

Chapter 16

Output and the Exchange Rate in the Short Run



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To Accompany

International Economics: Theory and Policy, Sixth Edition

by **Paul R. Krugman and Maurice Obstfeld**

Chapter Organization



- Determinants of Aggregate Demand in an Open Economy
- The Equation of Aggregate Demand
- How Output Is Determined in the Short Run
- Output Market Equilibrium in the Short Run: The *DD* Schedule
- Asset Market Equilibrium in the Short Run: The *AA* Schedule
- Short-Run Equilibrium for an Open Economy: Putting the *DD* and *AA* Schedules Together

Chapter Organization



- Temporary Changes in Monetary and Fiscal Policy
- Inflation Bias and Other Problems of Policy Formulation
- Permanent Shifts in Monetary and Fiscal Policy
- Macroeconomic Policies and the Current Account
- Gradual Trade Flow Adjustment and Current Account Dynamics
- Summary

Chapter Organization



- Appendix: The *IS-LM* Model and the *DD-AA* Model
- Appendix: Intertemporal Trade and the Current Account

Introduction



- Macroeconomic changes that affect exchange rates, interest rates, and price levels may also affect output.
 - This chapter introduces a new theory of how the output market adjusts to demand changes when product prices are themselves slow to adjust.
- A short-run model of the output market in an open economy will be utilized to analyze:
 - The effects of macroeconomic policy tools on output and the current account
 - The use of macroeconomic policy tools to maintain full employment

Determinants of Aggregate Demand in an Open Economy



- **Aggregate demand**
 - The amount of a country's goods and services demanded by households and firms throughout the world.
- The aggregate demand for an open economy's output consists of four components:
 - Consumption demand (C)
 - Investment demand (I)
 - Government demand (G)
 - Current account (CA)

Determinants of Aggregate Demand in an Open Economy



- **Determinants of Consumption Demand**
 - Consumption demand increases as disposable income (i.e., national income less taxes) increases at the aggregate level.
 - The increase in consumption demand is less than the increase in the disposable income because part of the income increase is saved.

Determinants of Aggregate Demand in an Open Economy



■ Determinants of the Current Account

- The *CA* balance is viewed as the demand for a country's exports (*EX*) less that country's own demand for imports (*IM*).
- The *CA* balance is determined by two main factors:
 - The domestic currency's real exchange rate against foreign currency ($q = EP^*/P$)
 - Domestic disposable income (Y^d)

Determinants of Aggregate Demand in an Open Economy



- How Real Exchange Rate Changes Affect the Current Account
 - An increase in q raises EX and improves the domestic country's CA .
 - Each unit of domestic output now purchases fewer units of foreign output, therefore, foreign will demand more exports.
 - An increase q can raise or lower IM and has an ambiguous effect on CA .
 - IM denotes the value of imports measured in terms of domestic output.

Determinants of Aggregate Demand in an Open Economy



- There are two effects of a real exchange rate:
 - Volume effect
 - The effect of consumer spending shifts on export and import quantities
 - Value effect
 - It changes the domestic output worth of a given volume of foreign imports.
- Whether the *CA* improves or worsens depends on which effect of a real exchange rate change is dominant.
- We assume that the volume effect of a real exchange rate change always outweighs the value effect.

Trade Elasticities



- Let $EX(q)$ = exports
- Let $IM(q, Y)$ = imports (in volume terms, e.g., number of widgets)
- Then imports valued in terms of domestic goods (exports) = $q IM(q, Y)$
- Exports EX rise when q rises (real depreciations)
- Import volume IM falls when q rises
- So import value $q IM$ may rise or fall when q rises.

Trade Elasticities (cont.)



- $CA(q, Y) = EX(q) - qIM(q)$.
- So a rise in q (real depreciation of the home currency) may cause home current account to rise or worsen.
- Depends on *elasticities* of export and import demand w.r.t the real exchange rate q . Define:

$$\eta = \frac{q}{EX} \left(\frac{dEX}{dq} \right), \eta^* = -\frac{q}{IM} \left(\frac{dIM}{dq} \right)$$

Trade Elasticities (cont.)



- You can show (see Chapter 16, appendix 2) that the condition for a real depreciation to improve the current account balance (other things equal) is that the elasticities be sufficiently big.
- This gives the following *Marshall-Lerner* condition:

$$\eta + \eta^* > 1.$$



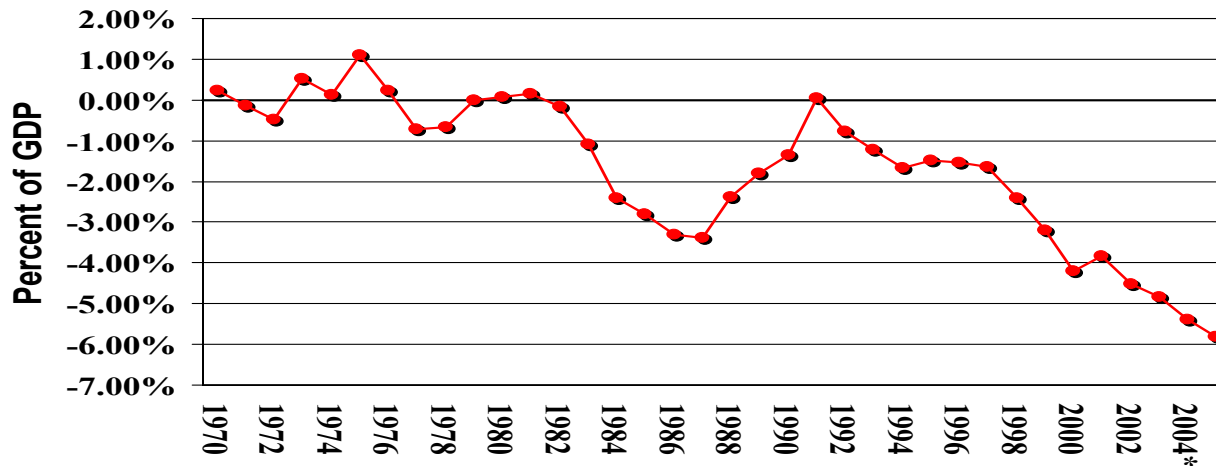
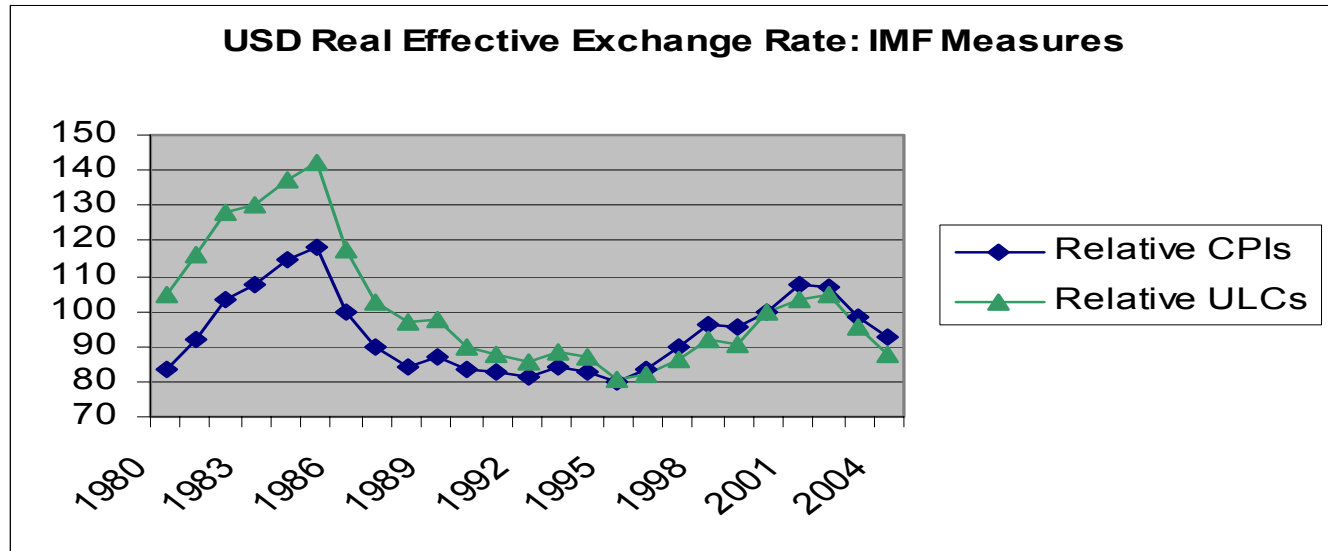
Some Empirical Estimates of Trade Elasticities for Manufactured Goods

Country	η			η^*		
	Impact	Short-run	Long-run	Impact	Short-run	Long-run
Austria	0.39	0.71	1.37	0.03	0.36	0.80
Belgium	0.18	0.59	1.55	—	—	0.70
Britain	—	—	0.31	0.60	0.75	0.75
Canada	0.08	0.40	0.71	0.72	0.72	0.72
Denmark	0.82	1.13	1.13	0.55	0.93	1.14
France	0.20	0.48	1.25	—	0.49	0.60
Germany	—	—	1.41	0.57	0.77	0.77
Italy	—	0.56	0.64	0.94	0.94	0.94
Japan	0.59	1.01	1.61	0.16	0.72	0.97
Netherlands	0.24	0.49	0.89	0.71	1.22	1.22
Norway	0.40	0.74	1.49	—	0.01	0.71
Sweden	0.27	0.73	1.59	—	—	0.94
Switzerland	0.28	0.42	0.73	0.25	0.25	0.25
United States	0.18	0.48	1.67	—	1.06	1.06

Note: Estimates are taken from Jacques R. Artus and Malcolm D. Knight, *Issues in the Assessment of the Exchange Rates of Industrial Countries*, Occasional Paper 29. Washington, D.C.: International Monetary Fund, July 1984, Table 4. Unavailable estimates are indicated by dashes.



Trade Elasticities (cont.)



Current account of U.S.

Determinants of Aggregate Demand in an Open Economy



- How Disposable Income Changes Affect the Current Account
 - An increase in disposable income (Y^d) worsens the CA .
 - A rise in Y^d causes domestic consumers to increase their spending on all goods.

Determinants of Aggregate Demand in an Open Economy



Table 16-1: Factors Determining the Current Account

Change	Effect on current account, CA
Real exchange rate, $EP^*/P \uparrow$	CA \uparrow
Real exchange rate, $EP^*/P \downarrow$	CA \downarrow
Disposable income, $Y^d \uparrow$	CA \downarrow
Disposable income, $Y^d \downarrow$	CA \uparrow

The Equation of Aggregate Demand



- The four components of aggregate demand are combined to get the total aggregate demand:

$$D = C(Y - T) + I + G + CA(EP^*/P, Y - T)$$

- This equation shows that aggregate demand for home output can be written as:

$$D = D(EP^*/P, Y - T, I, G)$$

The Equation of Aggregate Demand



- The Real Exchange Rate and Aggregate Demand
 - An increase in q raises CA and D .
 - It makes domestic goods and services cheaper relative to foreign goods and services.
 - It shifts both domestic and foreign spending from foreign goods to domestic goods.
 - A real depreciation of the home currency raises aggregate demand for home output.
 - A real appreciation lowers aggregate demand for home output.

