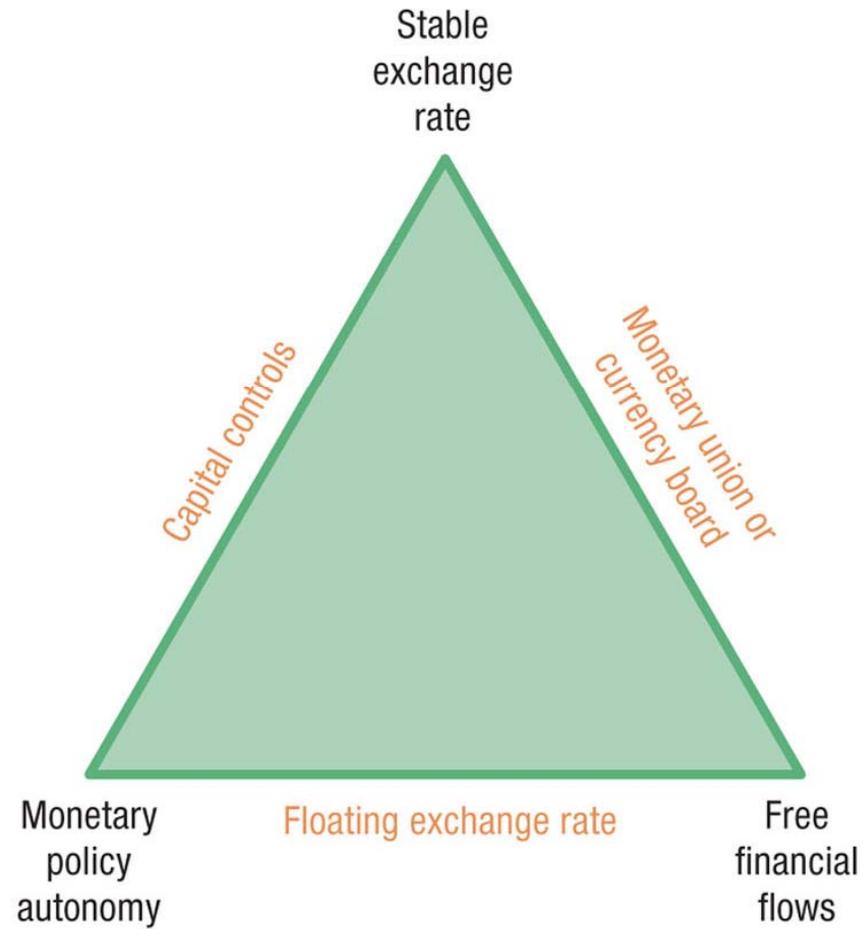
- There is a positive correlation between the value of the exchange rate and the overall performance of the economy.
 - This does not imply *causation*.
 - A strong economy is associated with low inflation and appreciation of the exchange rate.
 - It's likely that good macroeconomic performance leads to strong currencies, and not the other way around.

20.7 The Policy Trilemma

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

FIGURE 20.7

The Policy Trilemma in Open Economies



- 
- 
- Stable exchange rates
 - Make it easier for individuals and businesses to plan over time
 - Large changes in exchange rates
 - Have costs similar to changes in inflation

- The ability of a country to set its own monetary policy is desirable.
 - Countries can smooth shocks to the economy.
- Free flows of international finance
 - Allow resources to be allocated most efficiently

- The United States cannot guarantee a stable exchange rate:
 - United States is on the bottom of the triangle
 - the exchange rate depends on monetary policy in the United States as well as in other countries
- If a country gives up monetary policy autonomy:
 - the exchange rate is fixed
 - the central bank must hold a supply of dollars

- Foreign exchange reserves
 - The reserves of dollars or gold such that the domestic currency is fully backed by the foreign exchange
 - A currency crisis can result when a central bank does not have enough foreign exchange reserves to defend its peg.
 - Example of a country on the right side of the triangle: Argentina (1991–2001)

- A country that gives up free financial flows
 - Maintains control of monetary policy
 - Keeps the exchange rate stable
- Capital controls
 - The restrictions on financial flows and on trading of the currency in order to maintain a fixed price
 - China (1996–2005) was on the left side of the triangle

