

# *International Macroeconomic Policies*

Thematic Area 6

MSc in ISFM

# GDP Determination in the Open Economy

- To gain a more complete understanding of how an open economy works, we now extend our theory and explore what happens when exchange rates, interest rates, and output fluctuate in the short run.
- Our goal is to build a model that explains the relationships among all the major macroeconomic variables in an open economy in the short run.
- One key lesson we shall learn is that the feasibility and effectiveness of macroeconomic policies depends crucially on the type of exchange rate regime in operation.

# Assumptions

- For our purposes, the foreign economy can be thought of as “the rest of the world” (ROW). The key assumptions we make are as follows:
  - Because we are examining the short run, we assume that home and foreign price levels,  $P$  and  $P^*$ , are fixed due to price stickiness. As a result of price stickiness, expected inflation is fixed at zero,  $\pi^e = 0$ . If prices are fixed, all quantities can be viewed as both real and nominal quantities in the short run because there is no inflation.
  - We assume that conditions in the foreign economy such as foreign output  $Y^*$  and the foreign interest rate  $i^*$  are fixed and taken as given. Our main interest is in the equilibrium and fluctuations in the home economy

# Components of Aggregate Demand (AD)

- Aggregate demand is the aggregate amount of domestically produced goods and services that individuals and institutions are willing to buy:
  1. consumption expenditure
  2. investment expenditure
  3. government purchases
  4. net expenditure by foreigners: net exports of goods and services (or, the current account balance)

# Consumption and Investment Expenditure

Determinants of **consumption expenditure** include:

- **Disposable income:** (aggregate) income from production ( $Y$ ) minus taxes ( $T$ ); i.e.  $Y-T$ .
- More disposable income means more consumption expenditure, but consumption typically increases less than the amount that disposable income increases.

Real interest rates, wealth, and other things may influence the amount of saving and spending on consumption goods, but, for simplicity, we assume that they are relatively unimportant here.

# Investment, Government Spending and Taxes

- For simplicity, we assume that exogenous political factors determine government purchases  $G$  and the level of taxes  $T$ .
- For simplicity, we assume that investment expenditure  $I$  is determined by exogenous business decisions (the “animal spirits” of entrepreneurs, or “market psychology”).
  - A more complicated model would assume that investment depends on the cost of spending or borrowing to finance investment (the real interest rate). The conclusions of the analysis would not change.

# The Current Account (CA)

- Determinants of the current account include:
  - **Real exchange rate:** prices of foreign products relative to the prices of domestic products, both measured in domestic currency:  $EP^*/P$ 
    - As the prices of foreign products rise relative to those of domestic products, expenditure on domestic products rises, and expenditure on foreign products falls.
  - **Disposable income:** more disposable income means more expenditure on foreign products (imports).

<u>Change</u>	<u>Effect on Current Account, CA</u>
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 current account measures the value of exports relative to the value of imports:

$$CA \approx EX - IM.$$

- When the real exchange rate  $EP^*/P$  rises, the prices of foreign products rise relative to the prices of domestic products (this is called “**real depreciation**”).
  1. The **volume** of exports that are bought by foreigners rises.
  2. The **volume** of imports that are bought by domestic residents falls.
  3. The price of imports in terms of domestic products rises. If the volume of imports remain unchanged, then the **value** of imports would rise.
- If the volumes of imports and exports do not change much, the **value effect** may dominate the **volume effect** when the real exchange rate changes.
  - For example, contract obligations to buy fixed quantities of products may cause the volume effect to be small.
- However, evidence indicates that for most countries the volume effect dominates the value effect after one year or less.
- We assume that a real depreciation improves the current account: the volume effect dominates the value effect.



