

Chapter 17



Fixed Exchange Rates and Foreign Exchange Intervention

Chapter 17 Learning Goals



- How a central bank must manage monetary policy so as to fix its currency's value in the foreign exchange market.
- The relationship between the central bank's foreign exchange reserves, its purchases and sales in the foreign exchange market, and the money supply.
- How monetary, fiscal, and sterilized intervention policies affect the economy under a fixed exchange rate.
- Some causes and effects of balance of payments crises.
- How alternative multilateral systems for pegging exchange rates work.

Chapter Organization



- Why Study Fixed Exchange Rates?
- Central Bank Intervention and the Money Supply
- How the Central Bank Fixes the Exchange Rates
- Stabilization Policies with a Fixed Exchange Rate
- Balance of Payments Crises and Capital Flight
- Managed Floating and Sterilized Intervention
- Reserve Currencies in the World Monetary System
- The Gold Standard
- Liquidity Traps

Chapter Organization



- Summary
- Appendix I: Equilibrium in the Foreign Exchange Market with Imperfect Asset Substitutability
- Appendix III: The Timing of Balance of Payments Crises

Introduction



- In reality, the assumption of complete exchange rate flexibility is rarely accurate.
 - Industrialized countries operate under a hybrid system of **managed floating exchange rates**.
 - A system in which governments attempt to moderate exchange rate movements without keeping exchange rates rigidly fixed.
 - A number of developing countries have retained some form of government exchange rate fixing.
- How do central banks intervene in the foreign exchange market?

Why Study Fixed Exchange Rates?



- Four reasons to study fixed exchange rates:
 - Managed floating
 - Regional currency arrangements
 - Developing countries and countries in transition
 - Lessons of the past for the future



Why Study Fixed Exchange Rates?

Table 17-1: Exchange Rate Arrangements (As of March 31, 2001)

Exchange Rate Regime (Number of countries)	Monetary Policy Framework				
	Exchange rate anchor	Monetary aggregate target	Inflation targeting framework	Fund-supported or other monetary program	Other
Exchange arrangements with no separate legal tender (39)	<p>Another currency as legal tender</p> <p>ECCU²</p> <p>Ecuador* Kiribati Marshall Islands Rep. of Micronesia, Fed. States of Palau Panama San Marino</p> <p>CFA Franc Zone</p> <p>WAEMU</p> <p>Benin* Burkina Faso* Côte d'Ivoire* Guinea-Bissau* Mali* Niger* Senegal* Togo</p> <p>CAEMC</p> <p>Cameroon* C. African Rep.* Chad* Congo, Rep. of* Equatorial Guinea Gabon*</p>			<p>Benin* Burkina Faso* Cameroon* Central African Rep.* Chad* Congo, Rep. of* Côte d'Ivoire* Ecuador* Gabon* Guinea-Bissau* Mali* Niger* Senegal*</p>	<p>Euro Area^{3,4}</p> <p>Austria Belgium Finland France Germany Greece Ireland Italy Luxembourg Netherlands Portugal Spain</p>



Why Study Fixed Exchange Rates?

Table 17-1: Continued

Exchange Rate Regime (Number of countries)	Monetary Policy Framework				
Currency board arrangements (8)	Argentina* Bosnia and Herzegovina* Brunei Darussalam Bulgaria* China, P.R. Hong Kong Djibouti* Estonia* Lithuania*			Argentina* Bosnia and Herzegovina* Bulgaria* Djibouti* Estonia* Lithuania*	



Why Study Fixed Exchange Rates?

Table 17-1: Continued

Exchange Rate Regime (Number of countries)	Monetary Policy Framework				
Other conventional fixed peg arrangements (including de facto peg arrangements under managed floating) (44)	Against a single currency (31)		China, P.R.; Mainland**6		Jordan**6 Latvia* Lesotho* Macedonia, FYR**6 Trinidad & Tobago**6
	Aruba Bahamas, The ⁵ Bahrain ^{6,7} Barbados Belize Bhutan Cape Verde China, P.R. Mainland**6 Comoros ⁸ Congo, Dem. Rep. of El Salvador ¹³ Eritrea Iran ^{3,6} Iraq Jordan**6 Lebanon ⁶	Lesotho* Macedonia, FYR**6 Malaysia Maldives ⁶ Namibia Nepal Netherlands Antilles Oman Qatar ^{6,7} Saudi Arabia ^{6,7} Swaziland Syrian Arab Republic ⁵ Trinidad & Tobago**6 Turkmenistan ⁶ United Arab Emirates ^{6,7}			
	Against a composite (13)				
	Bangladesh Botswana ³ Fiji Kuwait Latvia* Malta Morocco	Myanmar ⁵ Samoa Seychelles Solomon Islands Tonga Vanuatu			

**ECCU: Eastern Caribbean Currency Union; WAEMU: West African Economic and Monetary Union; CAEMC: Central African Economic and Monetary Community



Why Study Fixed Exchange Rates?

Table 17-1: Continued

Exchange Rate Regime (Number of countries)	Monetary Policy Framework				
	Exchange rate anchor	Monetary aggregate target	Inflation targeting framework	Fund-supported or other monetary program	Other
Pegged exchange rates within horizontal bands (6) ⁹	Within a cooperative arrangement ERM II (1) Denmark	Other band arrangements (5) Cyprus Egypt ⁵ Libyan A.J. Suriname ⁵ Vietnam ⁶			
Crawling pegs (4) ⁶	Bolivia* Costa Rica Nicaragua* Zimbabwe*			Bolivia* Nicaragua* Zimbabwe*	
Exchange rates within crawling bands (5) ^{6, 10}	Israel* Honduras* Hungary Uruguay* Venezuela, Rep. Bolivariana		Israel*	Honduras* Uruguay*	



Why Study Fixed Exchange Rates?

Table 17-1: Continued

Exchange Rate Regime (Number of countries)	Monetary Policy Framework				
Managed floating with no preannounced path for exchange rate (33)		Jamaica* ⁶ Slovenia Tunisia	Czech Republic Norway	Cambodia ⁵ Croatia Ethiopia Jamaica* ⁶ Kazakhstan Kenya Kyrgyz Republic Mauritania Nigeria Pakistan Romania Russian Federation Rwanda Sri Lanka Sudan Ukraine Yugoslavia, Fed. Rep. of	Algeria ³ Azerbaijan Belarus ^{3,5} Burundi ³ Dominican Rep. ^{3,5} Guatemala ³ India ³ Lao PDR ^{3,5} Paraguay ³ Singapore Slovak Republic ³ Uzbekistan ^{3,5}



Why Study Fixed Exchange Rates?

Table 17-1: Continued

Exchange Rate Regime (Number of countries)	Monetary Policy Framework				
Independently floating (47)		Gambia, The* Ghana* Guinea* Guyana* Mauritius ⁶ Malawi* Mexico Mongolia* Peru* Philippines* São Tomé and Príncipe* Sierra Leone* Turkey* Yemen*	Australia Brazil ¹² Canada Chile ⁵ Colombia* Iceland Korea New Zealand Poland South Africa Sweden Thailand* United Kingdom	Albania Angola Armenia Colombia* Gambia, The* Georgia Ghana* Guinea* Guyana* Haiti Indonesia Madagascar Malawi* Moldova Mongolia*	Afghanistan ^{5, 11} Japan ³ Liberia ³ Somalia ^{5, 11} Switzerland ³ United States ³