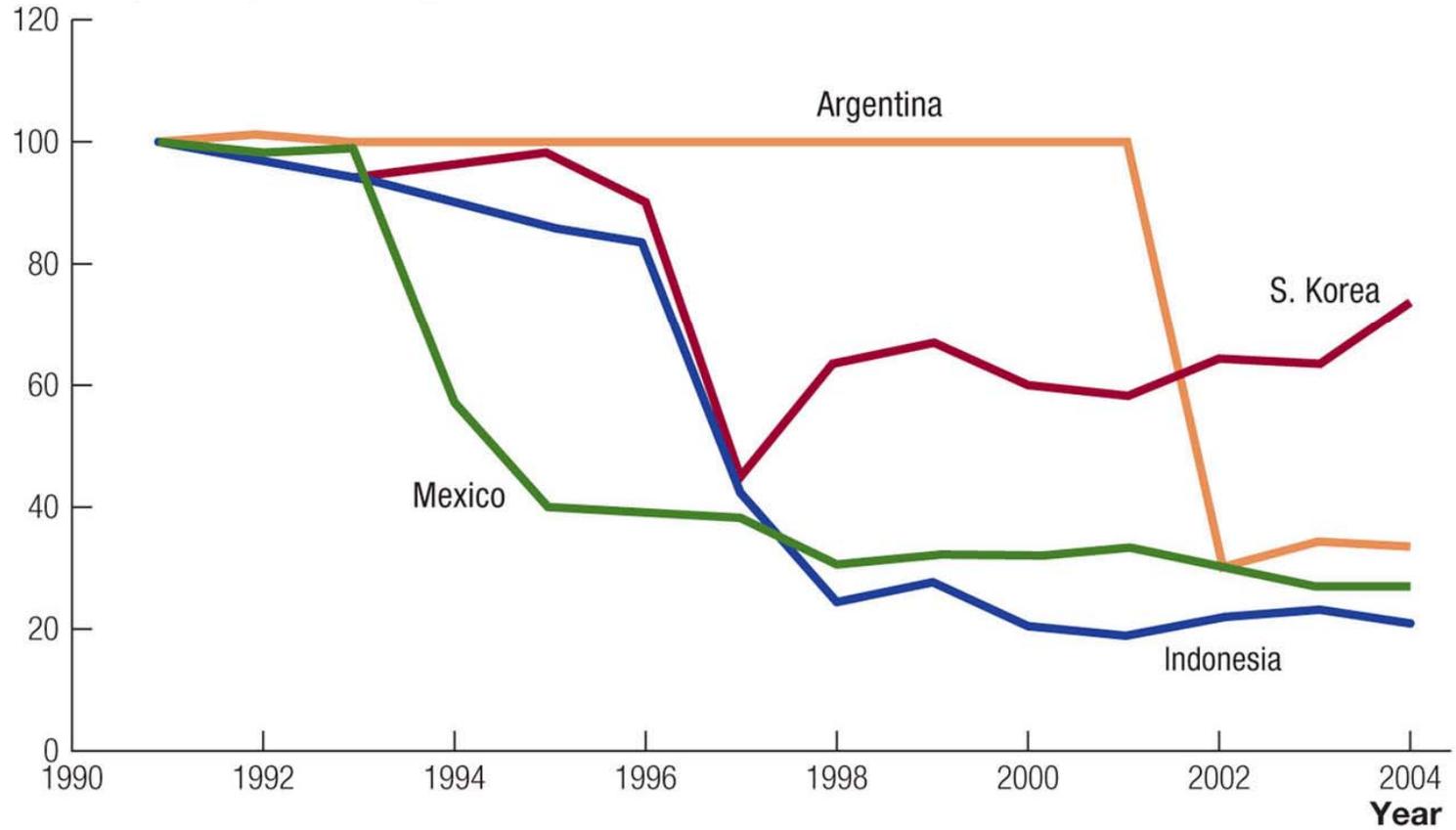
Which Side of the Triangle to Choose?

- The costs and benefits of giving up a particular goal may differ across countries and time.