The Equation of Aggregate Demand

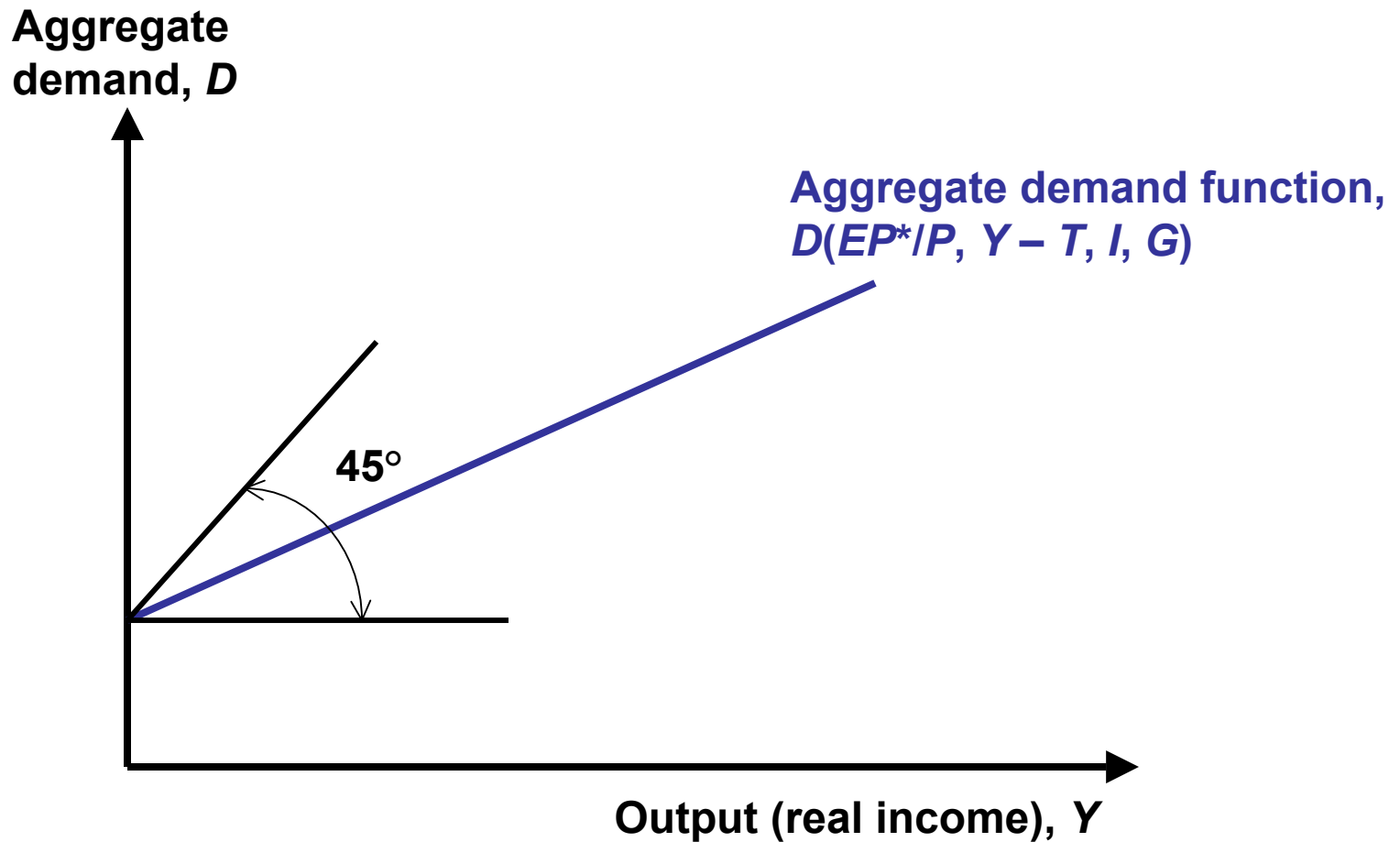


- **Real Income and Aggregate Demand**
 - A rise in domestic real income raises aggregate demand for home output.
 - A fall in domestic real income lowers aggregate demand for home output.

The Equation of Aggregate Demand



Figure 16-1: Aggregate Demand as a Function of Output



How Output Is Determined in the Short Run



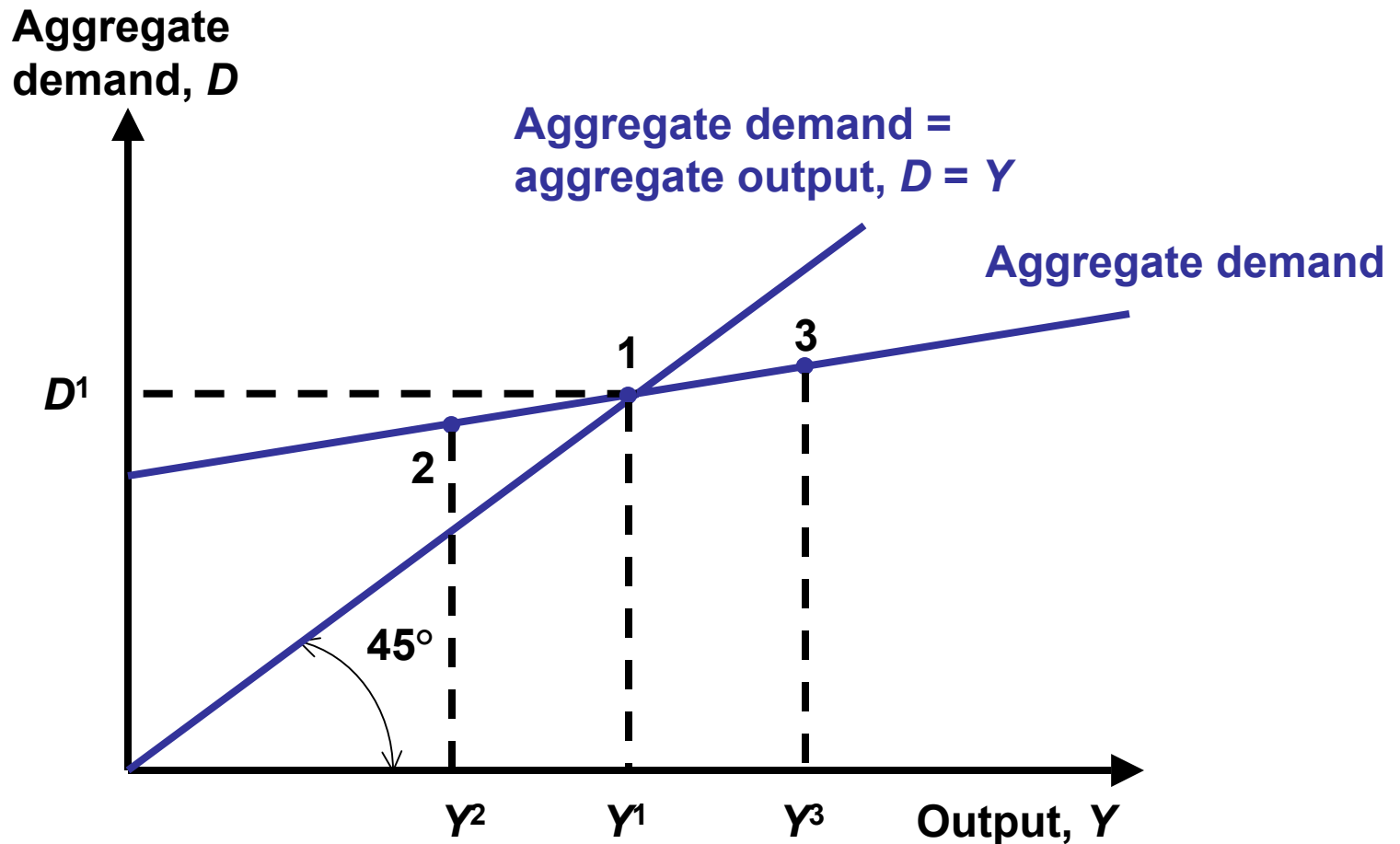
- Output market is in equilibrium in the short-run when real output, Y , equals the aggregate demand for domestic output:

$$Y = D(EP^*/P, Y - T, I, G) \quad (16-1)$$

How Output Is Determined in the Short Run



Figure 16-2: The Determination of Output in the Short Run



Output Market Equilibrium in the Short Run: The *DD* Schedule

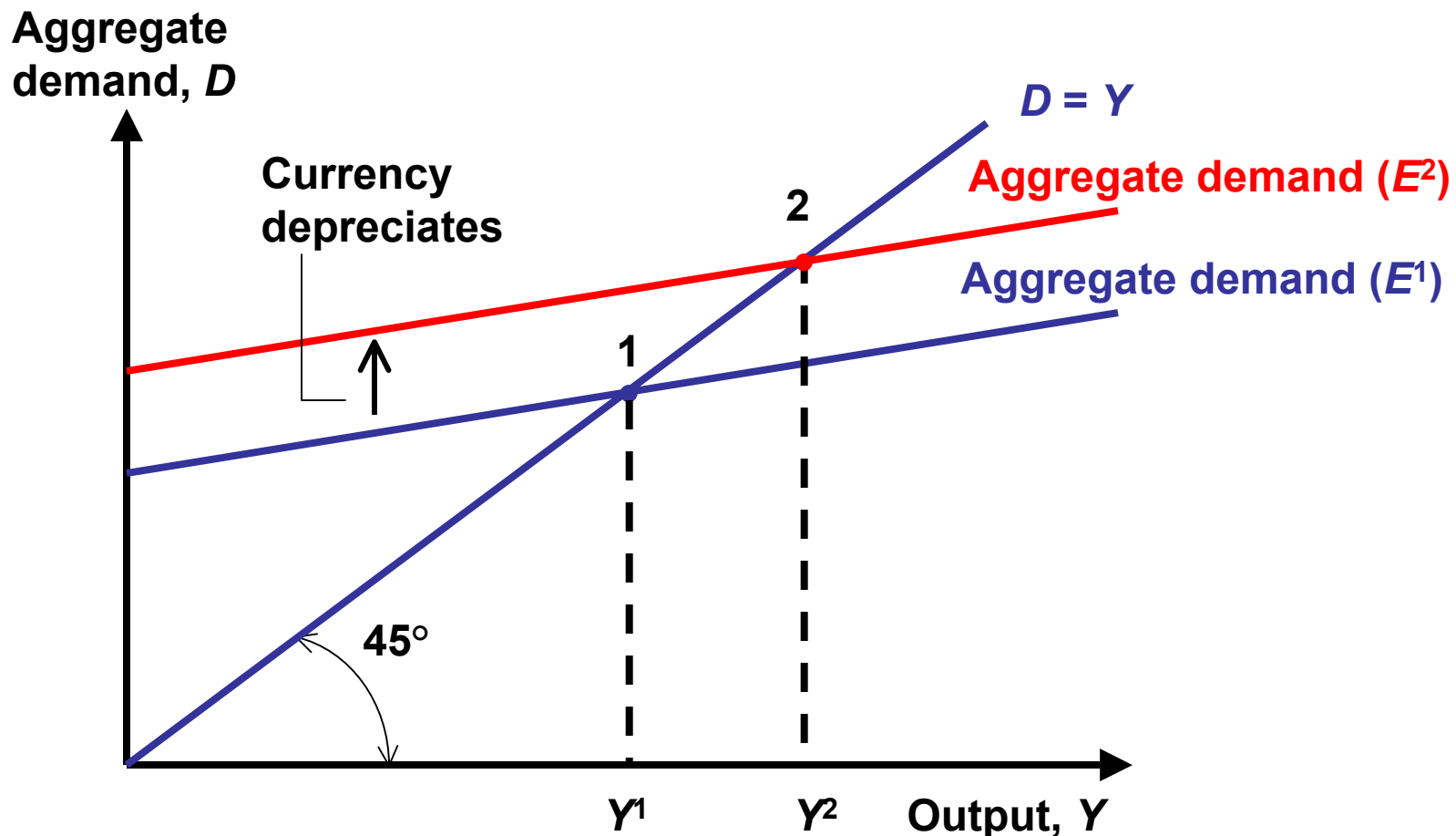


- Output, the Exchange Rate, and Output Market Equilibrium
 - With fixed price levels at home and abroad, a rise in the nominal exchange rate makes foreign goods and services more expensive relative to domestic goods and services.
 - Any rise in q will cause an upward shift in the aggregate demand function and an expansion of output.
 - Any fall in q will cause output to contract.