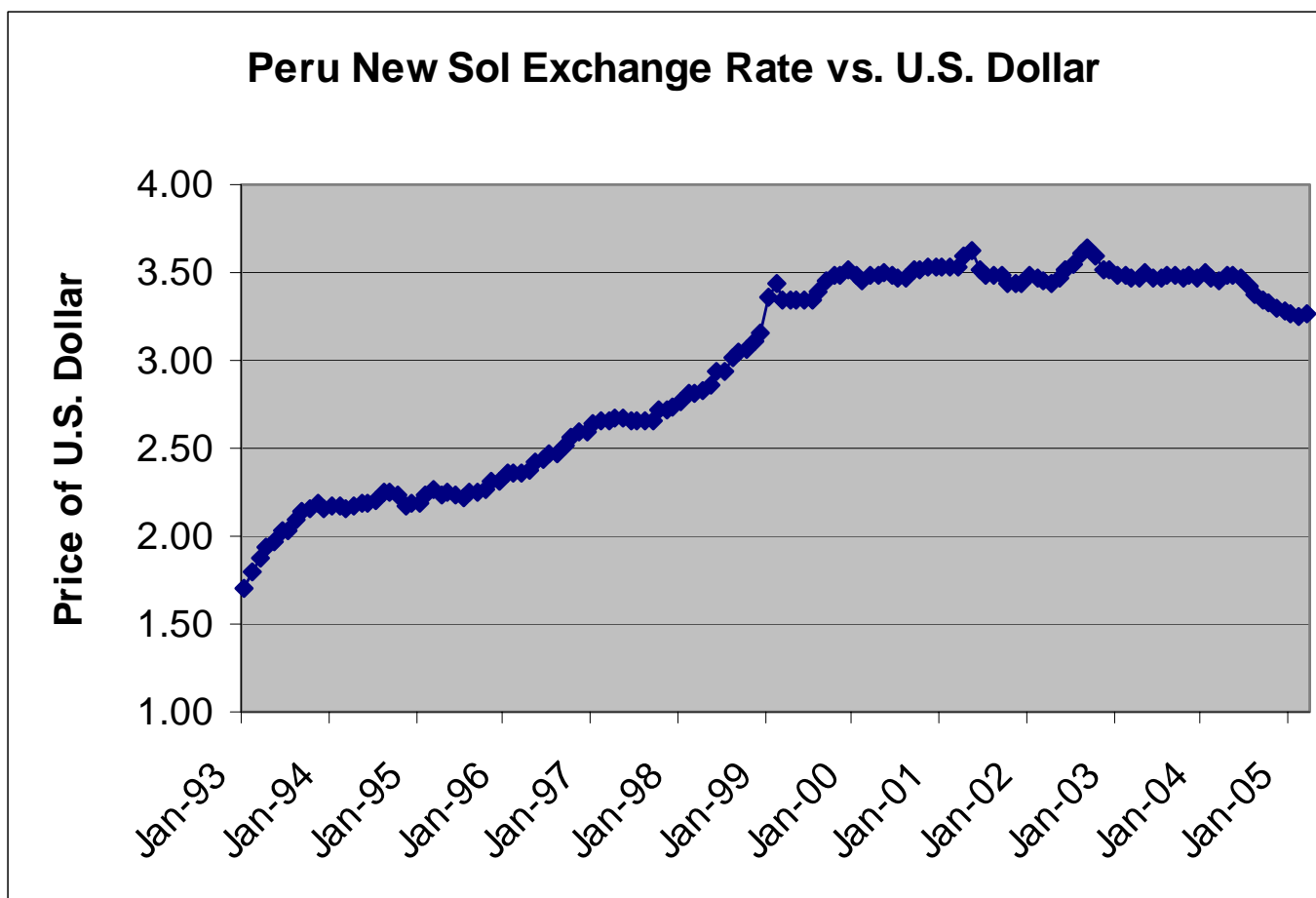


Why Study Fixed Exchange Rates?

Table 17-1: Continued

Exchange Rate Regime (Number of countries)	Monetary Policy Framework				
	Exchange rate anchor	Monetary aggregate target	Inflation targeting framework	Fund-supported or other monetary program	Other
				Mozambique Papua New Guinea Peru* Philippines* São Tomé and Príncipe* Sierra Leone* Tajikistan Tanzania Thailand* Turkey* Uganda Yemen* Zambia	

Source: International Monetary Fund, *International Financial Statistics*, August 2001.



Central Bank Intervention and the Money Supply



- **The Central Bank Balance Sheet and the Money Supply**
 - **Central bank balance sheet**
 - It records the assets held by the central bank and its liabilities.
 - It is organized according to the principles of double-entry bookkeeping.
 - Any acquisition of an asset by the central bank results in a + change on the assets side of the balance sheet.
 - Any increase in the bank's liabilities results in a + change on the balance sheet's liabilities side.

Central Bank Intervention and the Money Supply



- The assets side of a balance sheet lists two types of assets:
 - Foreign assets
 - Mainly foreign currency bonds owned by the central bank (its official international reserves)
 - Domestic assets
 - Central bank holdings of claims to future payments by its own citizens and domestic institutions
- The liabilities side of a balance sheet lists as liabilities:
 - Deposits of private banks
 - Currency in circulation
- Total assets = total liabilities + net worth

Central Bank Intervention and the Money Supply



- Net worth is constant.
 - The changes in central bank assets cause equal changes in central bank liabilities.
- Any central bank purchase of assets automatically results in an increase in the domestic money supply.
- Any central bank sale of assets automatically causes the money supply to decline.

Central Bank Intervention and the Money Supply



- Foreign Exchange Intervention and the Money Supply
 - The central bank balance sheet shows how foreign exchange intervention affects the money supply because the central bank's liabilities are the base of the domestic money supply process.
 - The central bank can negate the money supply effect of intervention through sterilization.

Central Bank Intervention and the Money Supply



■ Sterilization

• Sterilized foreign exchange intervention

- Central banks sometimes carry out equal foreign and domestic asset transactions in opposite directions to nullify the impact of their foreign exchange operations on the domestic money supply.
- With no sterilization, there is a link between the balance of payments and national money supplies that depends on how central banks share the burden of financing payments gaps.

Central Bank Intervention and the Money Supply



Table 17-2: Effects of a \$100 Foreign Exchange Intervention: Summary

Domestic Central Bank's Action	Effect on Domestic Money Supply	Effect on Central Bank Domestic Assets	Effect on Central Bank Foreign Assets
Nonsterilized foreign exchange purchase	+\$100	0	+\$100
Sterilized foreign exchange purchase	0	-\$100	+\$100
Nonsterilized foreign exchange sale	-\$100	0	-\$100
Sterilized foreign exchange sale	0	+\$100	-\$100

Central Bank Intervention and the Money Supply



- **The Balance of Payments and the Money Supply**
 - If central banks are not sterilizing and the home country has a balance of payments surplus:
 - An increase in the home central bank's foreign assets implies an increased home money supply.
 - A decrease in a foreign central bank's claims on the home country implies a decreased foreign money supply.

How the Central Bank Fixes the Exchange Rate



- Foreign Exchange Market Equilibrium Under a Fixed Exchange Rate
 - The foreign exchange market is in equilibrium when:

$$R = R^* + (E^e - E)/E$$

- When the central bank fixes E at E^0 , the expected rate of domestic currency depreciation is zero.
- The interest parity condition implies that E^0 is today's equilibrium exchange rate only if: $R = R^*$.

How the Central Bank Fixes the Exchange Rate



- Money Market Equilibrium Under a Fixed Exchange Rate
 - To hold the domestic interest rate at R^* , the central bank's foreign exchange intervention must adjust the money supply so that:

$$M^S/P = L(R^*, Y)$$

- Example: Suppose the central bank has been fixing E at E^0 and that asset markets are in equilibrium. An increase in output would raise the money demand and thus lead to a higher interest rate and an appreciation of the home currency.

How the Central Bank Fixes the Exchange Rate



- The central bank must intervene in the foreign exchange market by buying foreign assets in order to prevent this appreciation.
- If the central bank does not purchase foreign assets when output increases but instead holds the money stock constant, it cannot keep the exchange rate fixed at E^0 .