FIGURE 20.8

Depreciations during Several Currency Crises, 1991–2004

Exchange rate (1991 = 100)



- The Mexican peso crisis of 1994
 - Mexico had large capital flows and a stable exchange rate, resulting in economic growth until 1994.
 - Political turmoil and foreign borrowing led to fears of devaluation
 - The Mexican central bank tried to maintain the exchange rate.
 - reserves fell very low
 - the government was forced to devalue and float the peso against the dollar.

- The Asian currency crisis of 1997
 - During the 1990s, Asian economies turned to foreign savings to finance part of their booming economic growth.
 - Currency speculation led to declines in exchange rates.
 - loans denominated in dollars were more costly to repay.
 - The result was large recessions in Asia.

- End of Argentina's currency board in 2001:
 - Argentina created a currency board that was successful in overcoming hyperinflations.
 - Brazil's currency value declined
 - negative shock to aggregate demand via net exports in Argentina.
 - Lenders worried about the ability of the country to repay its debt
 - interest rates rose substantially
 - government defaulted on its debt.
 - Argentina devalued and allowed the peso to float.

Case Study: Hedge Funds, Financial Flows, and Financial Crises

- Hedge funds
 - Private investment funds that can accept money only from wealthy, accredited investors
 - Are free to undertake risky investments with little regulation.
 - Speculate using large sums of money
 - They can often start to trigger a financial crisis or a devaluation.

The Future of Exchange Rate Regimes

- Stable exchange rates and free international capital markets can be difficult to maintain together.
- Difficulty arises if there are
 - Problems with the government budget constraint
 - Diverse trading partners
- Economists tend to favor free flows of capital.
 - Some reason against this if currency speculators can create a currency crisis.

Case Study: The Euro

- Single currency advantages
 - Avoiding risks in exchange rate fluctuations
 - Transaction costs of trade in the currency region are reduced.
 - A single central bank can create credibility.
- Single currency disadvantages
 - Countries losing control of monetary policy
 - Reducing the ability to target particular regions that might be slumping.

20.8 The Euro Crisis

- The global financial crisis entered a new phase when it reached the European sovereign debt market.
- Sovereign debt
 - If a government defaults on a debt, there is no legal recourse
 - The euro intimately linked the economies of the euro area countries.