Output Market Equilibrium in the Short Run: The *DD* Schedule



Figure 16-3: Output Effect of a Currency Depreciation with Fixed Output Prices



Output Market Equilibrium in the Short Run: The *DD* Schedule



■ Deriving the *DD* Schedule

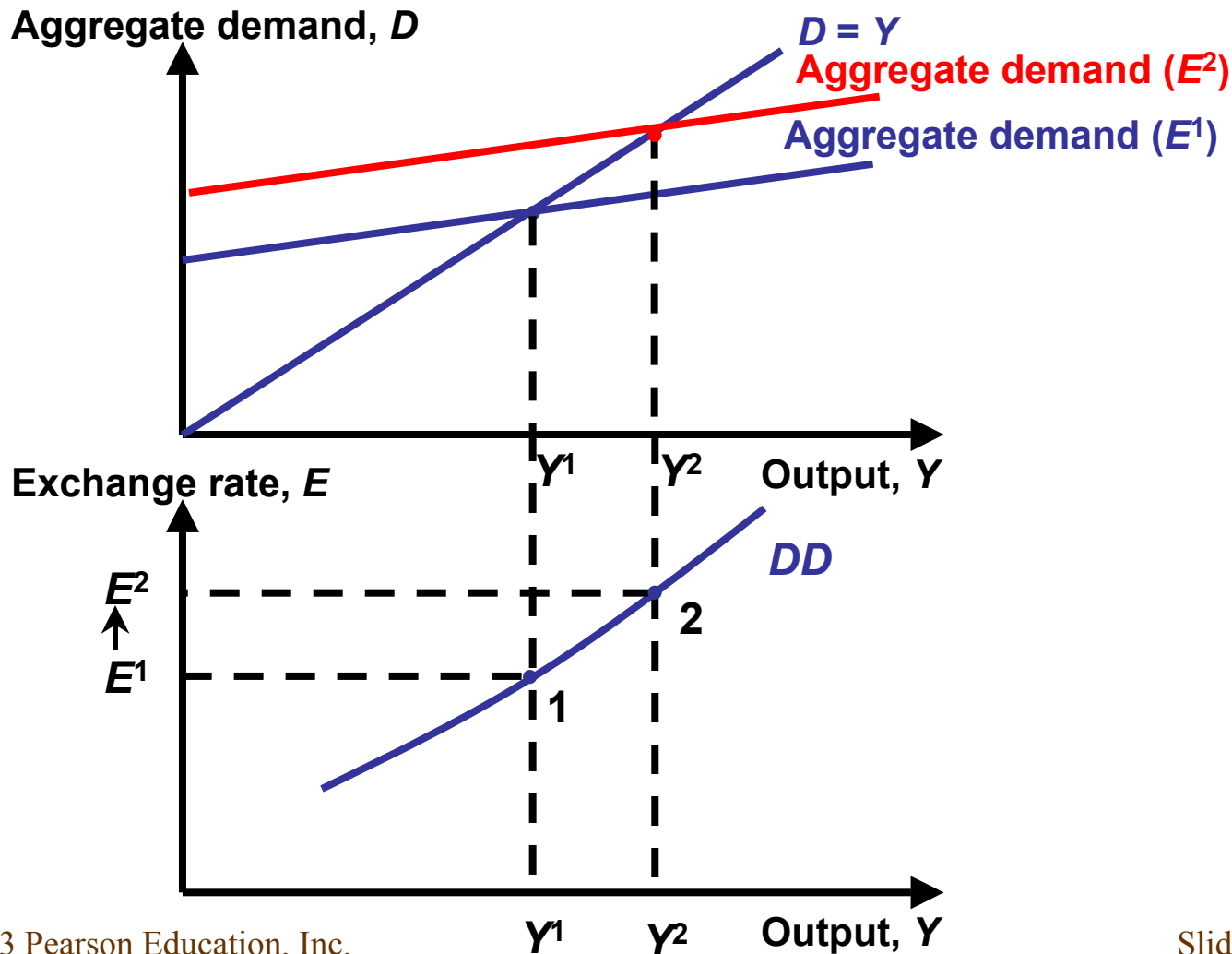
• *DD* schedule

- It shows all combinations of output and the exchange rate for which the output market is in short-run equilibrium (aggregate demand = aggregate output).
- It slopes upward because a rise in the exchange rate causes output to rise.

Output Market Equilibrium in the Short Run: The *DD* Schedule



Figure 16-4: Deriving the *DD* Schedule



Output Market Equilibrium in the Short Run: The *DD* Schedule

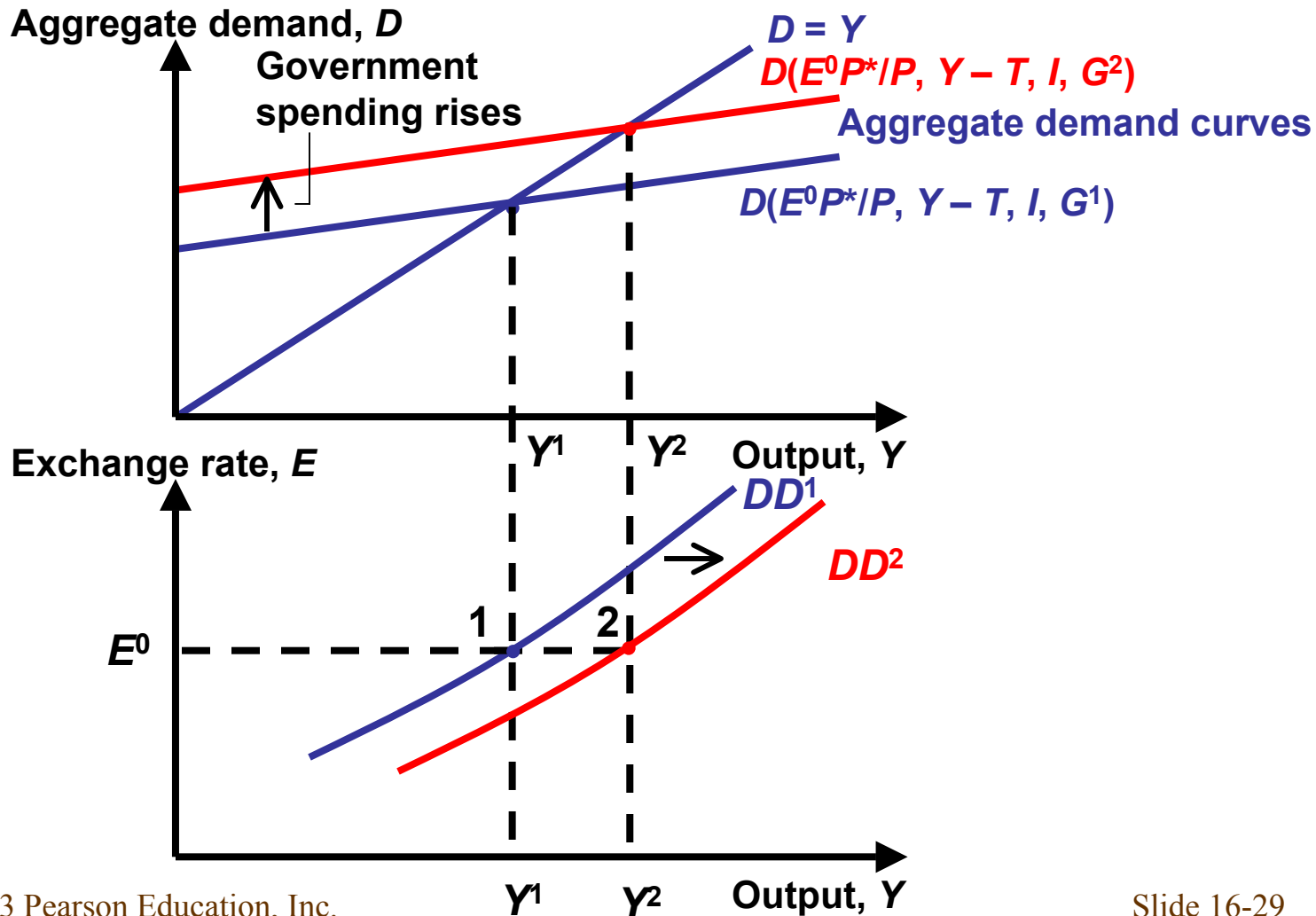


- Factors that Shift the *DD* Schedule
 - Government purchases
 - Taxes
 - Investment
 - Domestic price levels
 - Foreign price levels
 - Domestic consumption
 - Demand shift between foreign and domestic goods
- A disturbance that raises (lowers) aggregate demand for domestic output shifts the *DD* schedule to the right (left).

Output Market Equilibrium in the Short Run: The *DD* Schedule



Figure 16-5: Government Demand and the Position of the *DD* Schedule



Asset Market Equilibrium in the Short Run: The *AA* Schedule



■ *AA* Schedule

- It shows all combinations of exchange rate and output that are consistent with equilibrium in the domestic money market and the foreign exchange market.

Asset Market Equilibrium in the Short Run: The *AA* Schedule



■ Output, the Exchange Rate, and Asset Market Equilibrium

- We will combine the interest parity condition with the money market to derive the asset market equilibrium in the short-run.
- The interest parity condition describing foreign exchange market equilibrium is:

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

where: E^e is the expected future exchange rate

R is the interest rate on domestic currency deposits

R^* is the interest rate on foreign currency deposits

Asset Market Equilibrium in the Short Run: The *AA* Schedule



- The R satisfying the interest parity condition must also equate the real domestic money supply to aggregate real money demand:

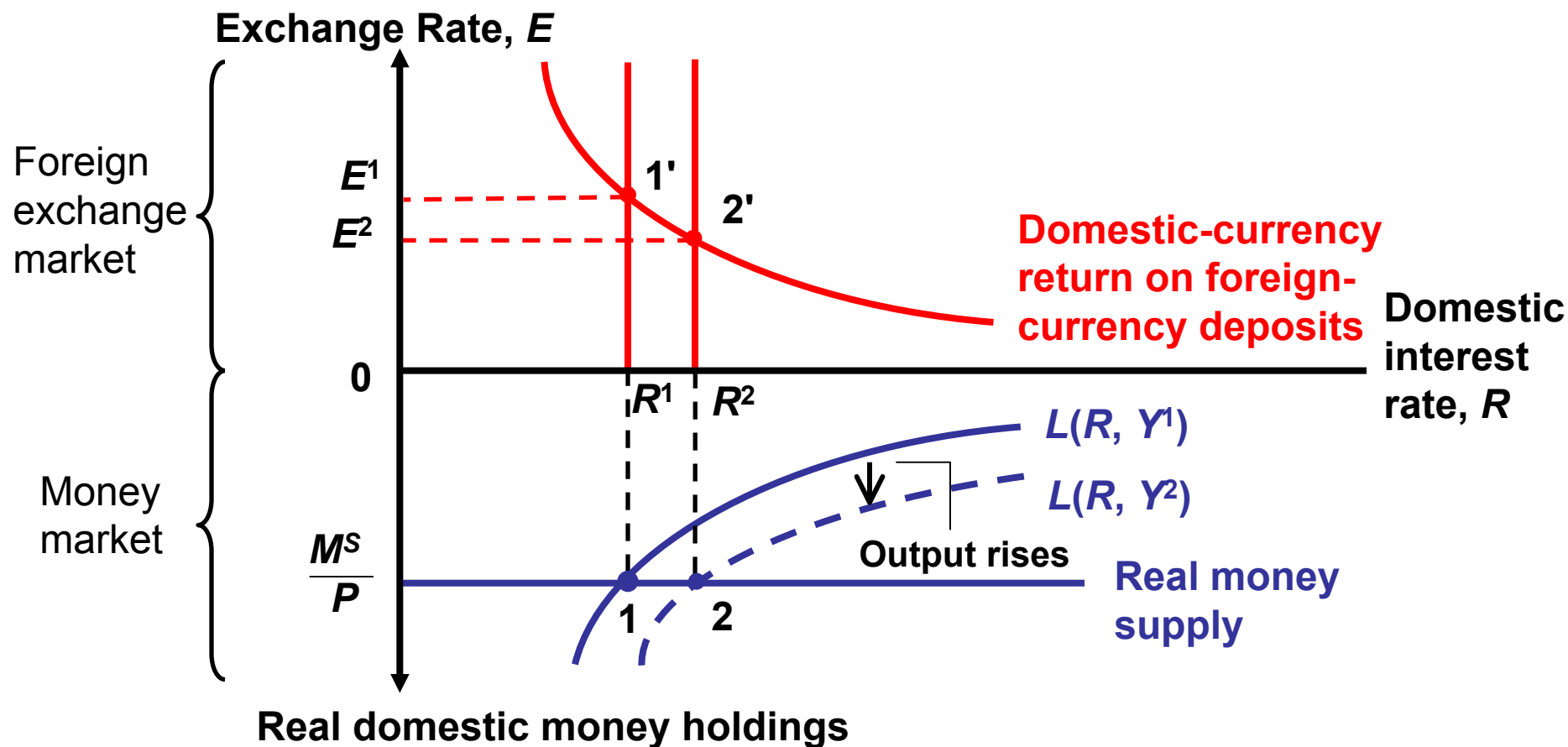
$$M^s/P = L(R, Y)$$

- Aggregate real money demand $L(R, Y)$ rises when the interest rate falls because a fall in R makes interest-bearing nonmoney assets less attractive to hold.

Asset Market Equilibrium in the Short Run: The *AA* Schedule



Figure 16-6: Output and the Exchange Rate in Asset Market Equilibrium



Asset Market Equilibrium in the Short Run: The *AA* Schedule



- For asset markets to remain in equilibrium:
 - A rise in domestic output must be accompanied by an appreciation of the domestic currency.
 - A fall in domestic output must be accompanied by a depreciation of the domestic currency.