How the Central Bank Fixes the Exchange Rate

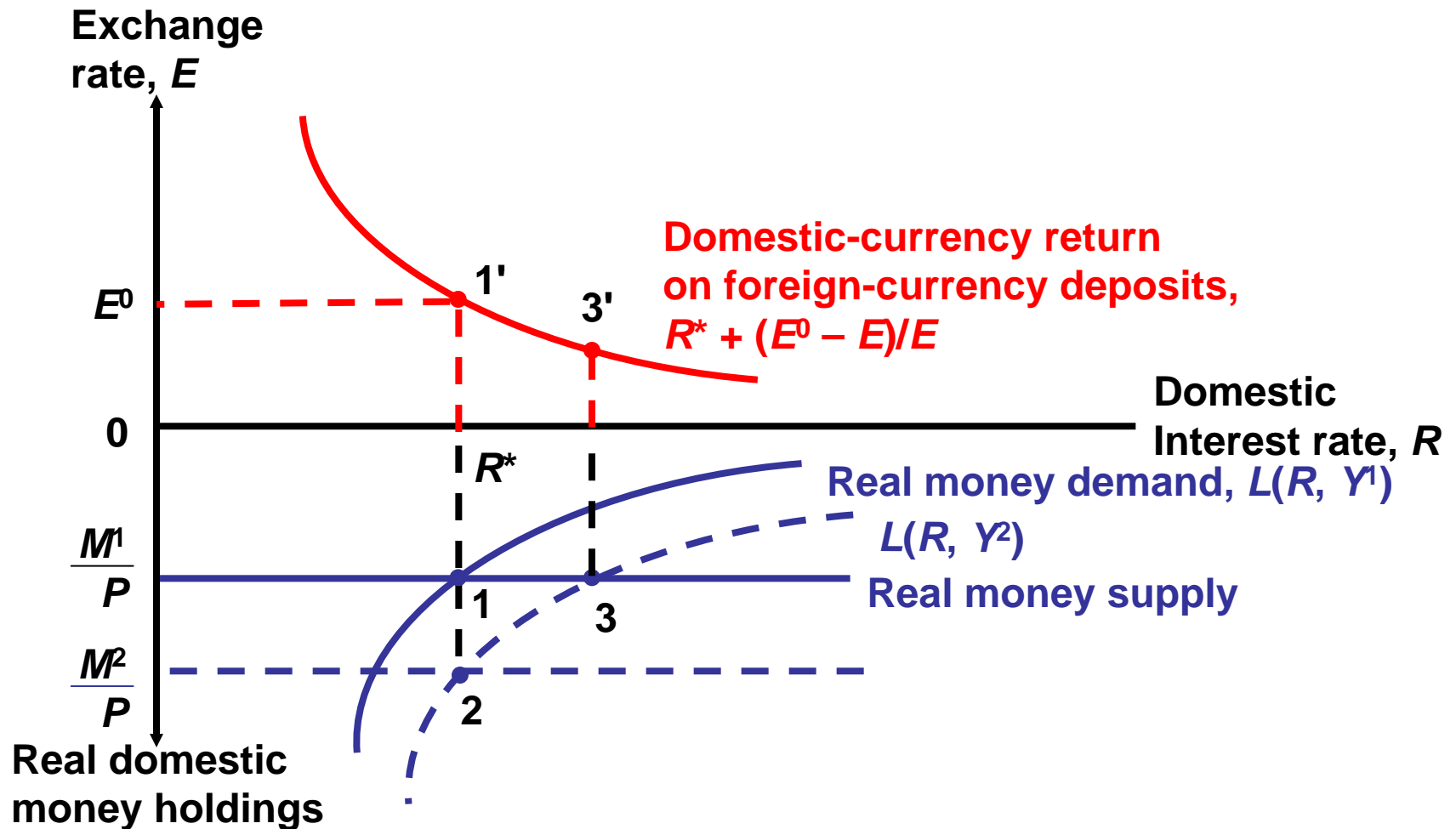


- **A Diagrammatic Analysis**
 - To hold the exchange rate fixed at E^0 when output rises, the central bank must purchase foreign assets and thereby raise the money supply.

How the Central Bank Fixes the Exchange Rate



Figure 17-1: Asset Market Equilibrium with a Fixed Exchange Rate, E^0



Stabilization Policies With a Fixed Exchange Rate



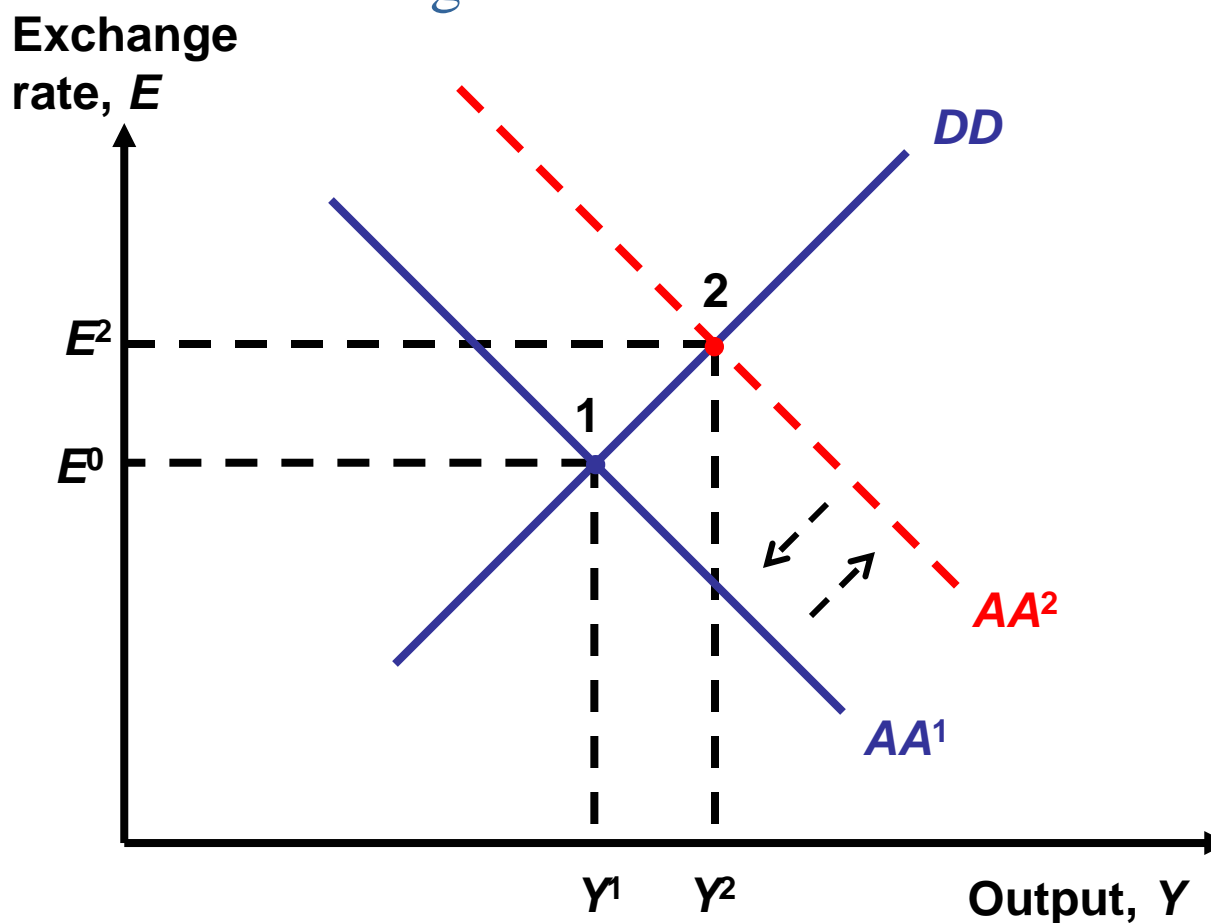
■ Monetary Policy

- Under a fixed exchange rate, central bank monetary policy tools are powerless to affect the economy's money supply or its output.
 - Figure 17-2 shows the economy's short-run equilibrium as point 1 when the central bank fixes the exchange rate at the level E^0 .