FIGURE 20.9

Government Bond Yields in Europe

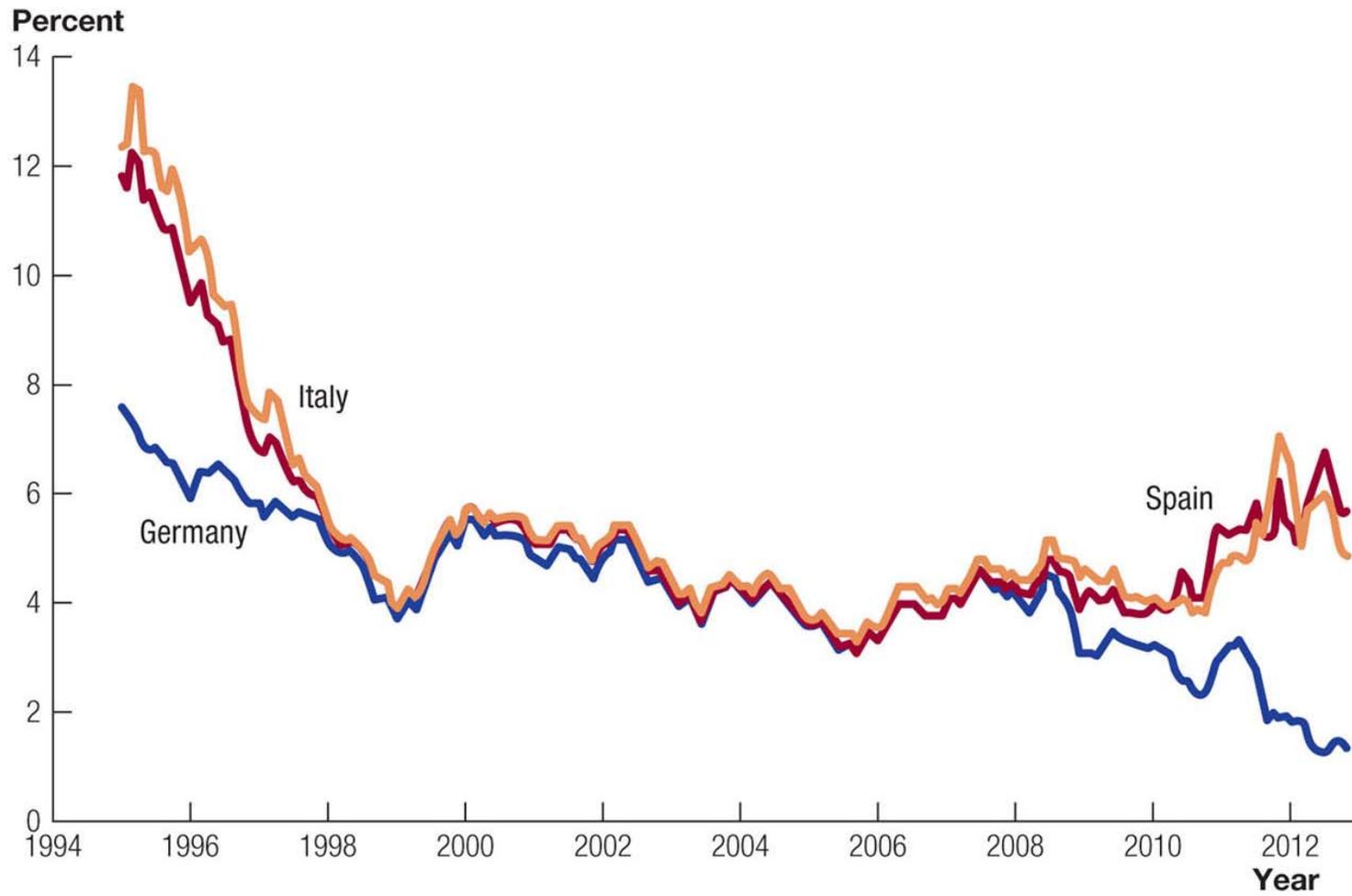