Asset Market Equilibrium in the Short Run: The *AA* Schedule



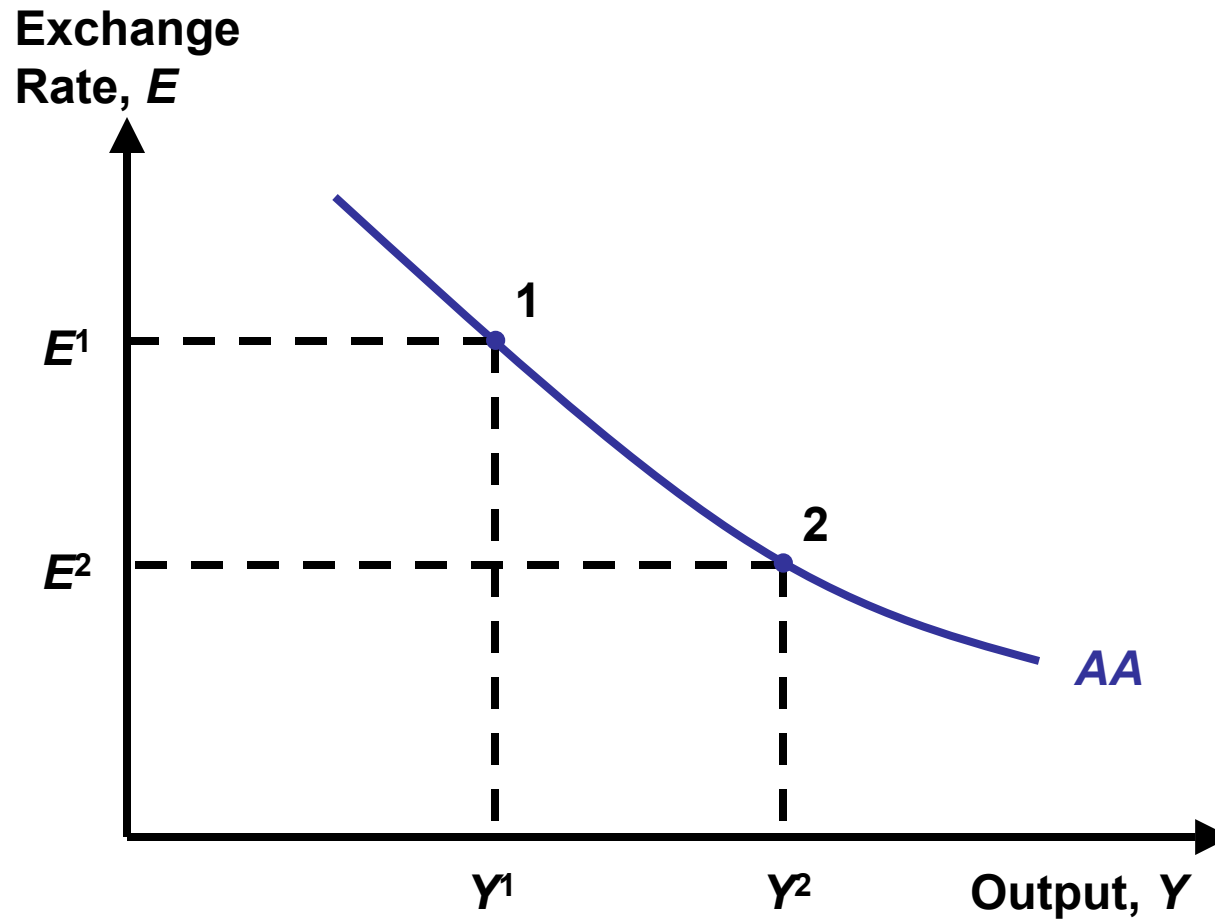
■ Deriving the *AA* Schedule

- It relates exchange rates and output levels that keep the money and foreign exchange markets in equilibrium.
- It slopes downward because a rise in output causes a rise in the home interest rate and a domestic currency appreciation.

Asset Market Equilibrium in the Short Run: The *AA* Schedule



Figure 16-7: The *AA* Schedule





Short-Run Equilibrium for an Open Economy: Putting the *DD* and *AA* Schedules Together

- A short-run equilibrium for the economy as a whole must bring equilibrium simultaneously in the output and asset markets.
 - That is, it must lie on both *DD* and *AA* schedules.

Asset Market Equilibrium in the Short Run: The *AA* Schedule



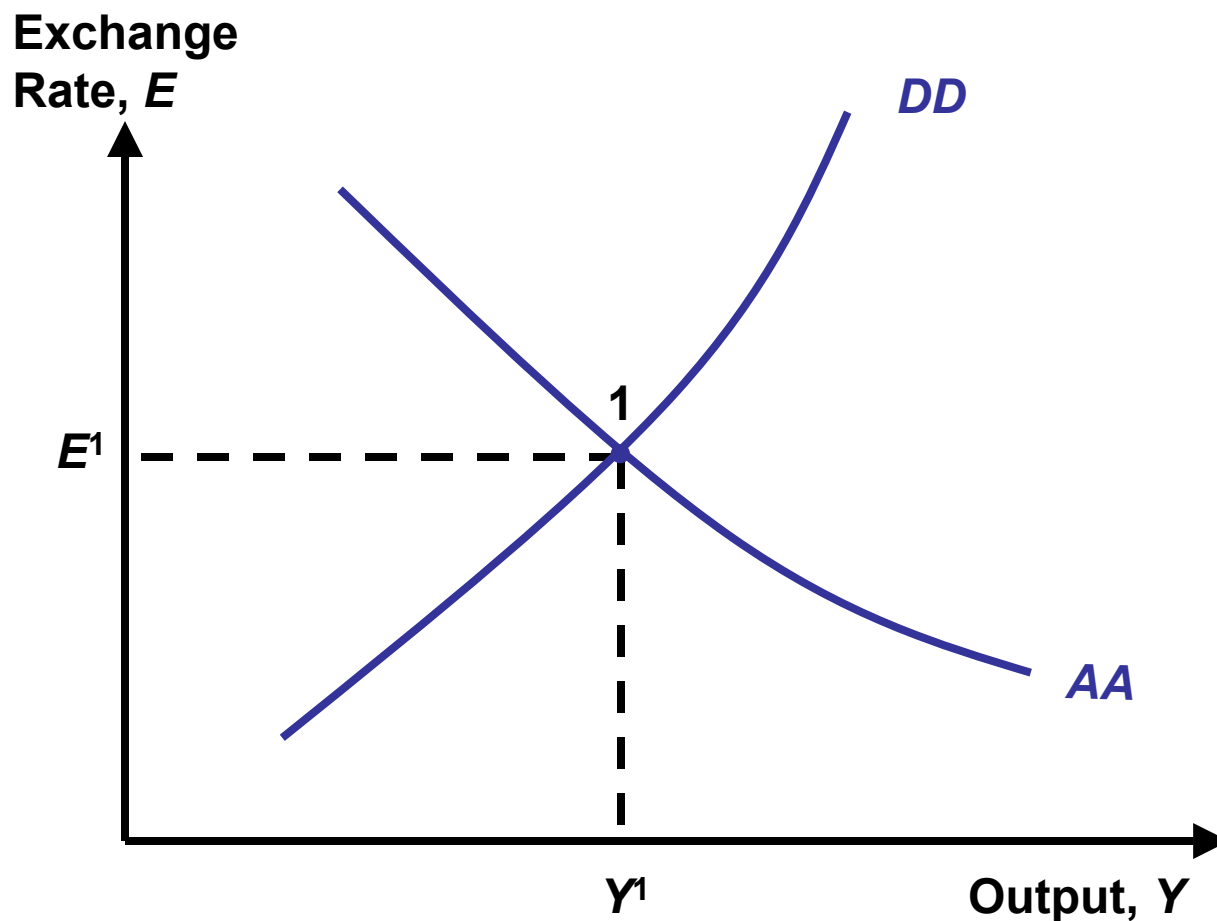
■ Factors that Shift the *AA* Schedule

- Domestic money supply
- Domestic price level
- Expected future exchange rate
- Foreign interest rate
- Shifts in the aggregate real money demand schedule

Short-Run Equilibrium for an Open Economy: Putting the *DD* and *AA* Schedules Together



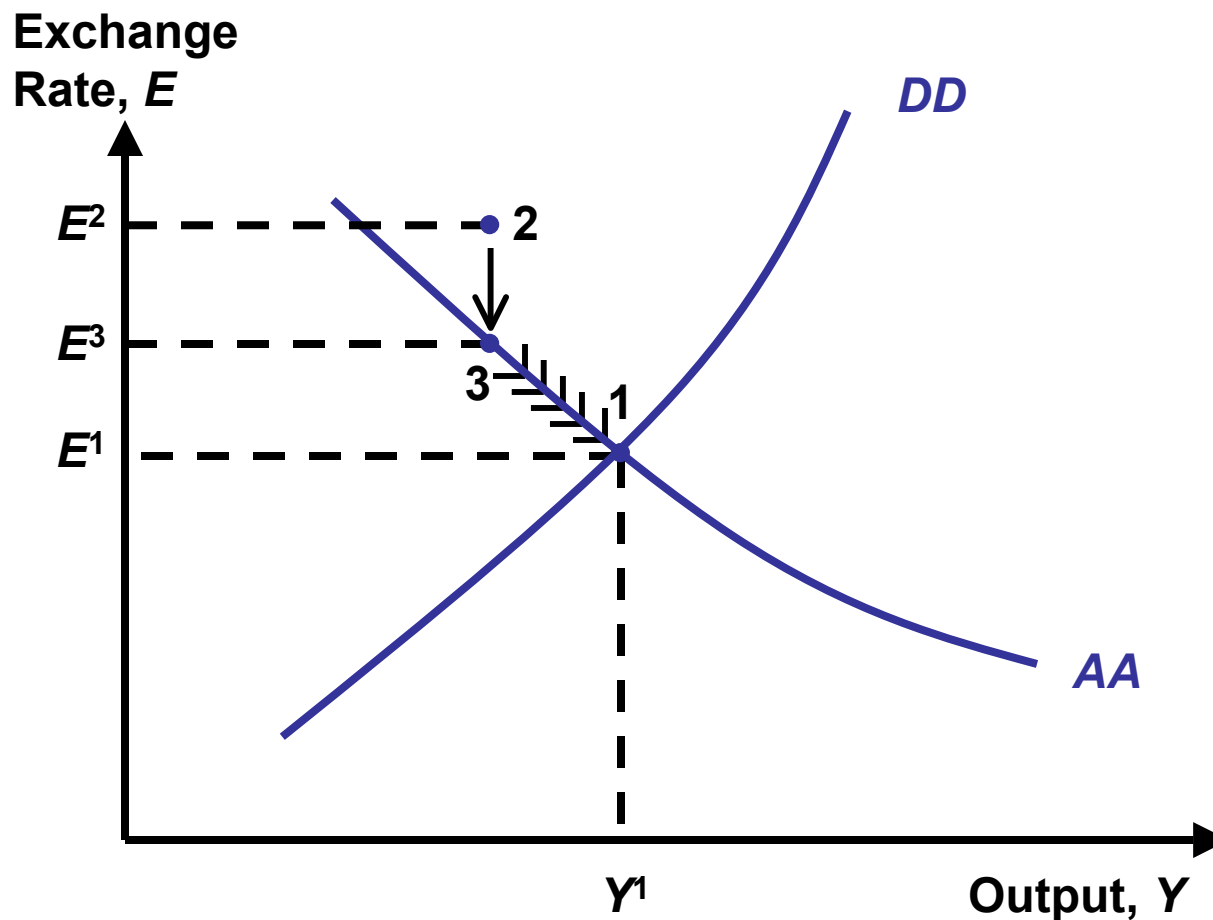
Figure 16-8: Short-Run Equilibrium: The Intersection of *DD* and *AA*



Short-Run Equilibrium for an Open Economy: Putting the *DD* and *AA* Schedules Together



Figure 16-9: How the Economy Reaches Its Short-Run Equilibrium



Temporary Changes in Monetary and Fiscal Policy



- Two types of government policy:
 - **Monetary policy**
 - It works through changes in the money supply.
 - **Fiscal policy**
 - It works through changes in government spending or taxes.
 - Temporary policy shifts are those that the public expects to be reversed in the near future and do not affect the long-run expected exchange rate.
 - Assume that policy shifts do not influence the foreign interest rate and the foreign price level.