# The Aggregate Demand Function

- Aggregate demand is therefore expressed as:

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

Consumption expenditure as a function of disposable income

Investment expenditure and government purchases, both exogenous

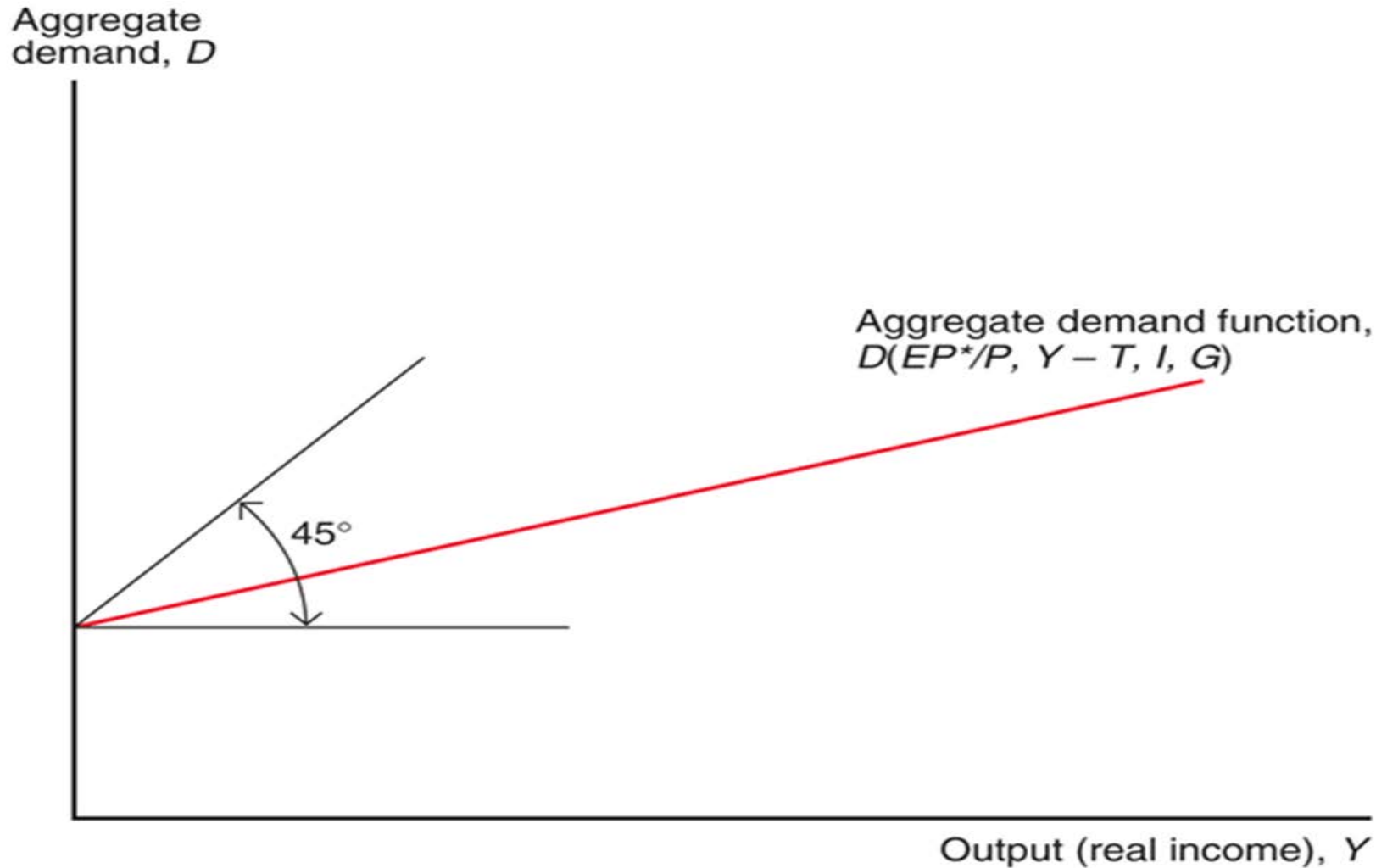
Current account as a function of the real exchange rate and disposable income.