FIGURE 20.10

Domestic Bank Lending in Europe

Percentage
of GDP

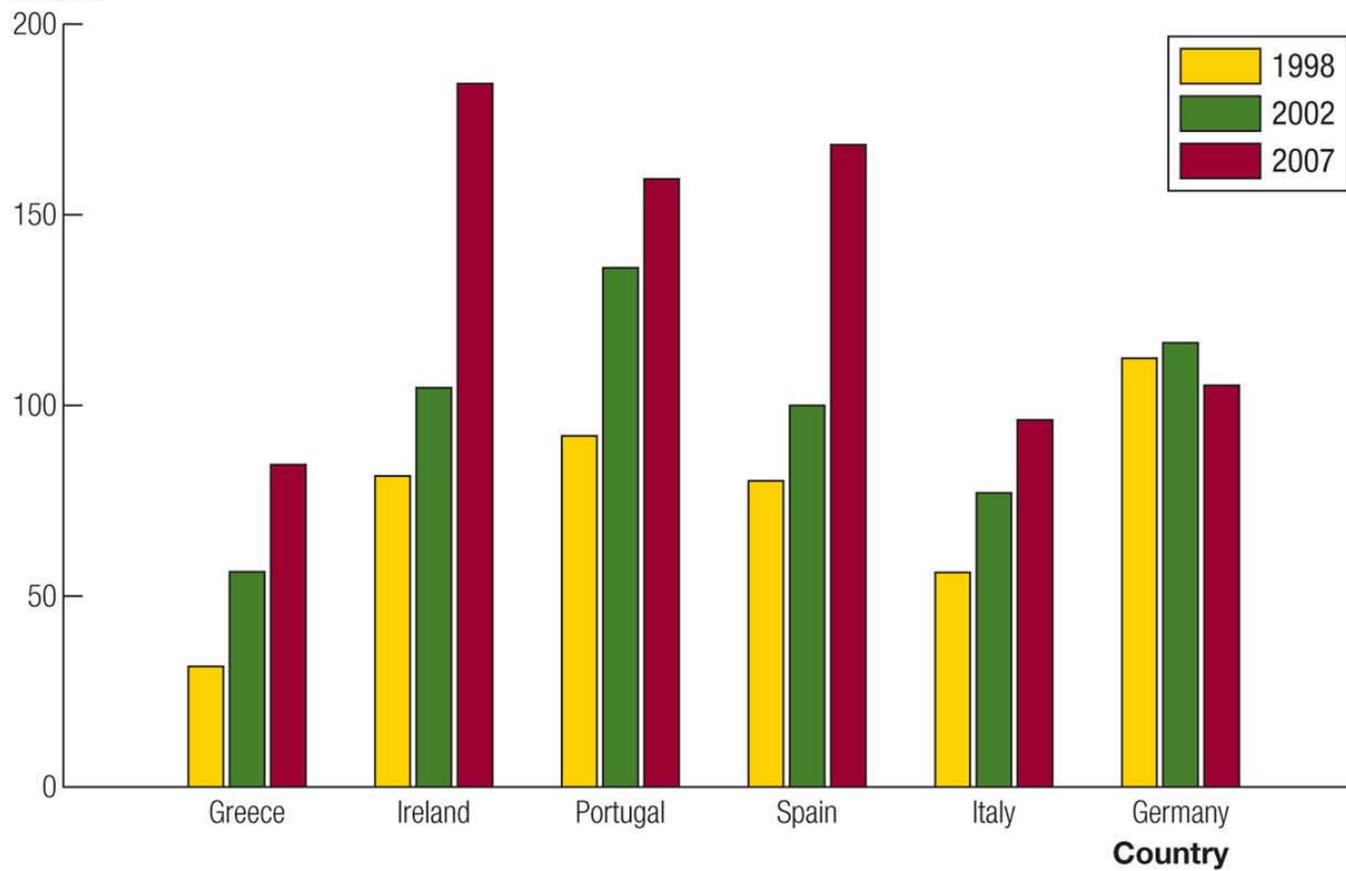
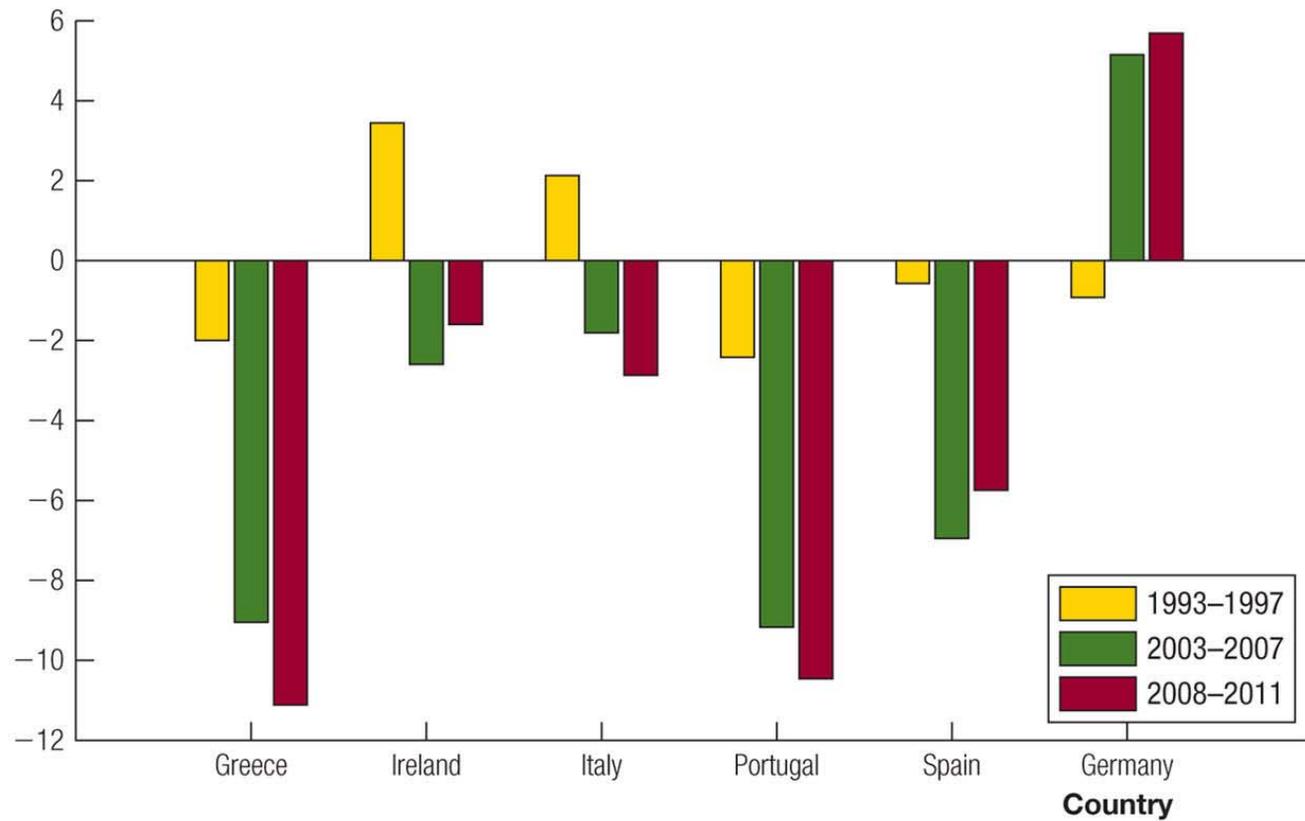