Temporary Changes in Monetary and Fiscal Policy



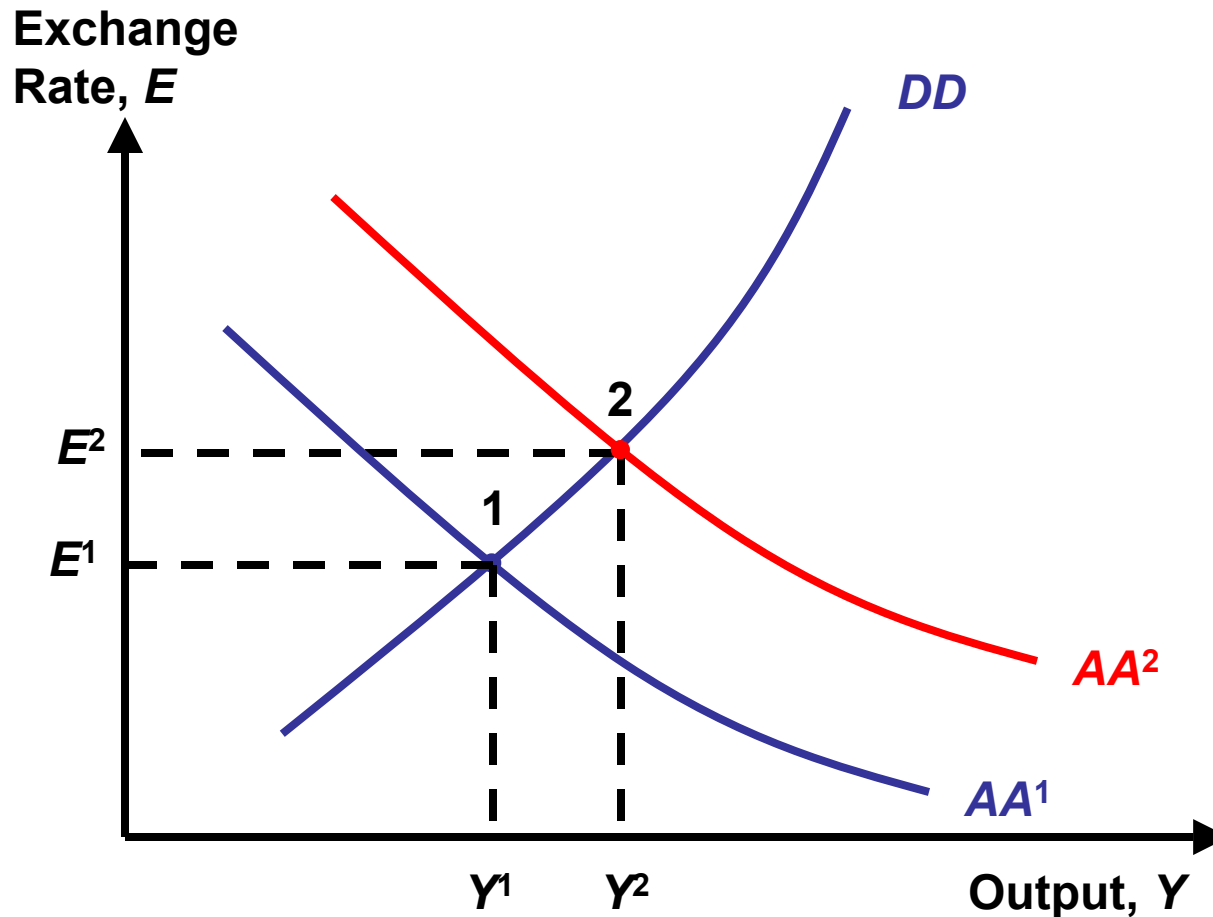
■ Monetary Policy

- An increase in money supply (i.e., expansionary monetary policy) raises the economy's output.
 - The increase in money supply creates an excess supply of money, which lowers the home interest rate.
 - As a result, the domestic currency must depreciate (i.e., home products become cheaper relative to foreign products) and aggregate demand increases.

Temporary Changes in Monetary and Fiscal Policy



Figure 16-10: Effects of a Temporary Increase in the Money Supply



Temporary Changes in Monetary and Fiscal Policy



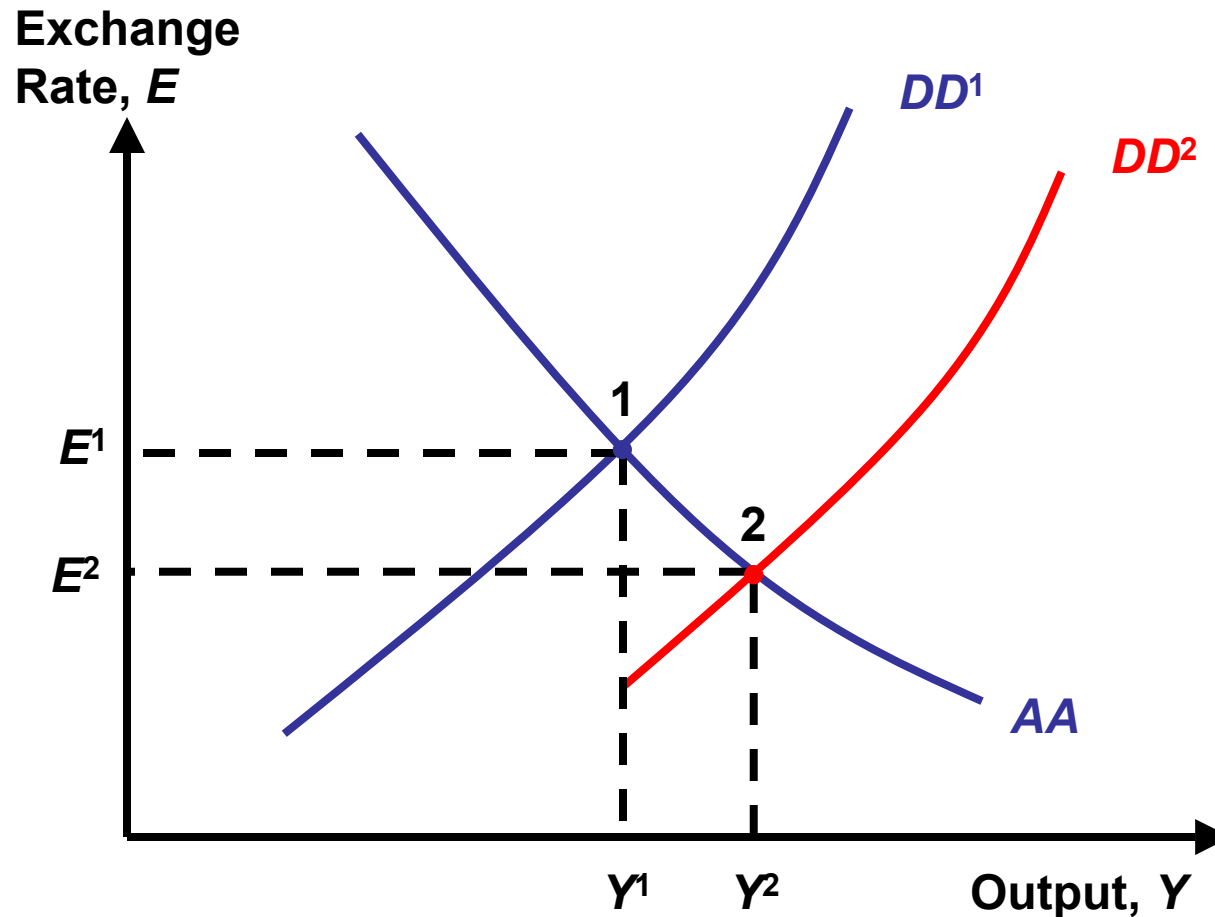
■ Fiscal Policy

- An increase in government spending, a cut in taxes, or some combination of the two (i.e, expansionary fiscal policy) raises output.
 - The increase in output raises the transactions demand for real money holdings, which in turn increases the home interest rate.
 - As a result, the domestic currency must appreciate.

Temporary Changes in Monetary and Fiscal Policy



Figure 16-11: Effects of a Temporary Fiscal Expansion



Temporary Changes in Monetary and Fiscal Policy

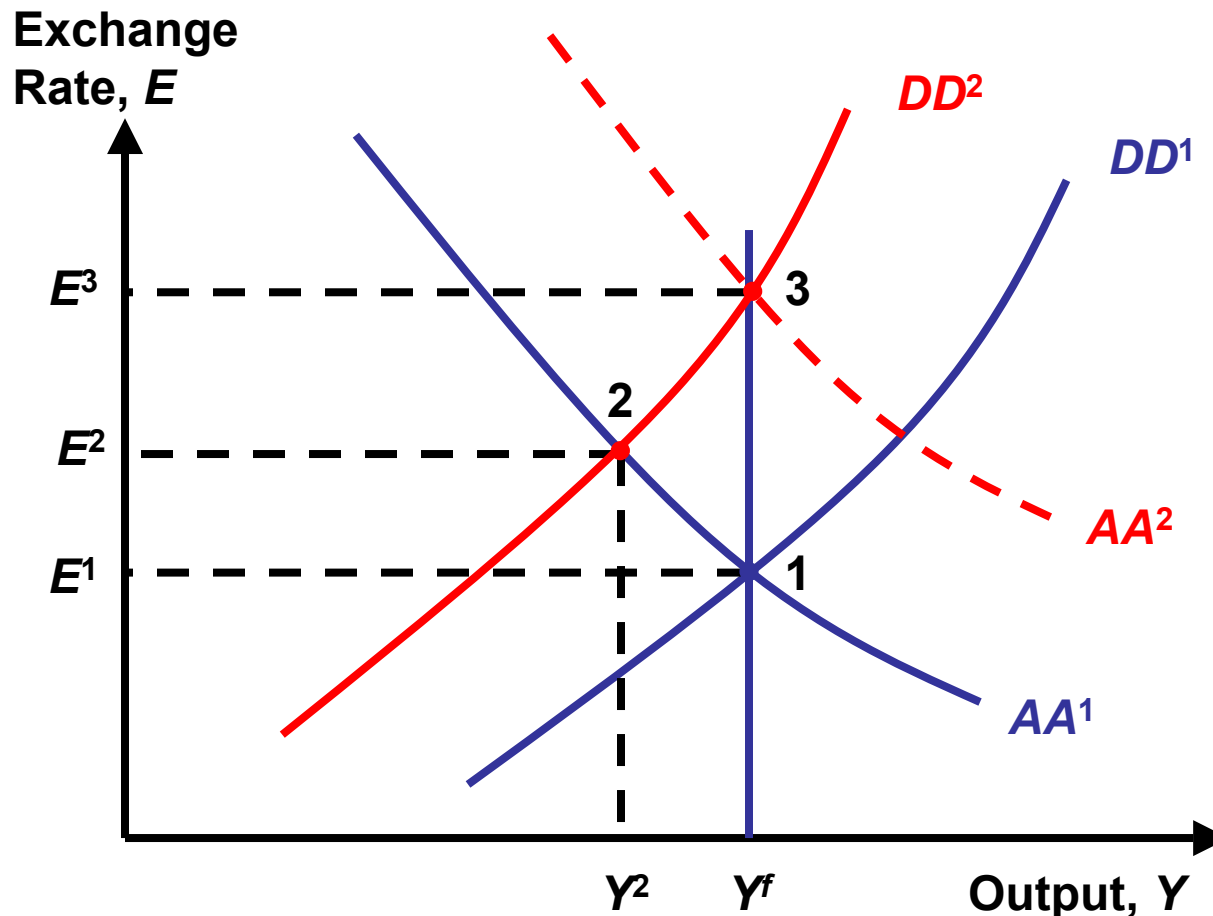


- Policies to Maintain Full Employment
 - Temporary disturbances that lead to recession can be offset through expansionary monetary or fiscal policies.
 - Temporary disturbances that lead to overemployment can be offset through contractionary monetary or fiscal policies.