Stabilization Policies With a Fixed Exchange Rate



Figure 17-2: Monetary Expansion Is Ineffective Under a Fixed Exchange Rate



Stabilization Policies

With a Fixed Exchange Rate



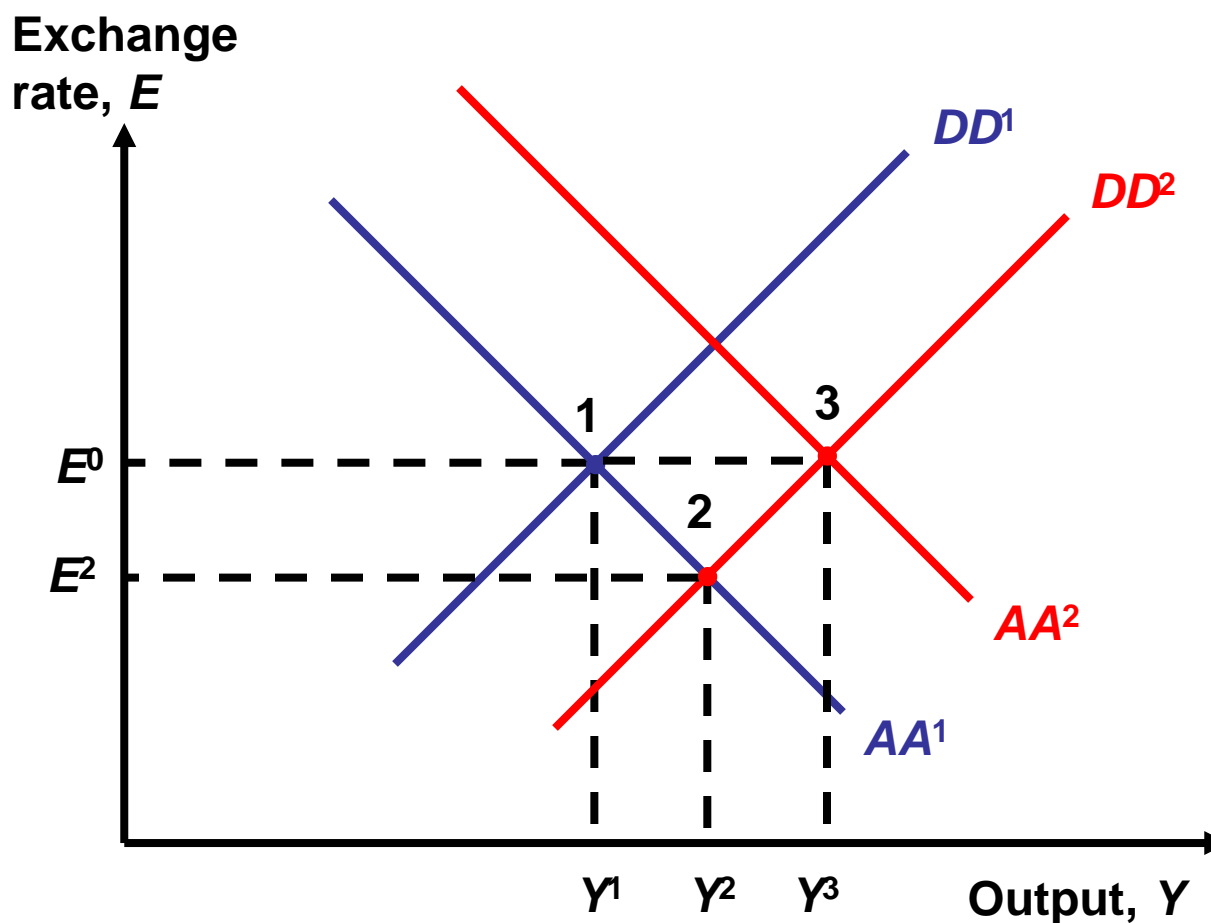
■ Fiscal Policy

- How does the central bank intervention hold the exchange rate fixed after the fiscal expansion?
 - The rise in output due to expansionary fiscal policy raises money demand.
 - To prevent an increase in the home interest rate and an appreciation of the currency, the central bank must buy foreign assets with money (i.e., increasing the money supply).
- The effects of expansionary fiscal policy when the economy's initial equilibrium is at point 1 are illustrated in Figure 17-3.

Stabilization Policies With a Fixed Exchange Rate



Figure 17-3: Fiscal Expansion Under a Fixed Exchange Rate



Stabilization Policies

With a Fixed Exchange Rate



■ Changes in the Exchange Rate

• Devaluation

- It occurs when the central bank raises the domestic currency price of foreign currency, E .
- It causes:
 - A rise in output
 - A rise in official reserves
 - An expansion of the money supply
- It is chosen by governments to:
 - Fight domestic unemployment
 - Improve the current account
 - Affect the central bank's foreign reserves

Stabilization Policies

With a Fixed Exchange Rate

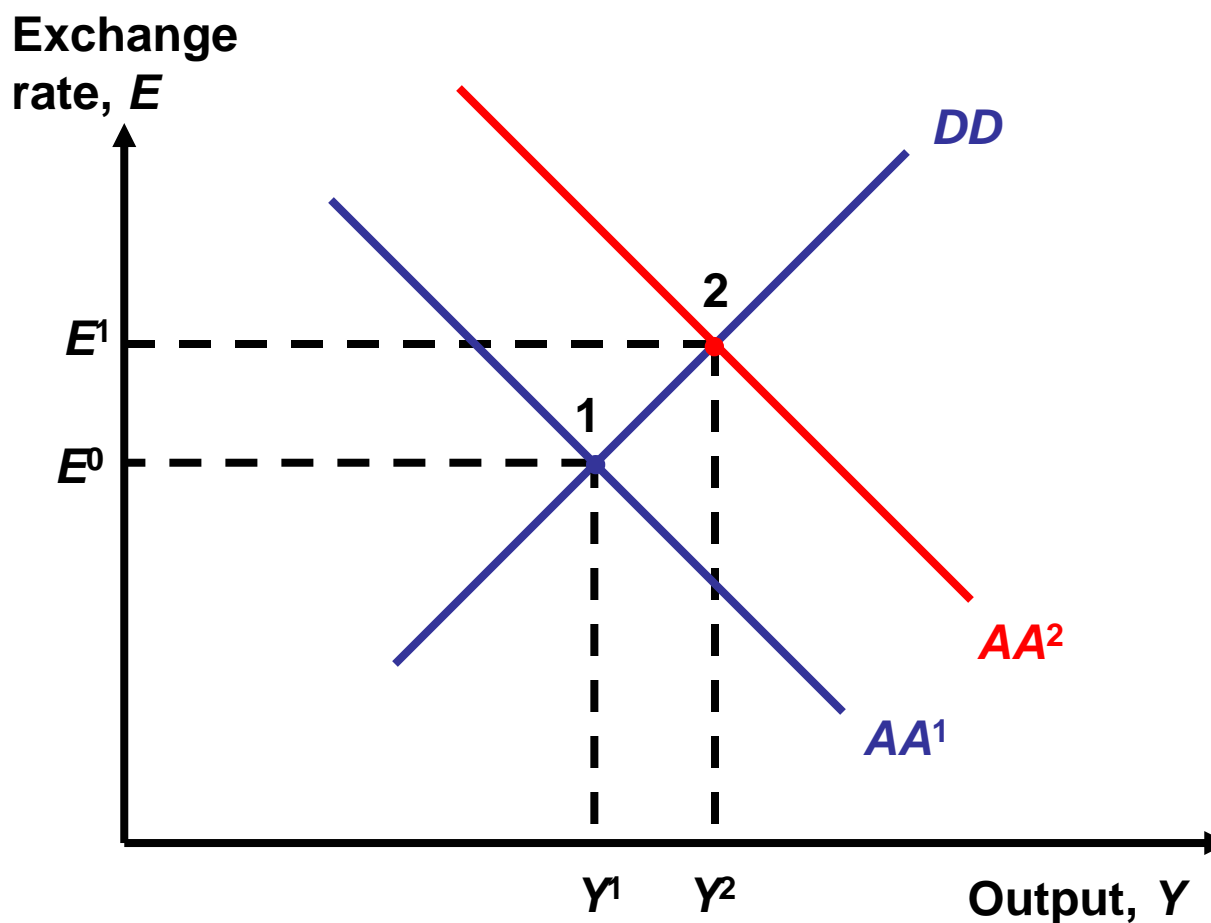


- **Revaluation**
 - It occurs when the central bank lowers E .
- In order to devalue or revalue, the central bank has to announce its willingness to trade domestic against foreign currency, in unlimited amounts, at the new exchange rate.

Stabilization Policies With a Fixed Exchange Rate



Figure 17-4: Effects of a Currency Devaluation



Stabilization Policies With a Fixed Exchange Rate



- Adjustment to Fiscal Policy and Exchange Rate Changes
 - Fiscal expansion causes P to rise.
 - There is no real appreciation in the short-run
 - There is real appreciation in the long-run
 - Devaluation is neutral in the long-run.

Balance of Payments Crises and Capital Flight



- **Balance of payments crisis**
 - It is a sharp change in official foreign reserves sparked by a change in expectations about the future exchange rate.