FIGURE 20.11

Current Account Balances in Europe

Percentage of GDP

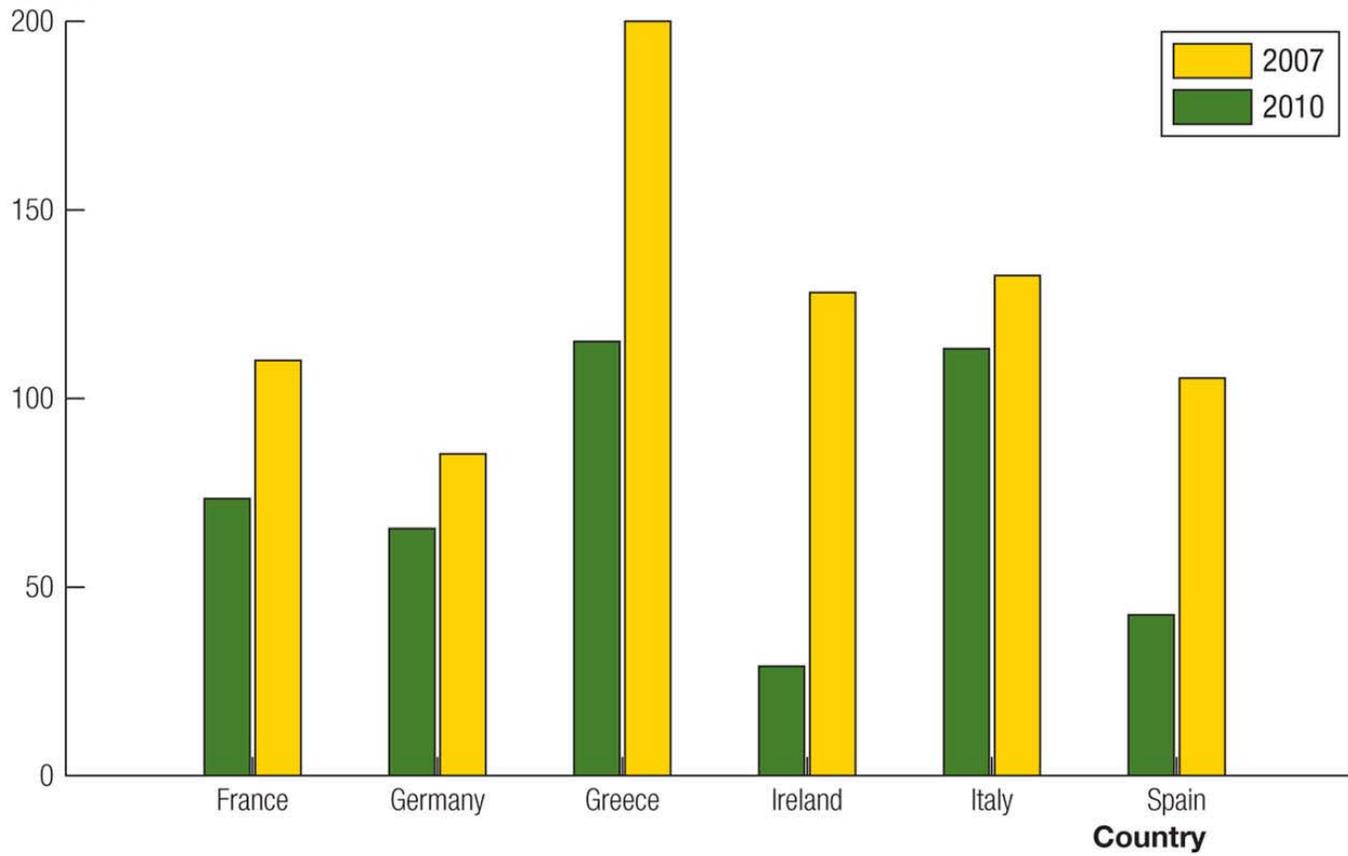


- 
- 
- Lending based on excessive optimism
 - Availability of easy credit created a property boom and housing bubble
 - When the bubble burst the European banking system came under intense pressure

FIGURE 20.12

Government Debt in Europe

Percentage
of GDP



- The euro crisis has two main dimensions
 - The immediate crisis
 - investor fear of sovereign debt and default
 - the break-up of the euro
 - crisis mentality
 - Lack of competitiveness
 - “hangover” from the rise in wages in the 2000s

The Immediate Crisis

- Crisis mentality
 - Investors lose confidence
 - Demand higher interest rates to cover risk of default
 - High interest rate more difficult to pay if the debt-GDP ratio is high
 - Default caused by the belief that a country can't repay debt

- Commitment to the euro
 - Financial crises in Asia and Argentina
 - Currency depreciation made some debts easier to pay
 - Euro area countries don't have individual currencies, thus no option for devaluing currency
- European Central Bank (ECB)
 - Attempt to manage crisis mentality
 - New programs to facilitate purchases of government bonds