Temporary Changes in Monetary and Fiscal Policy



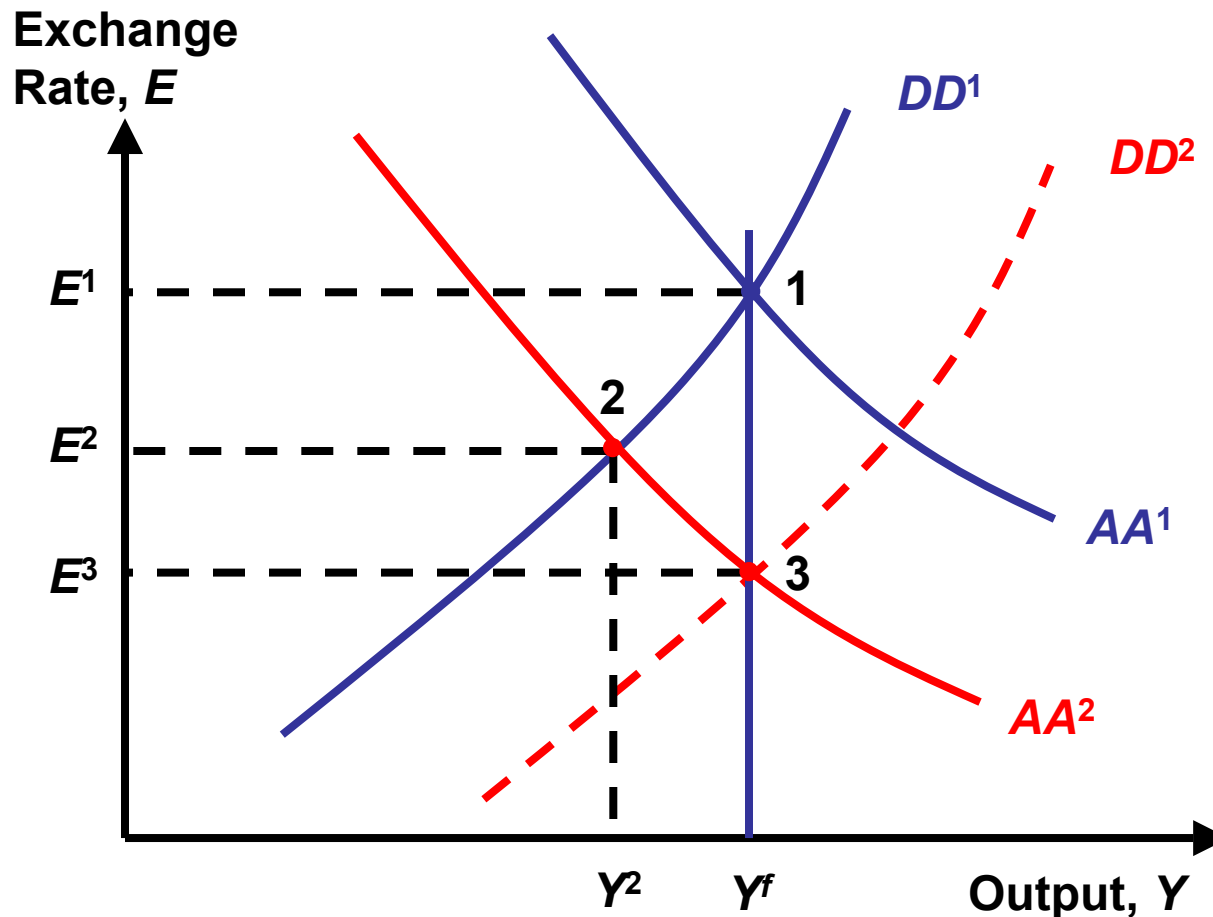
Figure 16-12: Maintaining Full Employment After a Temporary Fall in World Demand for Domestic Products



Temporary Changes in Monetary and Fiscal Policy



Figure 16-13: Policies to Maintain Full Employment After a Money-Demand Increase



Inflation Bias and Other Problems of Policy Formulation



- Problems of policy formulation:
 - **Inflation bias**
 - High inflation with no average gain in output that results from governments' policies to prevent recession
 - Identifying the sources of economic changes
 - Identifying the durations of economic changes
 - The impact of fiscal policy on the government budget
 - Time lags in implementing policies

Permanent Shifts in Monetary and Fiscal Policy

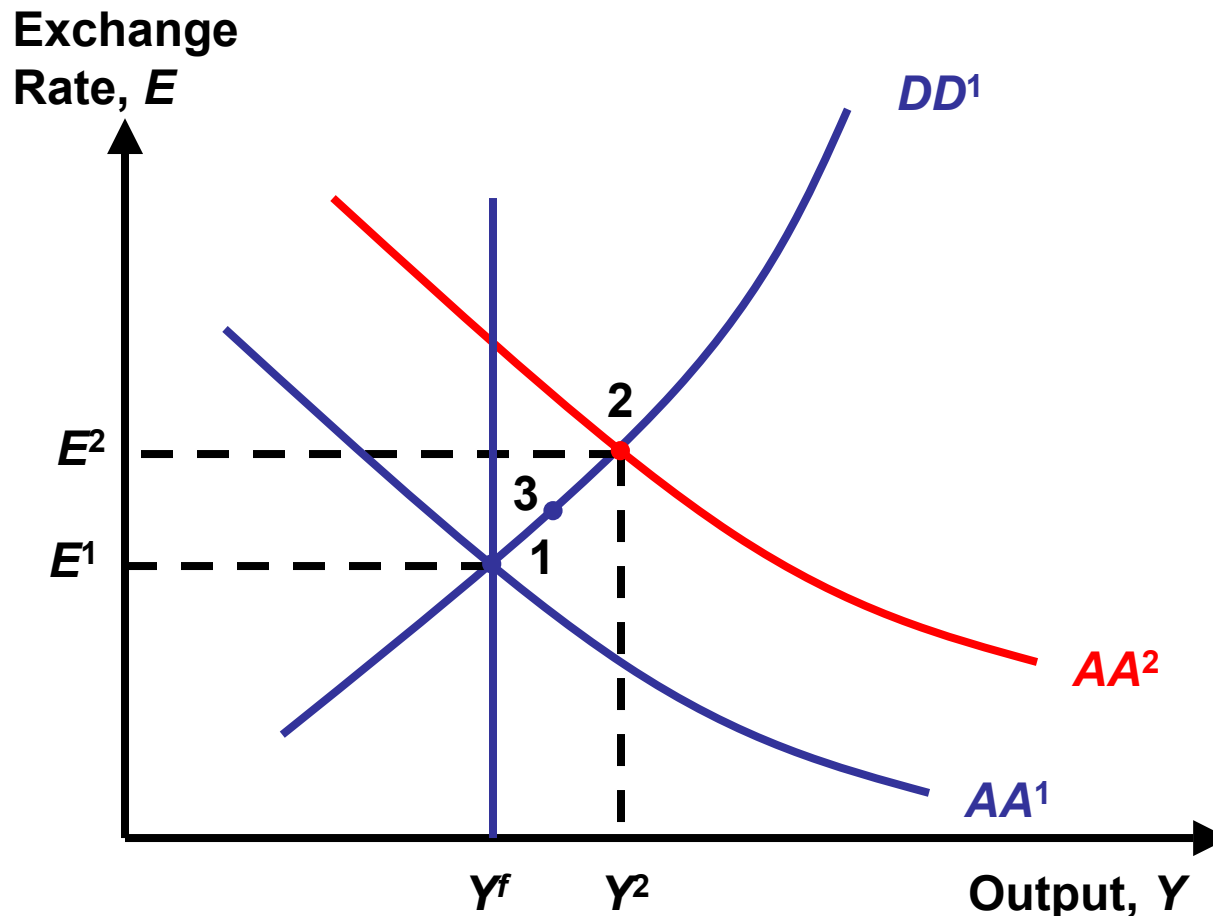


- A permanent policy shift affects not only the current value of the government's policy instrument but also the *long-run* exchange rate.
 - This affects expectations about future exchange rates.
- **A Permanent Increase in the Money Supply**
 - A permanent increase in the money supply causes the expected future exchange rate to rise proportionally.
 - As a result, the upward shift in the *AA* schedule is greater than that caused by an equal, but transitory, increase (compare point 2 with point 3 in Figure 16-14).

Permanent Shifts in Monetary and Fiscal Policy



Figure 16-14: Short-Run Effects of a Permanent Increase in the Money Supply



Permanent Shifts in Monetary and Fiscal Policy

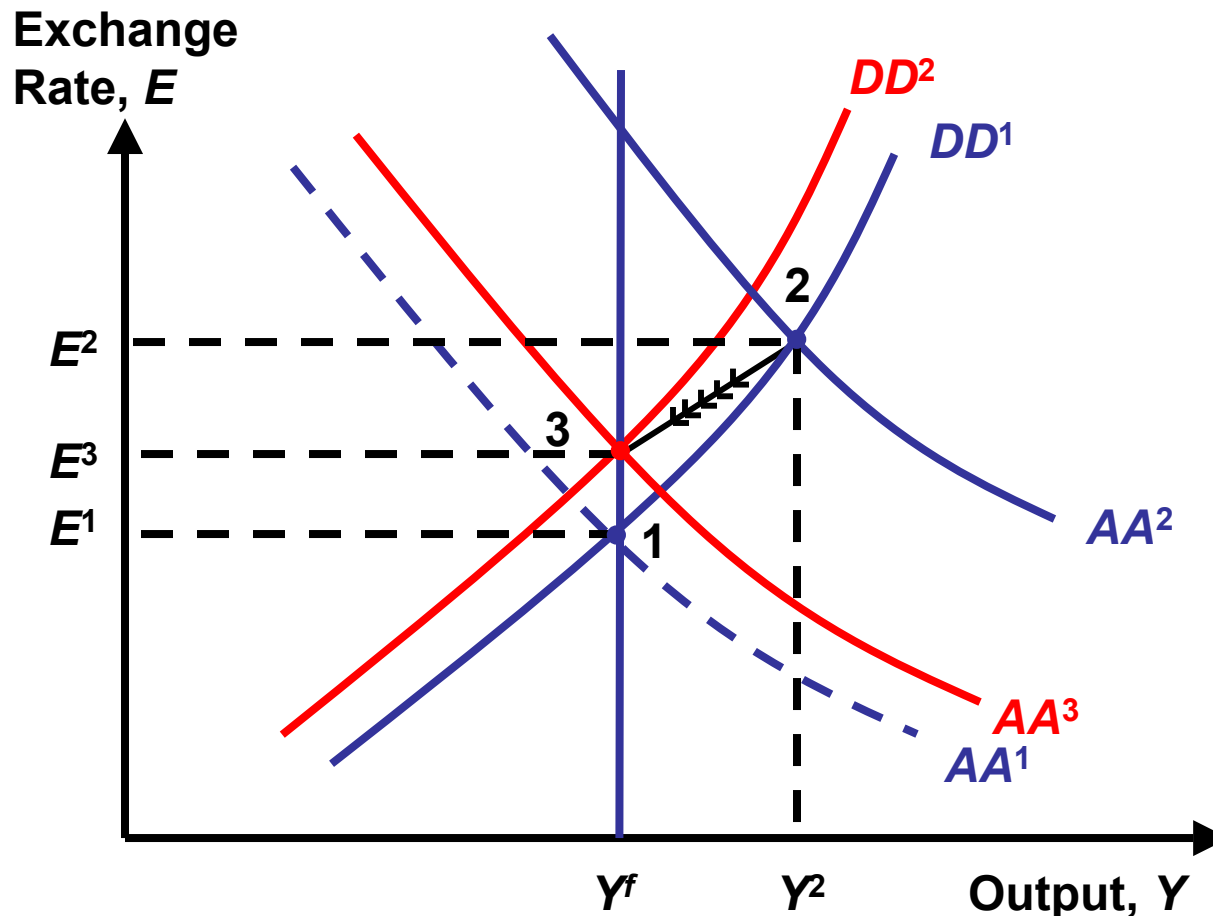


- Adjustment to a Permanent Increase in the Money Supply
 - The permanent increase in the money supply raises output above its full-employment level.
 - As a result, the price level increases to bring the economy back to full employment.
 - Figure 16-15 shows the adjustment back to full employment.