Balance of Payments Crises and Capital Flight



- The expectation of a future devaluation causes:
 - A balance of payments crisis marked by a sharp fall in reserves
 - A rise in the home interest rate above the world interest rate
- An expected revaluation causes the opposite effects of an expected devaluation.

Balance of Payments Crises and Capital Flight



■ **Capital flight**

- The reserve loss accompanying a devaluation scare
 - The associated debit in the balance of payments accounts is a private capital outflow.

■ **Self-fulfilling currency crises**

- It occurs when an economy is vulnerable to speculation.
- The government may be responsible for such crises by creating or tolerating domestic economic weaknesses that invite speculators to attack the currency.

Managed Floating and Sterilized Intervention



- Under managed floating, monetary policy is influenced by exchange rate change.
- **Perfect Asset Substitutability and the Ineffectiveness of Sterilized Intervention**
 - When a central bank carries out a sterilized foreign exchange intervention, its transactions leave the domestic money supply unchanged.

Managed Floating and Sterilized Intervention



- **Perfect asset substitutability**
 - The foreign exchange market is in equilibrium only when the expected return on domestic and foreign currency bonds are the same.
 - Central banks cannot control the money supply and the exchange rate through sterilized foreign exchange intervention.

Managed Floating and Sterilized Intervention



- **Imperfect asset substitutability**
 - Assets' expected returns can differ in equilibrium.
 - Risk is the main factor that may lead to imperfect asset substitutability in foreign exchange markets.
 - Central banks may be able to control both the money supply and the exchange rate through sterilized foreign exchange intervention.

Managed Floating and Sterilized Intervention



■ Foreign Exchange Market Equilibrium Under Imperfect Asset Substitutability

- When domestic and foreign currency bonds are perfect substitutes, the foreign exchange market is in equilibrium only if the interest parity condition holds:

$$R = R^* + (E^e - E)/E \quad (17-1)$$

- This condition does not hold when domestic and foreign currency bonds are imperfect substitutes.

Managed Floating and Sterilized Intervention



- Equilibrium in the foreign exchange market requires that:

$$R = R^* + (E^e - E)/E + \rho \quad (17-2)$$

where:

ρ is a **risk premium** that reflects the difference between the riskiness of domestic and foreign bonds

- The risk premium depends positively on the stock of domestic government debt:

$$\rho = \rho(B - A) \quad (17-3)$$

where:

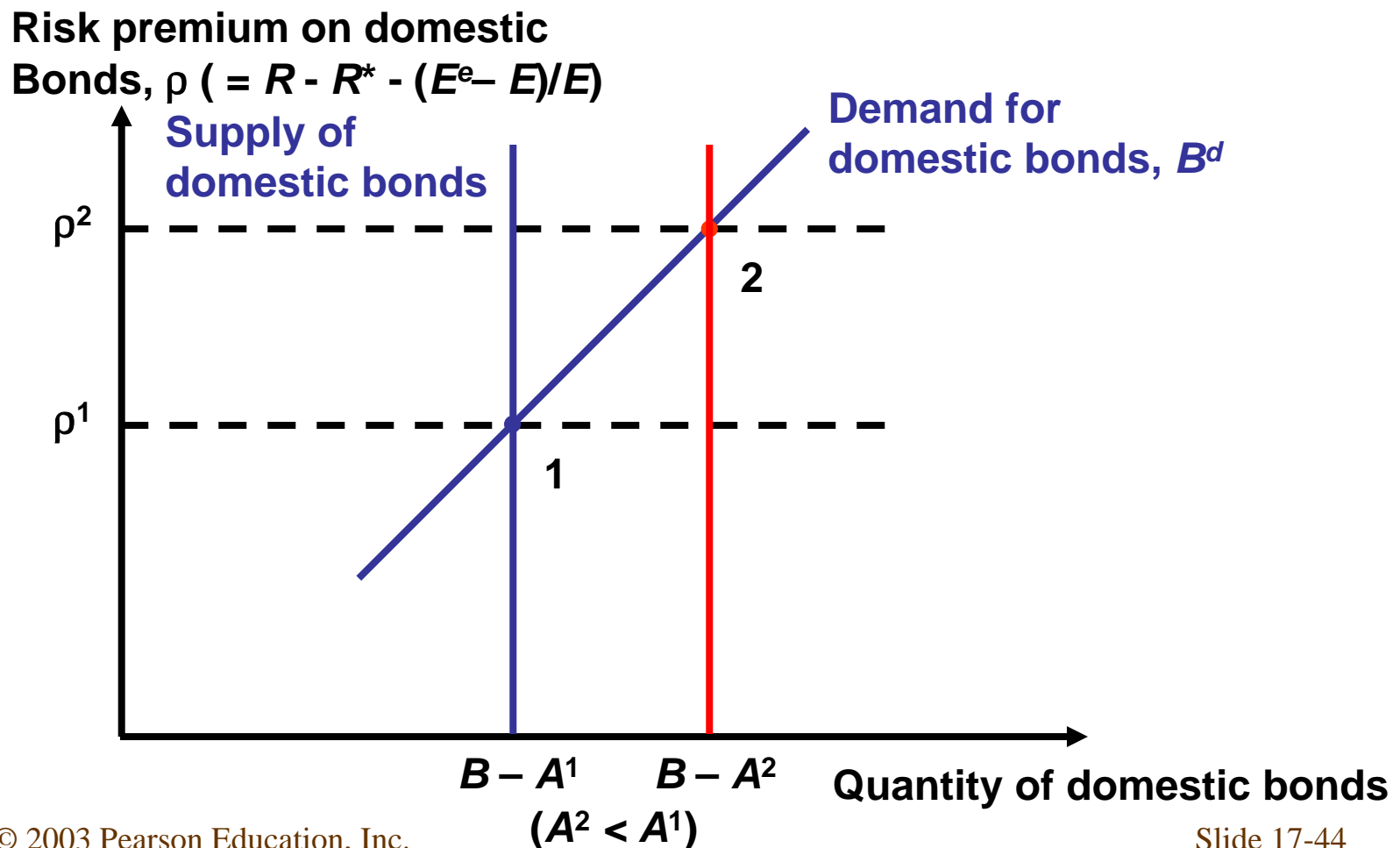
B is the stock of domestic government debt

A is domestic assets of the central bank



Managed Floating and Sterilized Intervention

Figure 17AI-1: The Domestic Bond Supply and the Foreign Exchange Risk Premium Under Imperfect Asset Substitutability