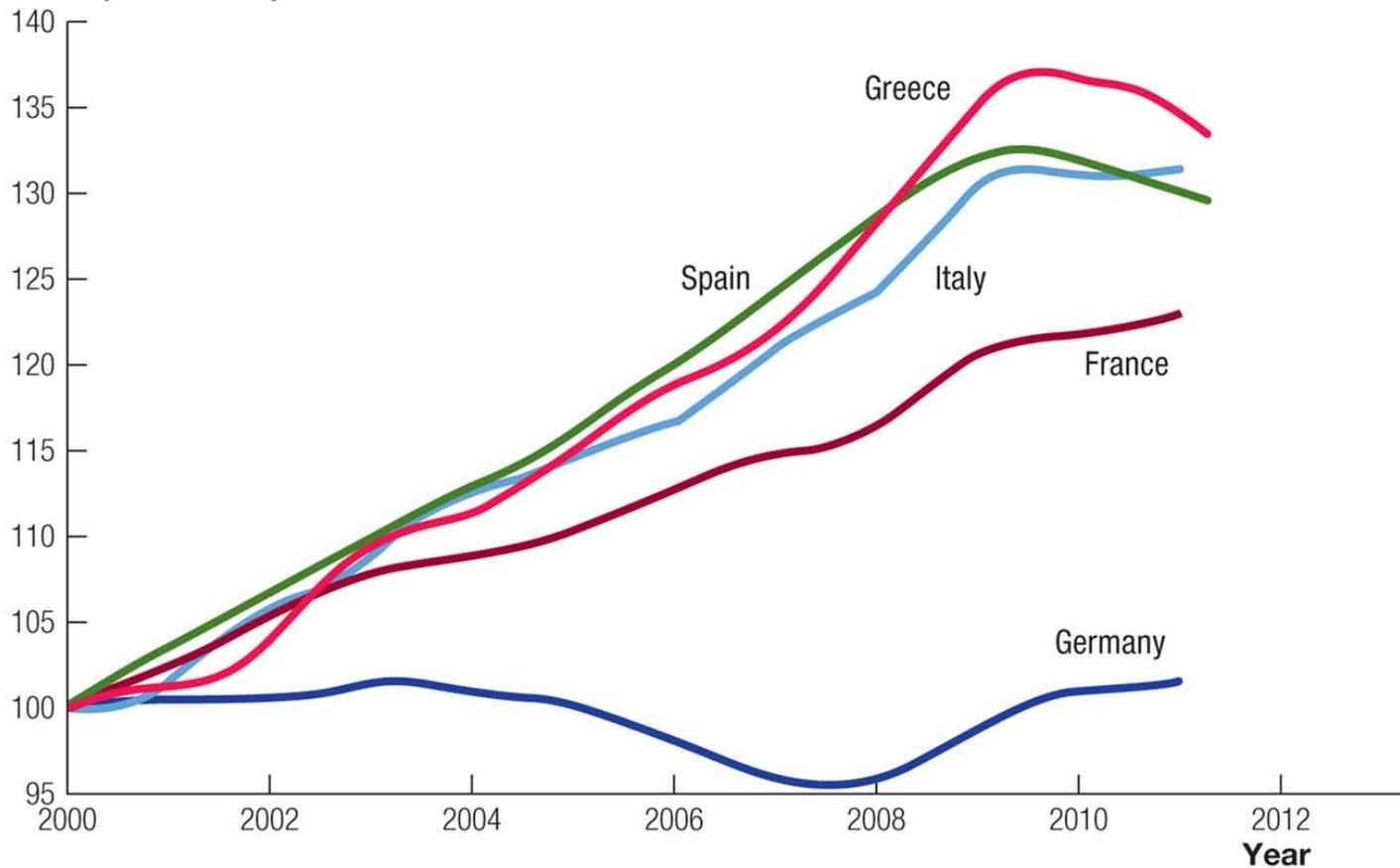
Long-Term Competitiveness

- Disparate unit labor costs between euro area countries.
 - These countries do not have the tool of currency depreciation at their disposal
- Competitiveness must be restored by the slow processes of wage adjustment and productivity growth

FIGURE 20.13

Unit Labor Costs in Europe

Index (2000 = 100)



Summary

- The nominal exchange rate
 - The price of the domestic currency in units of foreign currency
- The real exchange rate
 - The price of domestic goods in units of foreign goods

- In the long run, the value of the real exchange rate is pinned down by the law of one price: $EP = P^w$.
- The real exchange rate is just the ratio of prices at home and abroad, EP / P^w .
- The value of the real exchange rate is equal to 1 in the long run.
 - Goods have to sell for the same price.
 - Frictions in the real world, however, prevent this law from holding exactly.

- The nominal exchange rate is pinned down by the domestic and foreign price levels.
 - These in turn come from the quantity theory of money.
- Quantity theory of the nominal exchange rate
 - In the long run, the nominal exchange rate is pinned down by the relative supplies of different currencies.

- Sticky inflation
 - The law of one price can fail to hold in the short run.
 - Movements in the nominal exchange rate E translate to movements in the real exchange rate EP / P^w in the short run.
- Interest rates and exchange rates move together.

- A tightening of monetary policy raises the short-term nominal interest rate.
 - High interest rates attract financial investors.
 - increasing the demand for dollars
 - causing the exchange rate to appreciate

- Real exchange rate
 - The price of domestic goods (in units of foreign goods)
 - A key determinant of imports and exports is the real exchange rate.
- If domestic goods become more expensive
 - If the real exchange rate goes up
 - exports will fall.
 - imports will rise.
- Net exports are a decreasing function of
 - The real exchange rate
 - The real interest rate

- The short-run model incorporating exchange rates works just like the short-run model analyzed in Chapters 9–12.
 - Net exports behave much like investment.
 - lending abroad is another way to defer consumption to the future.
 - The experiments we can consider in the model that incorporates net exports are richer.
 - Quantitatively, the inclusion of exchange rates makes the economy more sensitive to interest rate changes.

- The international financial system, has been based on three different regimes in the last 150 years:
 - The gold standard
 - The Bretton Woods system
 - The current system of floating exchange rates
- The policy trilemma
 - Open economies can achieve at most two of the following three goals:
 - stable exchange rates
 - monetary policy autonomy
 - free flows of international finance

This concludes the Lecture
Slide Set for Chapter 20

Macroeconomics

Third Edition

by
Charles I. Jones

W. W. Norton & Company
Independent Publishers Since 1923