Permanent Shifts in Monetary and Fiscal Policy



Figure 16-15: Long-Run Adjustment to a Permanent Increase in the Money Supply



Permanent Shifts in Monetary and Fiscal Policy

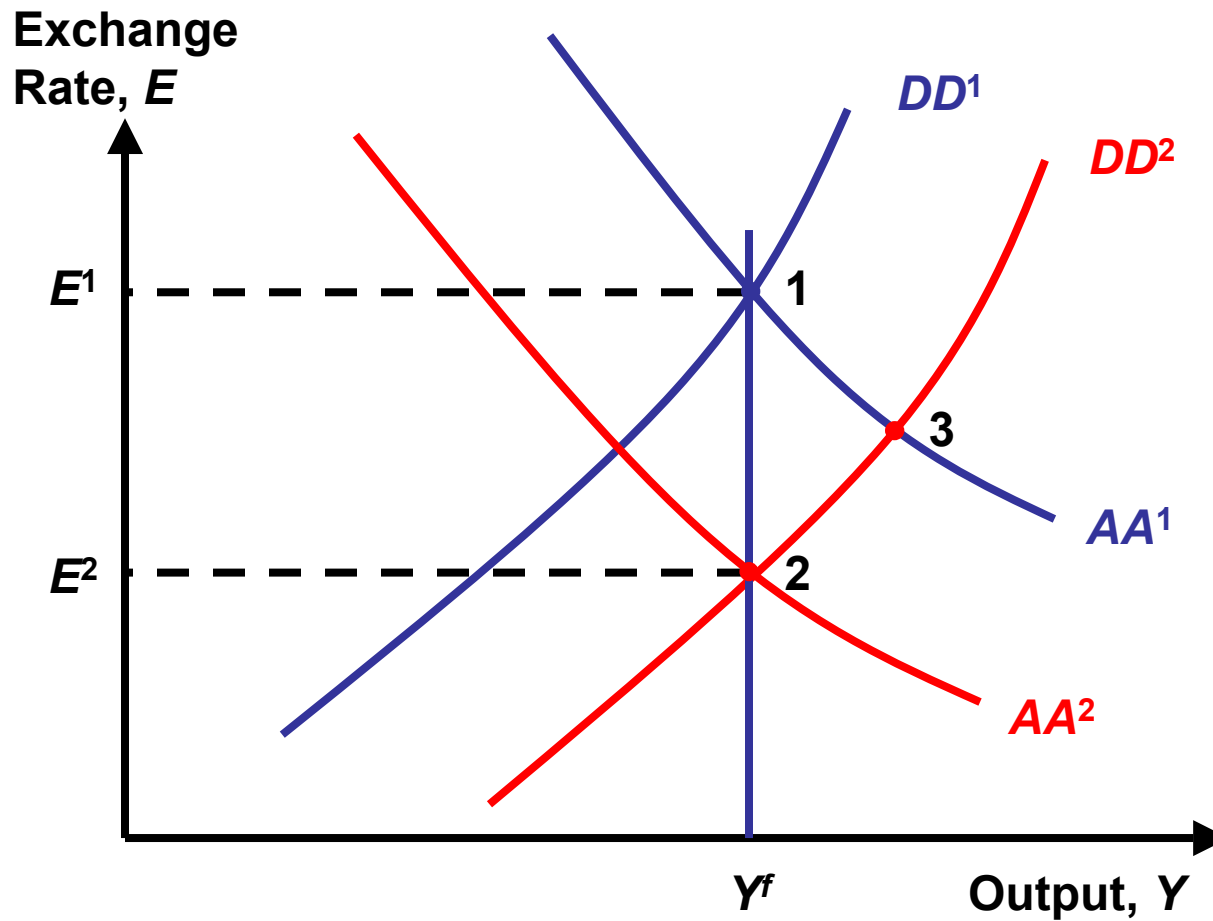


- **A Permanent Fiscal Expansion**
 - A permanent fiscal expansion changes the long-run expected exchange rate.
 - If the economy starts at long-run equilibrium, a permanent change in fiscal policy has no effect on output.
 - It causes an immediate and permanent exchange rate jump that offsets exactly the fiscal policy's direct effect on aggregate demand.

Permanent Shifts in Monetary and Fiscal Policy



Figure 16-16: Effects of a Permanent Fiscal Expansion Changing the Capital Stock



Macroeconomic Policies and the Current Account



- *XX* schedule
 - It shows combinations of the exchange rate and output at which the *CA* balance would be equal to some desired level.
 - It slopes upward because a rise in output encourages spending on imports and thus worsens the current account (if it is not accompanied by a currency depreciation).
 - It is flatter than *DD*.

Macroeconomic Policies and the Current Account

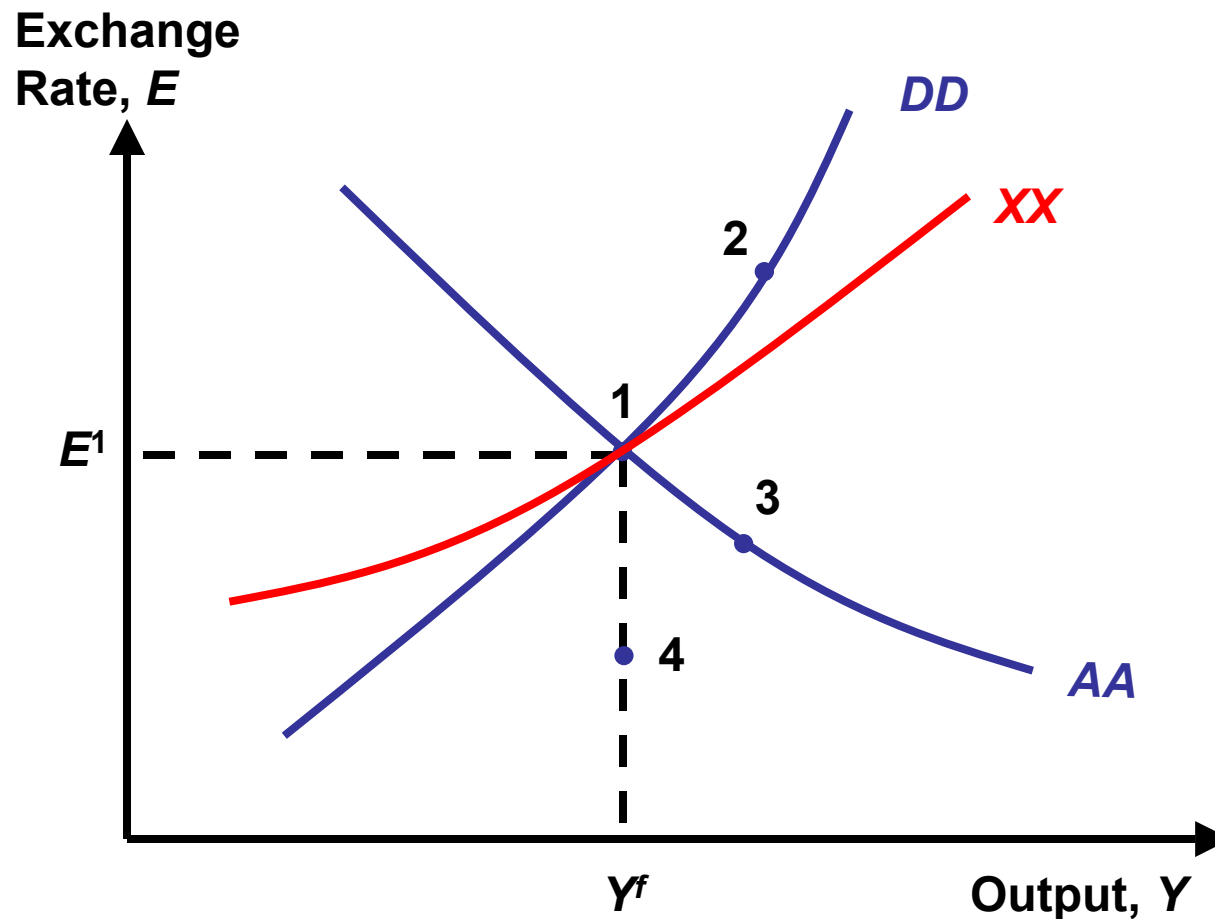


- Monetary expansion causes the *CA* balance to increase in the short run (point 2 in Figure 16-17).
- Expansionary fiscal policy reduces the *CA* balance.
 - If it is temporary, the *DD* schedule shifts to the right (point 3 in Figure 16-17).
 - If it is permanent, both *AA* and *DD* schedules shift (point 4 in Figure 16-17).

Macroeconomic Policies and the Current Account



Figure 16-17: How Macroeconomic Policies Affect the Current Account



Gradual Trade Flow Adjustment and Current Account Dynamics



■ The J-Curve

- If imports and exports adjust gradually to real exchange rate changes, the *CA* may follow a J-curve pattern after a real currency depreciation, first worsening and then improving.
 - Currency depreciation may have a contractionary initial effect on output, and exchange rate overshooting will be amplified.
- It describes the time lag with which a real currency depreciation improves the *CA*.

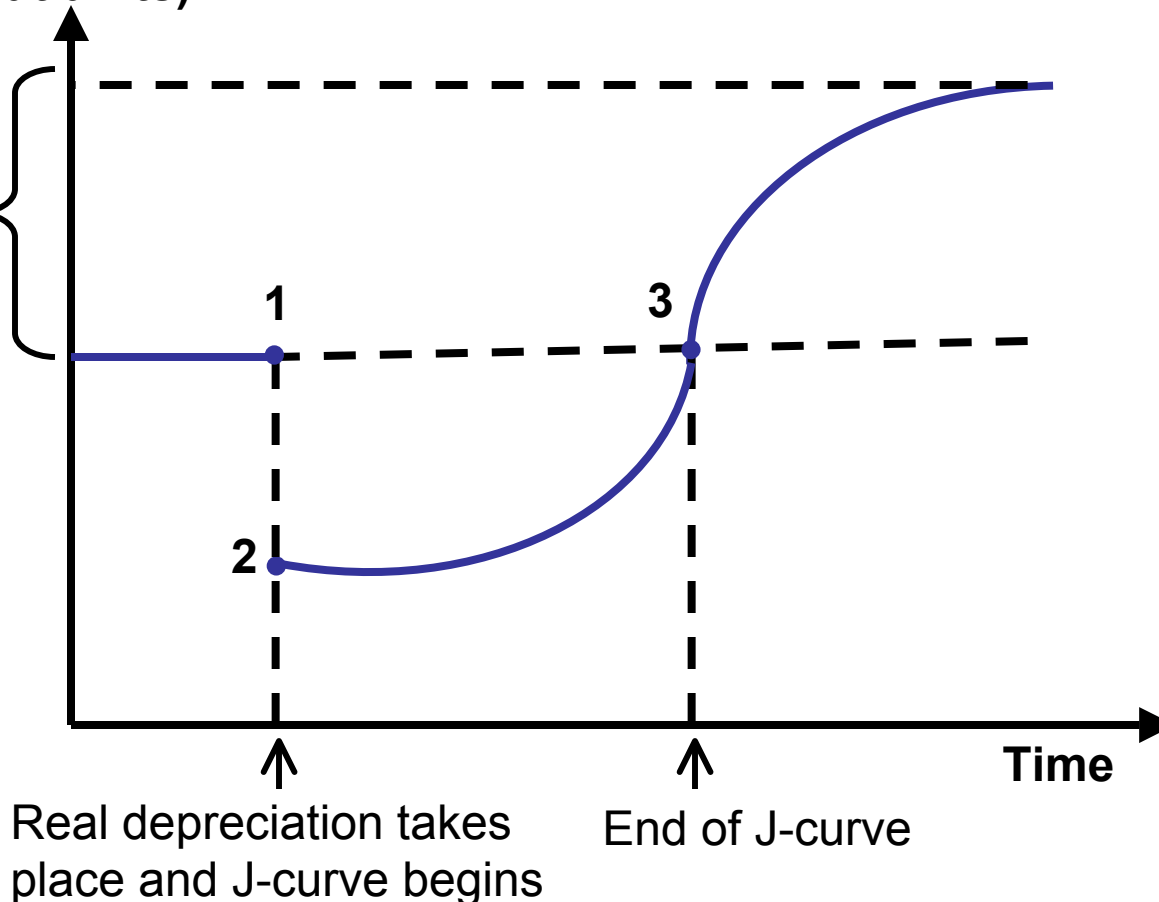
Gradual Trade Flow Adjustment and Current Account Dynamics



Figure 16-18: The J-Curve

Current account (in domestic output units)

Long-run effect of real depreciation on the current account



Gradual Trade Flow Adjustment and Current Account Dynamics



- **Exchange Rate Pass-Through and Inflation**
 - The *CA* in the *DD-AA* model has assumed that nominal exchange rate changes cause proportional changes in the real exchange rates in the short run.
 - **Degree of Pass-through**
 - It is the percentage by which import prices rise when the home currency depreciates by 1%.
 - In the *DD-AA* model, the degree of pass-through is 1.
 - Exchange rate pass-through can be incomplete because of international market segmentation.
 - Currency movements have less-than-proportional effects on the relative prices determining trade volumes.