Managed Floating and Sterilized Intervention

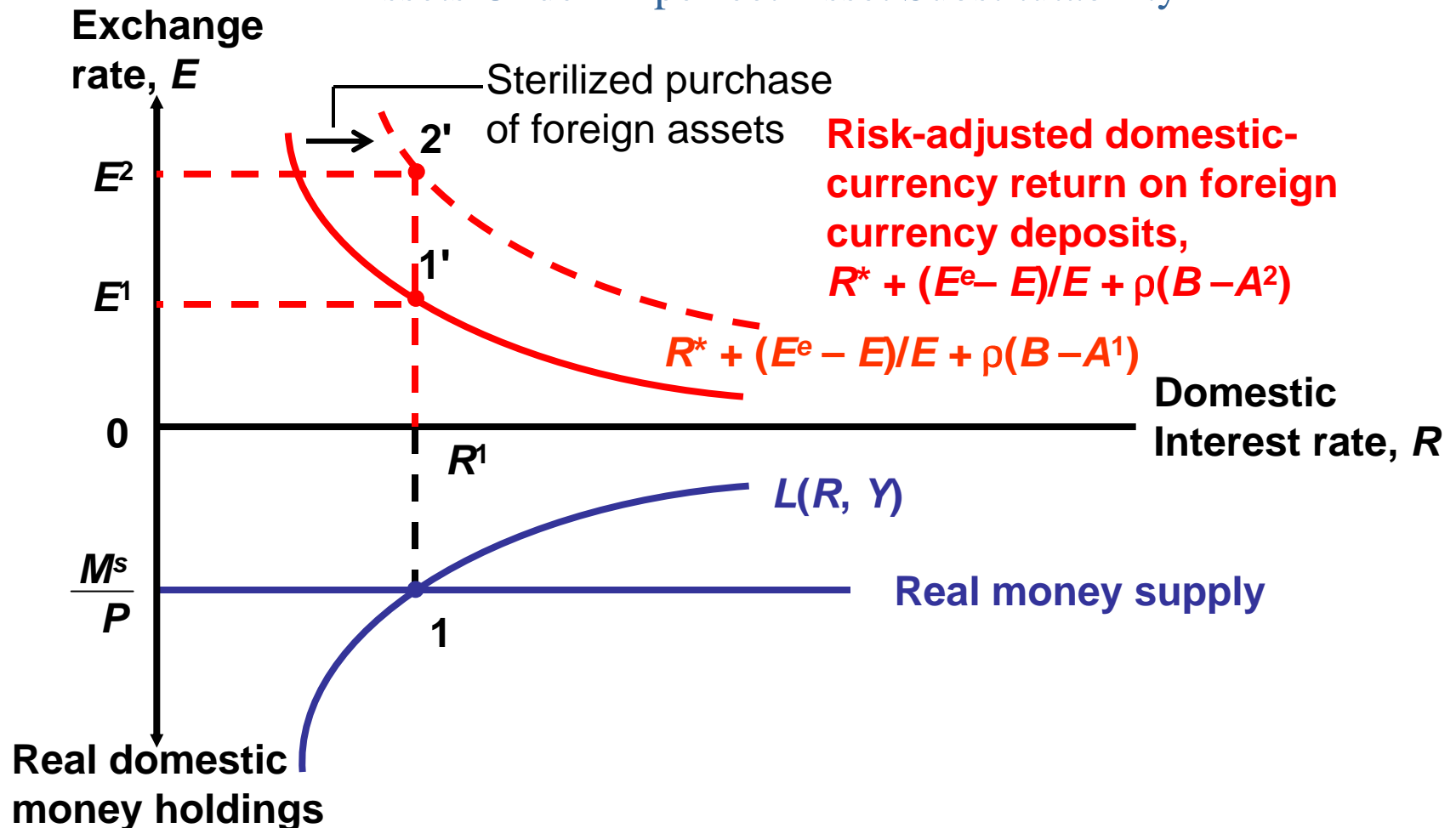


- The Effects of Sterilized Intervention with Imperfect Asset Substitutability
 - A sterilized purchase of foreign assets leaves the money supply unchanged but raises the risk adjusted return that domestic currency deposits must offer in equilibrium.
 - Figure 17-8 illustrates the effects of a sterilized purchase of foreign assets by the central bank.
 - The purchase of foreign assets is matched by a sale of domestic assets (from A^1 to A^2).

Managed Floating and Sterilized Intervention



Figure 17-8: Effect of a Sterilized Central Bank Purchase of Foreign Assets Under Imperfect Asset Substitutability



Managed Floating and Sterilized Intervention



- Evidence on the Effects of Sterilized Intervention
 - Empirical evidence provides little support for the idea that sterilized intervention has a significant direct effect on exchange rates.

Managed Floating and Sterilized Intervention



■ The Signaling Effect of Intervention

• Signaling effect of foreign exchange intervention

- An important complicating factor in econometric efforts to study the effects of sterilization
- Sterilized intervention may give an indication of where the central bank expects (or desires) the exchange rate to move.
 - This signal can change market views of future policies even when domestic and foreign bonds are perfect substitutes.

Reserve Currencies in the World Monetary System



- Two possible systems for fixing the exchange rates:
 - **Reserve currency standard**
 - Central banks peg the prices of their currencies in terms of a reserve currency.
 - The currency central banks hold in their international reserves.
 - **Gold standard**
 - Central banks peg the prices of their currencies in terms of gold.

Reserve Currencies in the World Monetary System



- The two systems have very different implications about:
 - How countries share the burden of balance of payments financing
 - The growth and control of national money supplies

Reserve Currencies in the World Monetary System



- **The Mechanics of a Reserve Currency Standard**
 - The workings of a reserve currency system can be illustrated by the system based on the U.S. dollar set up at the end of World War II.
 - Every central bank fixed the dollar exchange rate of its currency through foreign exchange market trades of domestic currency for dollar assets.
 - Exchange rates between any two currencies were fixed.

Reserve Currencies in the World Monetary System



- **The Asymmetric Position of the Reserve Center**
 - The reserve-issuing country can use its monetary policy for macroeconomic stabilization even though it has fixed exchange rates.
 - The purchase of domestic assets by the central bank of the reserve currency country leads to:
 - Excess demand for foreign currencies in the foreign exchange market
 - Expansionary monetary policies by all other central banks
 - Higher world output

The Gold Standard



- Each country fixes the price of its currency in terms of gold.
- No single country occupies a privileged position within the system.
- **The Mechanics of a Gold Standard**
 - Exchange rates between any two currencies were fixed.
 - Example: If the dollar price of gold is pegged at \$35 per ounce by the Federal Reserve while the pound price of gold is pegged at £14.58 per ounce by the Bank of England, the dollar/pound exchange rate must be constant at \$2.40 per pound.

The Gold Standard



- **Symmetric Monetary Adjustment Under a Gold Standard**
 - Whenever a country is losing reserves and its money supply shrinks as a consequence, foreign countries are gaining reserves and their money supplies expand.
- **Benefits and Drawbacks of the Gold Standard**
 - **Benefits:**
 - It avoids the asymmetry inherent in a reserve currency standard.
 - It places constraints on the growth of countries' money supplies.

The Gold Standard



- Drawbacks:
 - It places undesirable constraints on the use of monetary policy to fight unemployment.
 - It ensures a stable overall price level only if the relative price of gold and other goods and services is stable.
 - It makes central banks compete for reserves and bring about world unemployment.
 - It could give gold producing countries (like Russia and South Africa) too much power.

The Gold Standard



■ Bimetallic standard

- The currency was based on both silver and gold.
- The U.S. was bimetallic from 1837 until the Civil War.
- In a bimetallic system, a country's mint will coin specified amounts of gold or silver into the national currency unit.
 - Example: 371.25 grains of silver or 23.22 grains of gold could be turned into a silver or a gold dollar. This made gold worth $371.25/23.22 = 16$ times as much as silver.
- It might reduce the price-level instability resulting from use of one of the metals alone.

The Gold Standard



■ The Gold Exchange Standard

- Central banks' reserves consist of gold and currencies whose prices in terms of gold are fixed.
 - Each central bank fixes its exchange rate to a currency with a fixed gold price.
- It can operate like a gold standard in restraining excessive monetary growth throughout the world, but it allows more flexibility in the growth of international reserves.