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

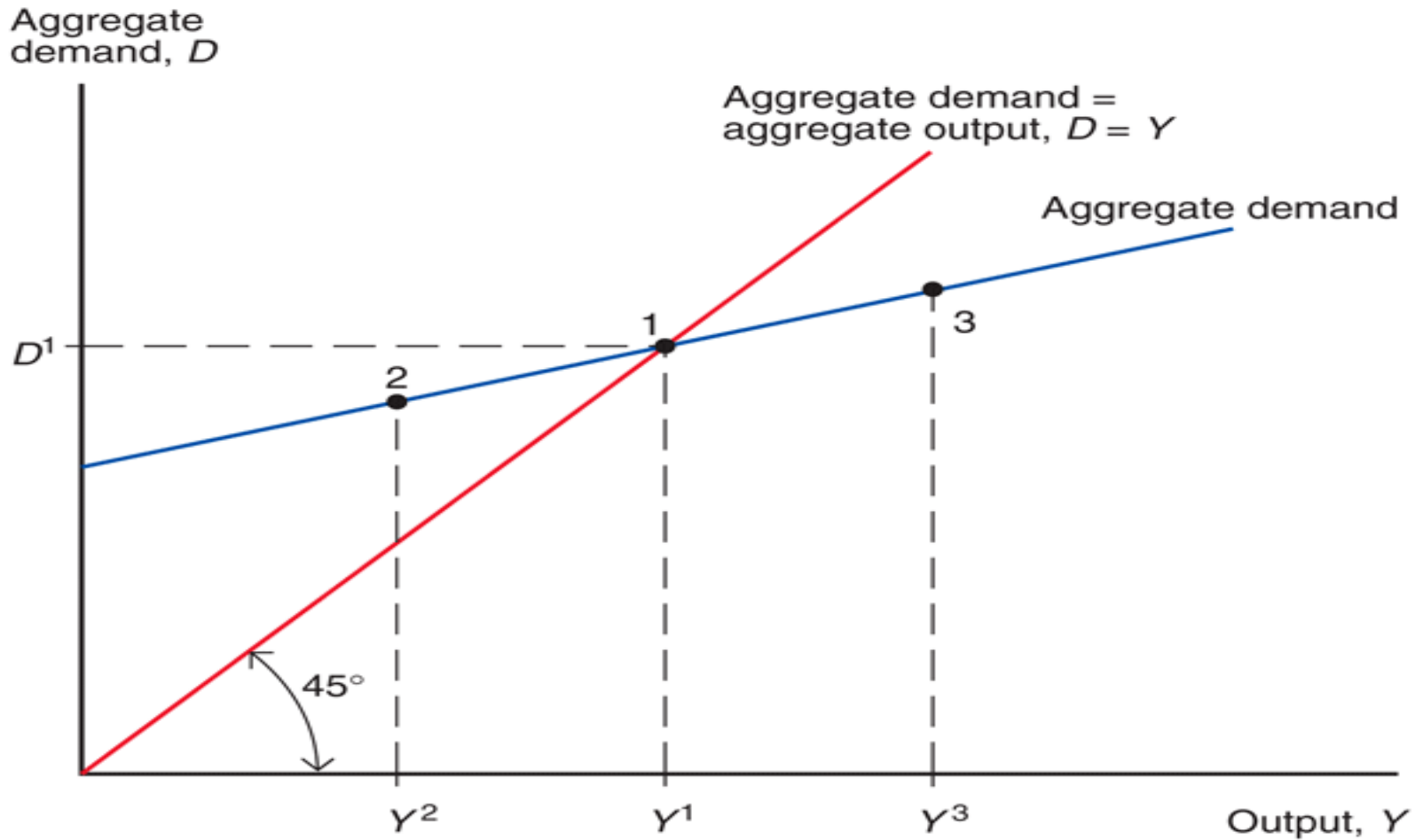
## Determinants of aggregate demand include:

- **Real exchange rate:** an increase in the real exchange rate increases the current account, and therefore increases aggregate demand of domestic products.
- **Disposable income:** an increase in the disposable income increases consumption expenditure, but decreases the current account.
  - Since consumption expenditure is usually greater than expenditure on foreign products, the first effect dominates the second effect.
  - As income increases for a given level of taxes, aggregate consumption expenditure and aggregate demand increase by less than income.