Summary



- The aggregate demand for an open economy's output consists of four components: consumption demand, investment demand, government demand, and the current account.
- Output is determined in the short run by the equality of aggregate demand and aggregate supply.
- The economy's short-run equilibrium occurs at the exchange rate and output level.

Summary

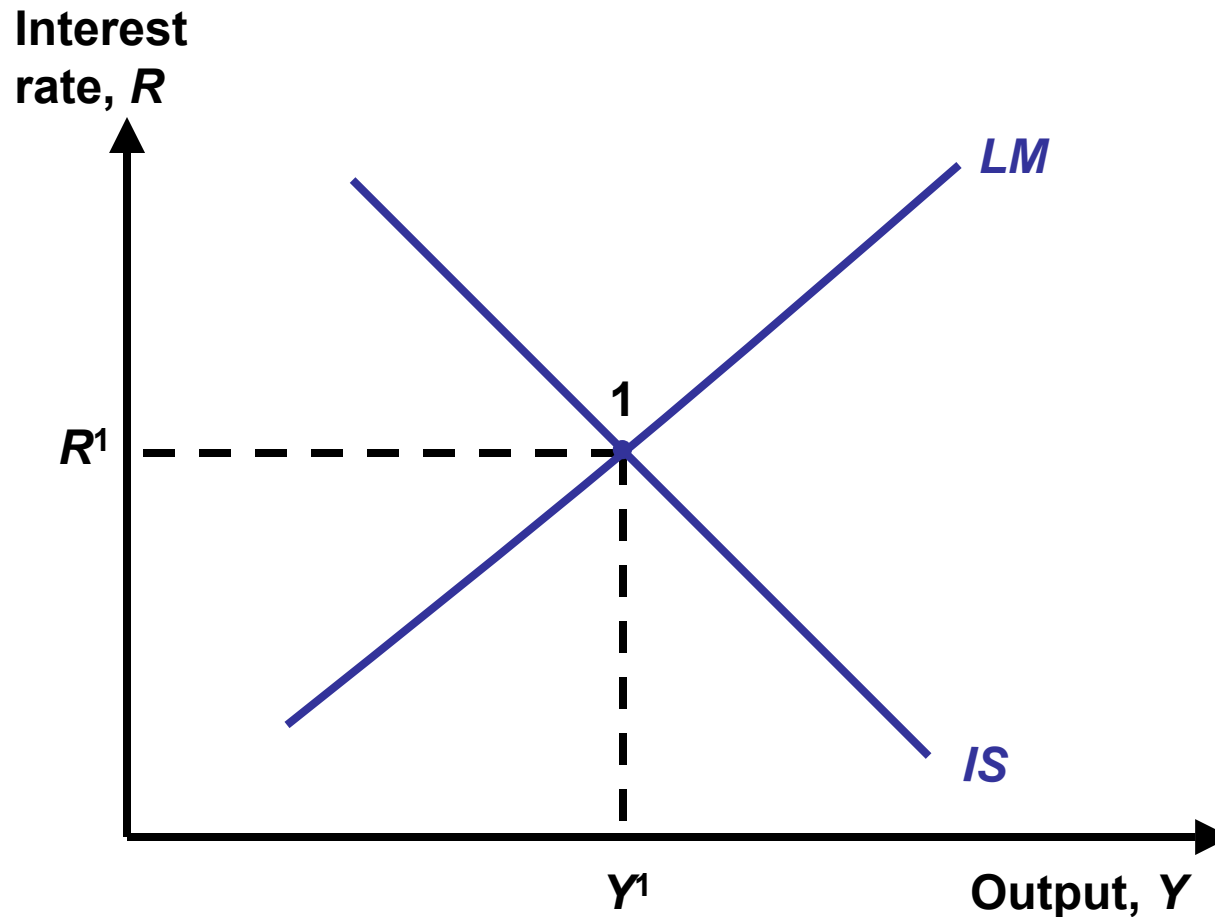


- A temporary increase in the money supply causes a depreciation of the currency and a rise in output.
- Permanent shifts in the money supply cause sharper exchange rate movements and therefore have stronger short-run effects on output than transitory shifts.
- If exports and imports adjust gradually to real exchange rate changes, the current account may follow a J-curve pattern after a real currency depreciation, first worsening and then improving.

Appendix I: The *IS-LM* Model and the *DD-AA* Model



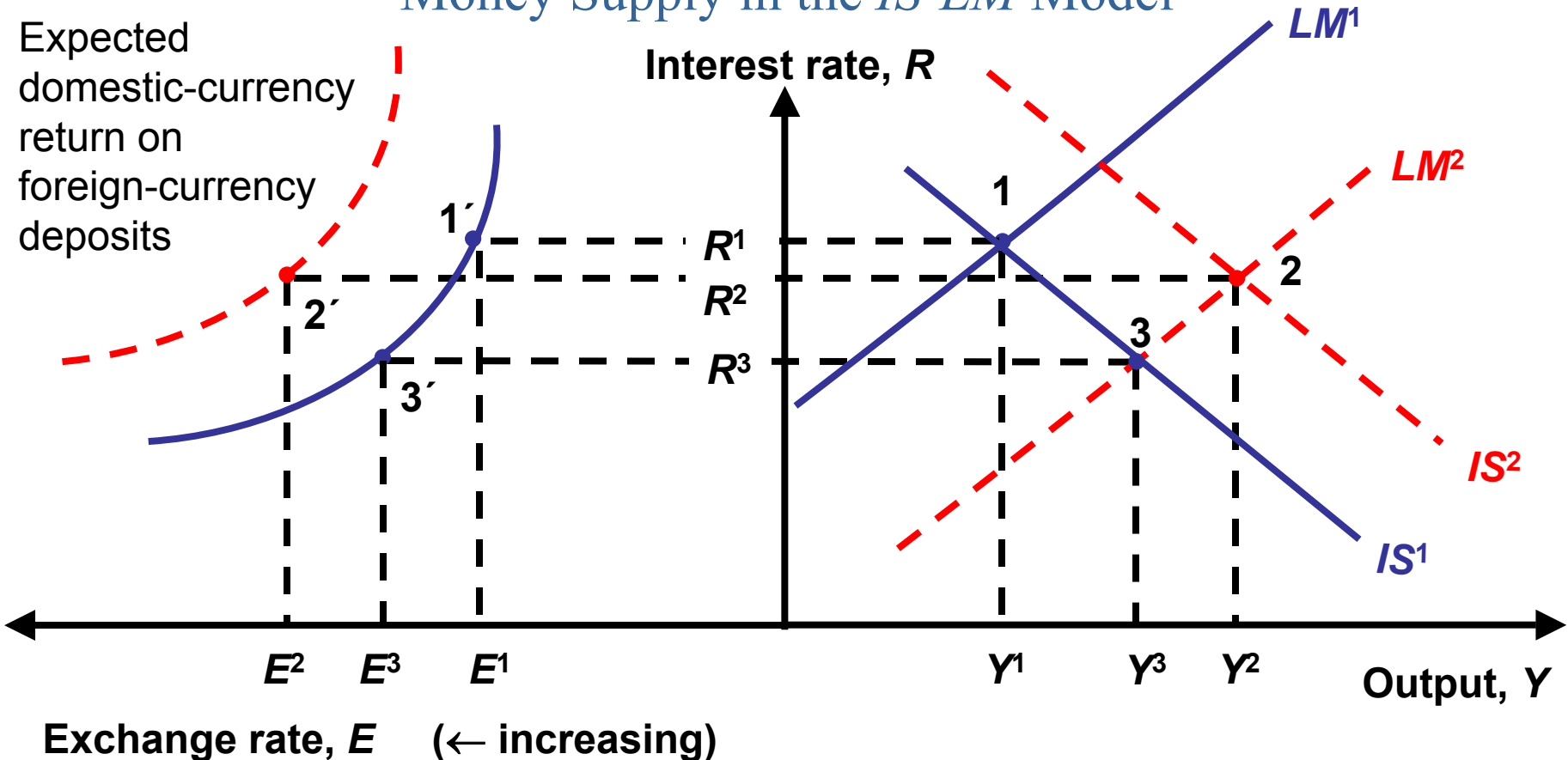
Figure 16AI-1: Short-Run Equilibrium in the *IS-LM* Model



Appendix I: The *IS-LM* Model and the *DD-AA* Model



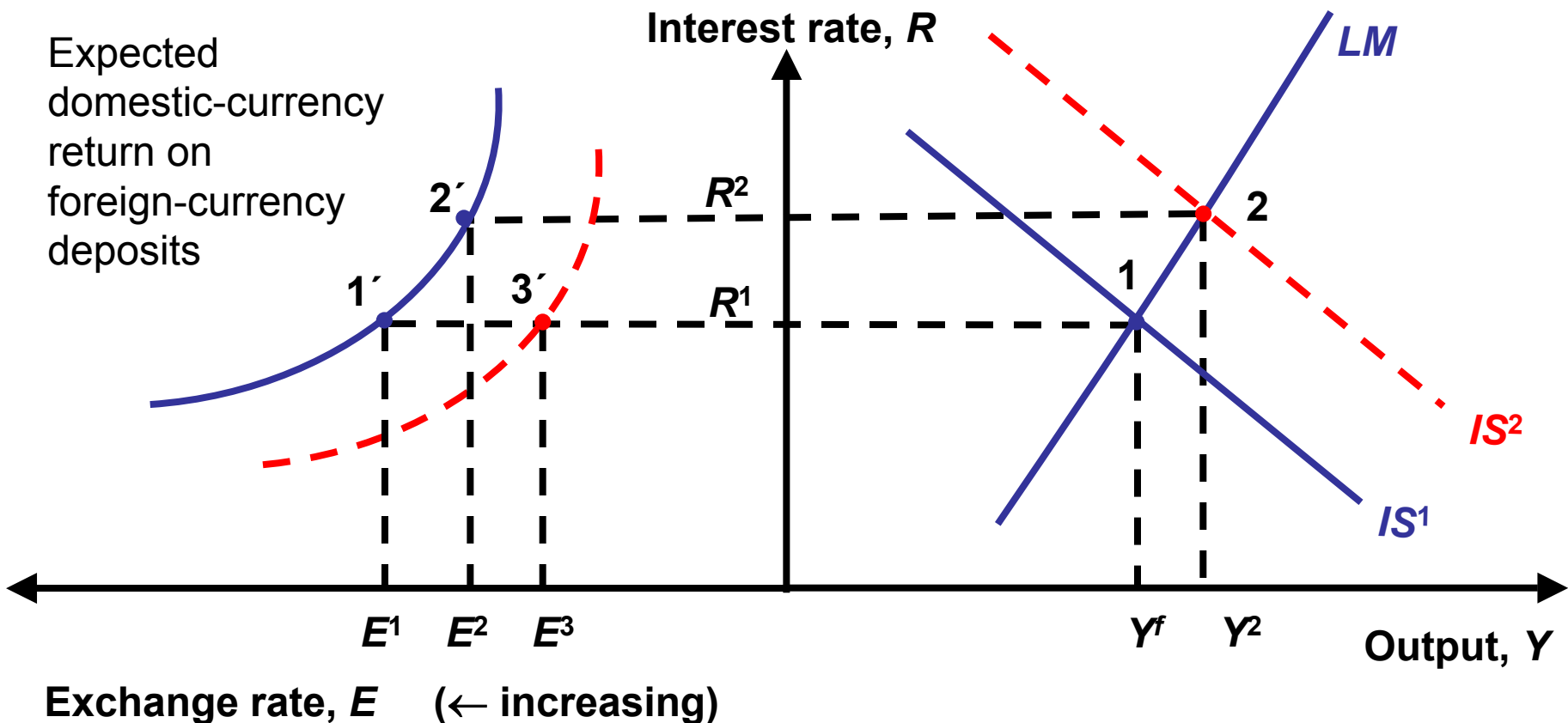
Figure 16AI-2: Effects of Permanent and Temporary Increases in the Money Supply in the *IS-LM* Model



Appendix I: The *IS-LM* Model and the *DD-AA* Model



Figure 16AI-3: Effects of Permanent and Temporary Fiscal Expansions in the *IS-LM* Model



Appendix II: Intertemporal Trade and Consumption Demand



Figure 16AII-1: Change in Output and Saving