Interest Rates, Exchange Rates and the Liquidity Trap



- If interest rates are stuck at zero, then

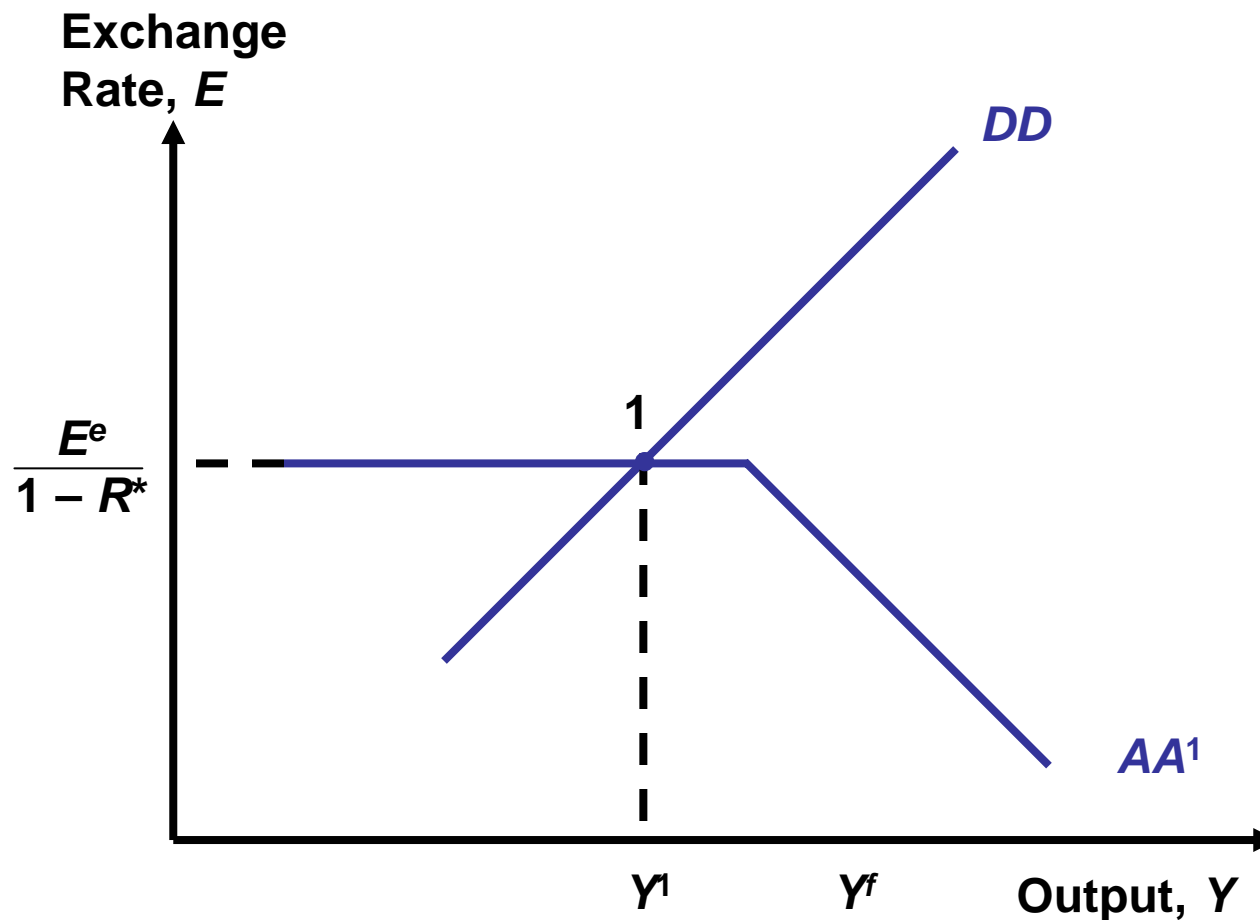
$$R = 0 = R^* + (E^e - E)/E$$

- $-ER^* = E^e - E$
 - $E(1 - R^*) = E^e$
 - $E = E^e / (1 - R^*)$
- With fixed expectations about the exchange rate (and inflation) and fixed foreign interest rates, the exchange rate is fixed.
 - A purchase of domestic assets by the central bank does not lower the interest rate, nor does it change the exchange rate.

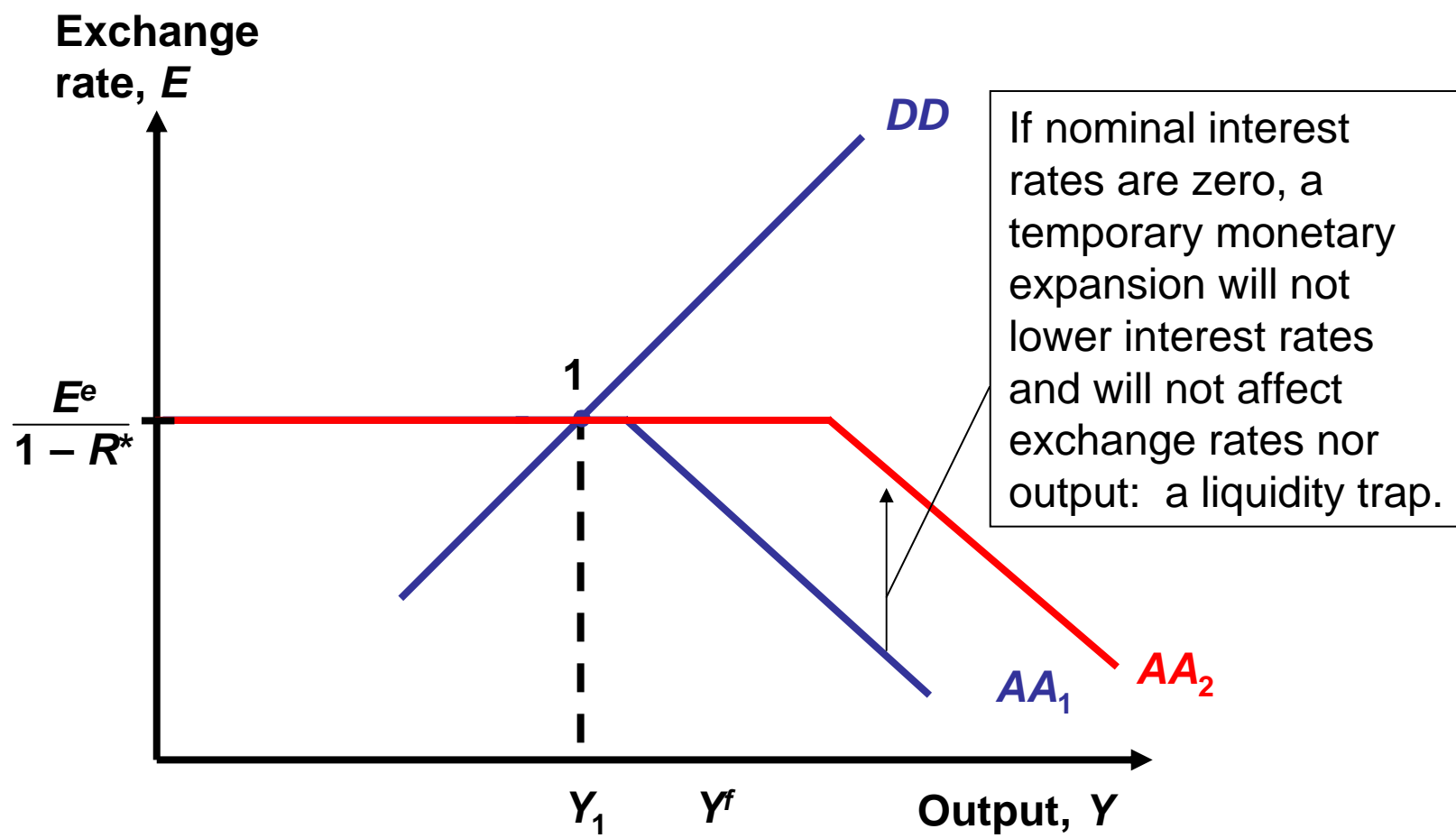
Interest Rates, Exchange Rates and the Liquidity Trap (cont.)



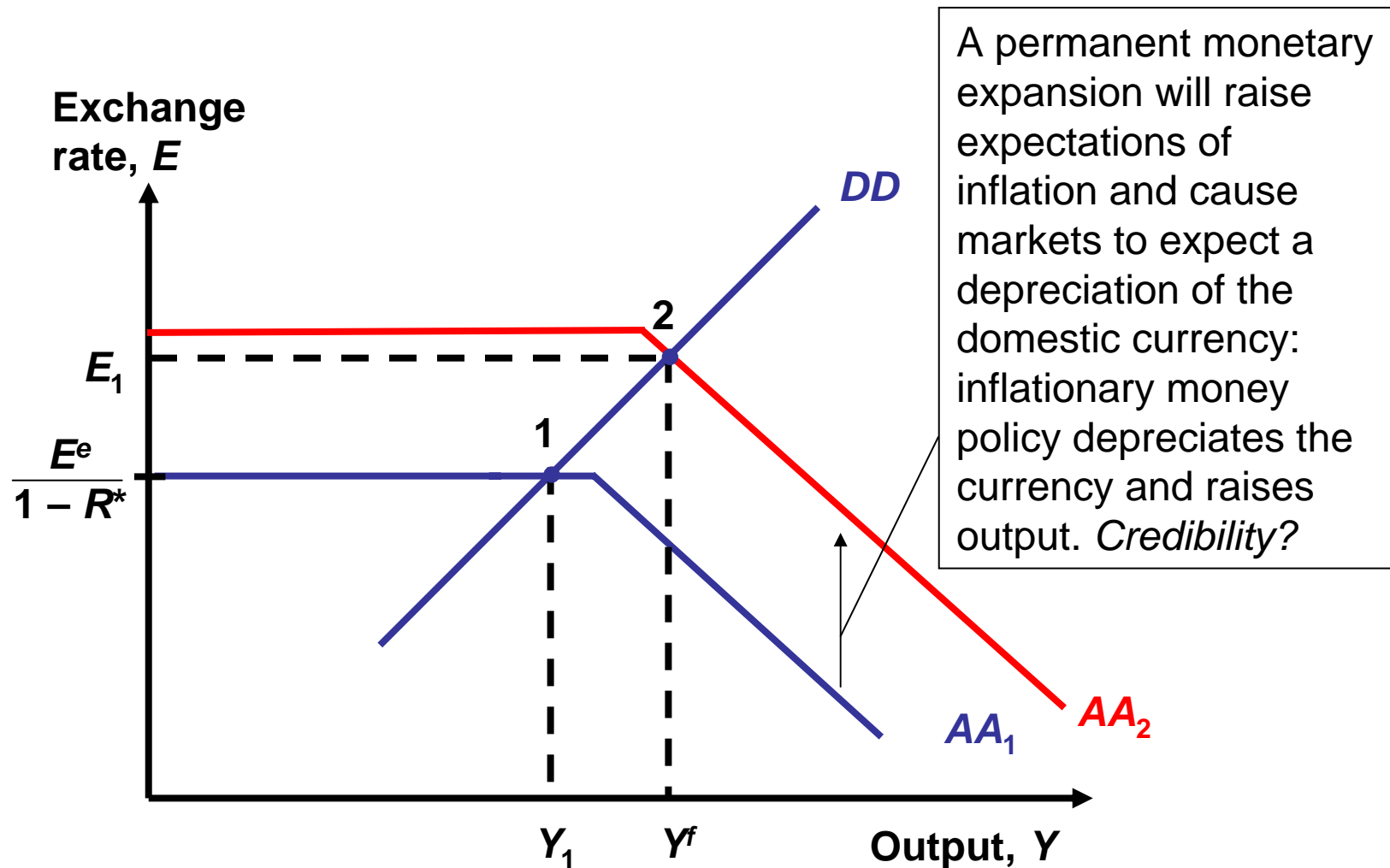
Figure 17-5: A Low-Output Liquidity Trap



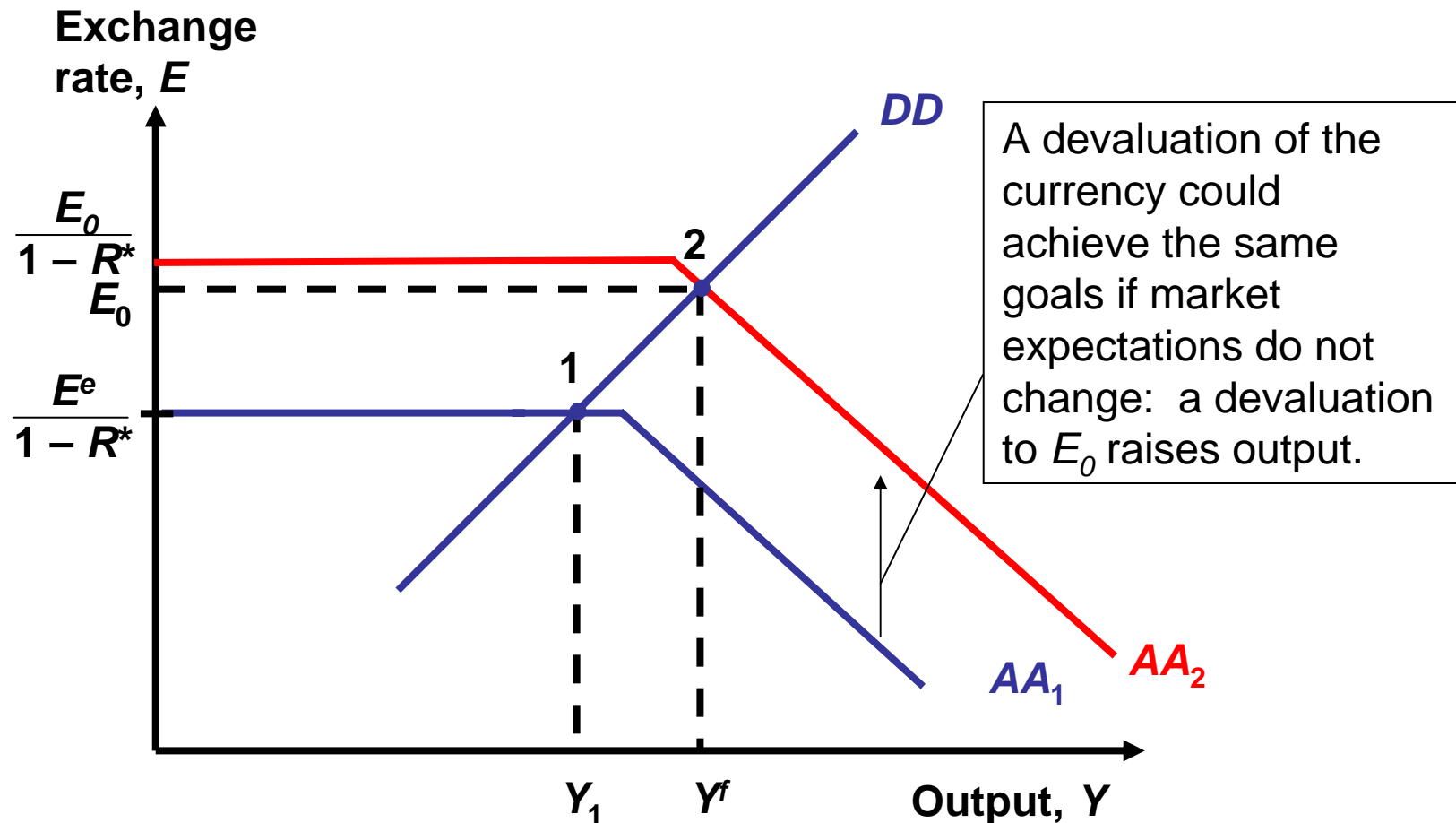
Interest Rates, Exchange Rates and the Liquidity Trap (cont.)



Interest Rates, Exchange Rates and the Liquidity Trap (cont.)



Interest Rates, Exchange Rates and the Liquidity Trap (cont.)



Interest Rates, Exchange Rates and the Liquidity Trap (cont.)



- Since March 2001 the Bank of Japan has held policy interest rate at zero and vastly raised the monetary base. It also bought vast quantities of US dollars in the foreign exchange market, as well as some Japanese stocks.
 - In March 2006 the BOJ announced it would end its policy of “quantitative easing” and also reduce the outstanding monetary base gradually.
 - It also promised to keep interest rates at zero for the near future.
 - Were the BOJ’s quantitative operations viewed as permanent or temporary? Or partly permanent?
 - Depends on one’s view of BOJ’s definition of “price stability.” Most of their statements had suggested *zero* inflation as the Bank’s target.
 - In March 2006, the Bank stated (in *The Bank’s Thinking on Price Stability*, March 10, 2006): “[A]n approximate range between 0 and 2 percent was generally consistent with each Board member’s understanding of medium- to long-term price stability.”

Summary



- There is a direct link between central bank intervention in the foreign exchange market and the domestic money supply.
 - When a country's central bank purchases (sells) foreign assets, the country's money supply automatically increases (decreases).
- The central bank balance sheet shows how foreign exchange intervention affects the money supply.
- The central bank can negate the money supply effect of intervention through sterilization.

Summary



- A central bank can fix the exchange rate of its currency against foreign currency if it trades unlimited amounts of domestic money against foreign assets at that rate.
- A commitment to fix the exchange rate forces the central bank to sacrifice its ability to use monetary policy for stabilization.
- Fiscal policy has a more powerful effect on output under fixed exchange rates than under floating rates.
- Balance of payments crises occur when market participants expect the central bank to change the exchange rate from its current level.

Summary



- Self-fulfilling currency crises can occur when an economy is vulnerable to speculation.
- A system of managed floating allows the central bank to retain some ability to control the domestic money supply.
- A world system of fixed exchange rates in which countries peg the prices of their currencies in terms of a reserve currency involves a striking asymmetry.
- A gold standard avoids the asymmetry inherent in a reserve currency standard.
 - A related arrangement was the bimetallic standard based on both silver and gold.