# Aggregate Demand as Function of Output



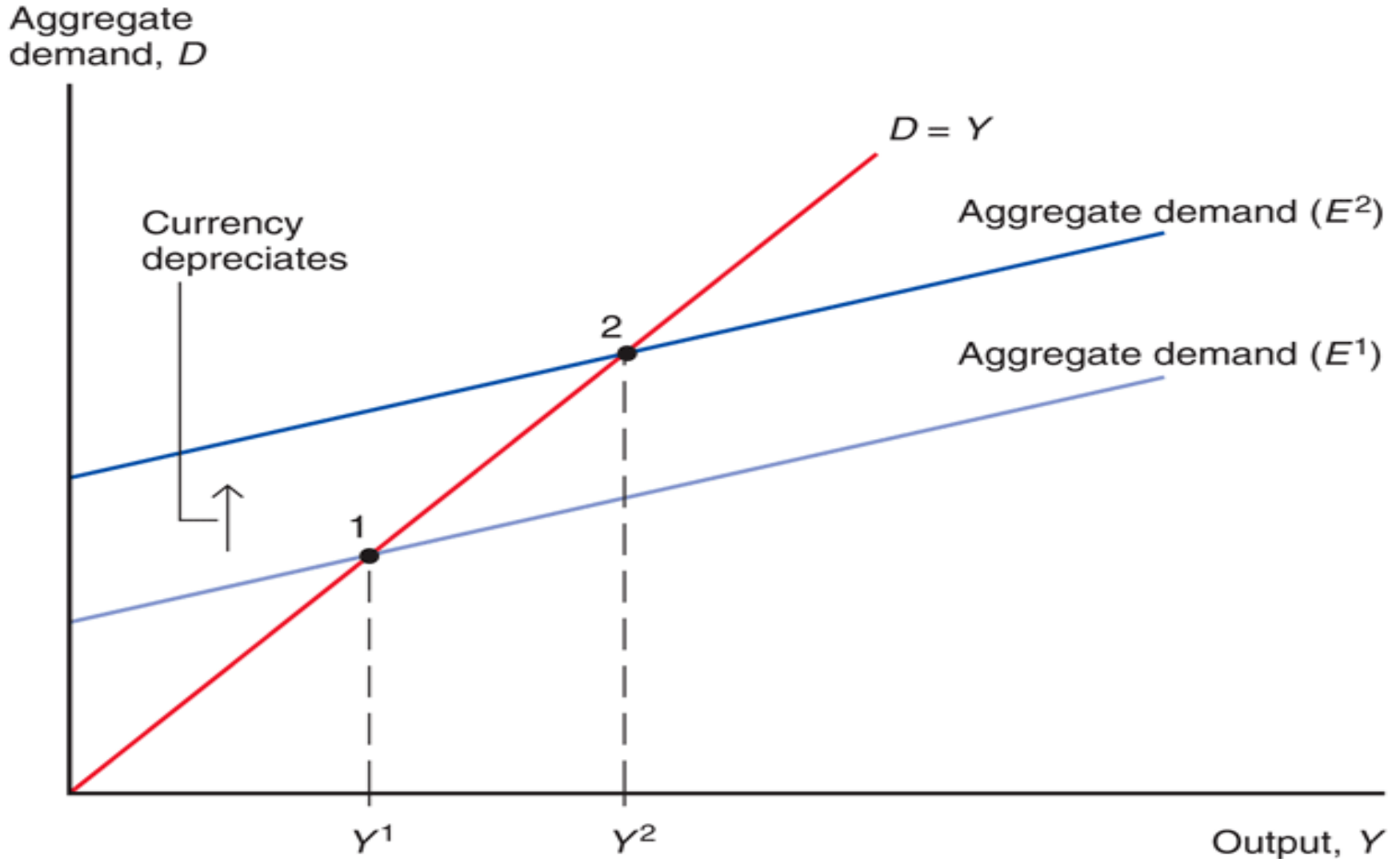
# Output Determination in the Short-Run



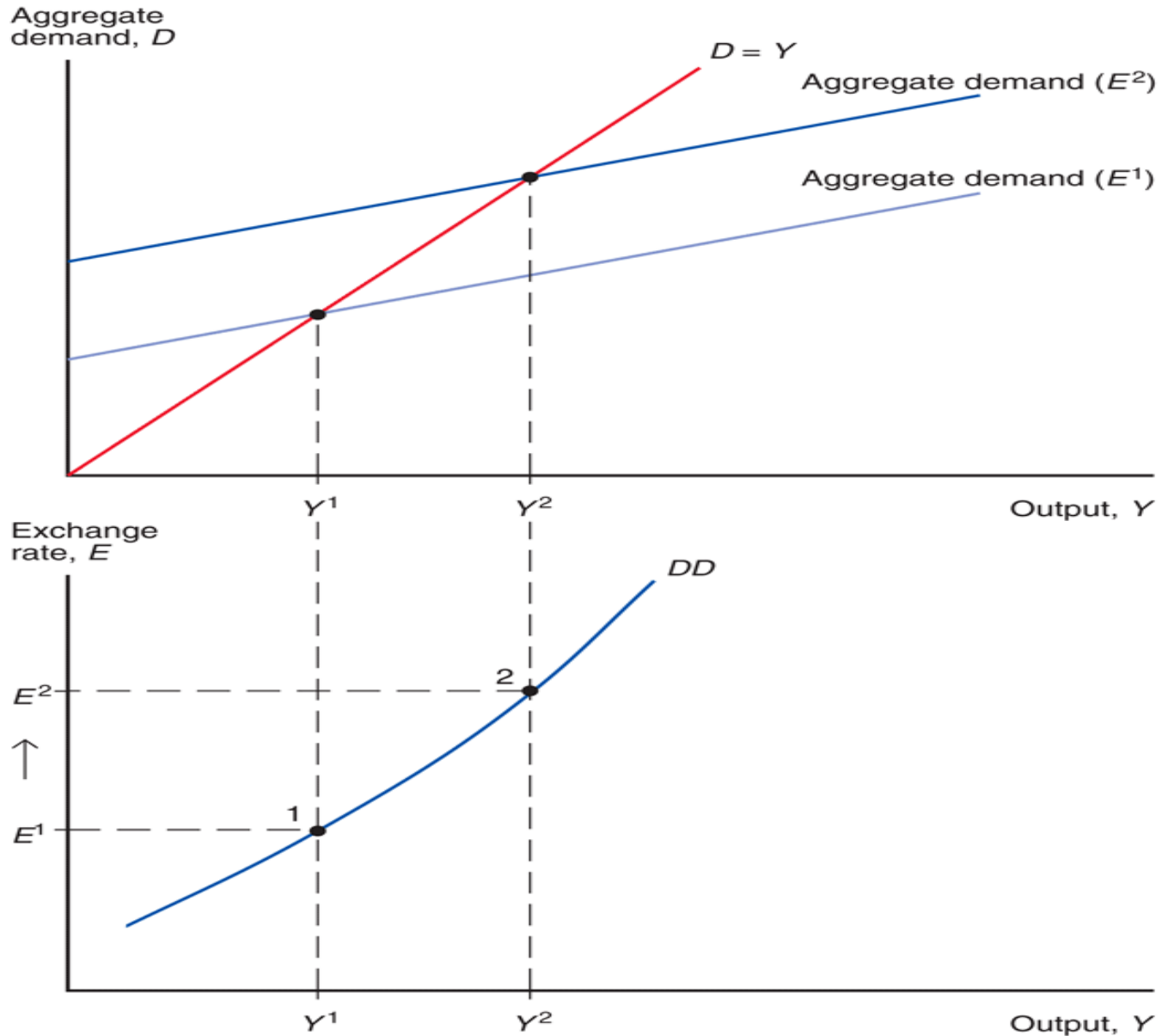
# Short-Run Equilibrium and the Exchange Rate: *DD* Schedule

- How does the exchange rate affect the short-run equilibrium of aggregate demand and output?
- With fixed domestic and foreign levels of average prices, a rise in the nominal exchange rate makes foreign goods and services more expensive relative to domestic goods and services.
- A rise in the nominal exchange rate (a domestic currency depreciation) increases aggregate demand of domestic products.
- In equilibrium, production will increase to match the higher aggregate demand.

# Output Effect of a Currency Depreciation with Fixed Output Prices



# Derivation of the DD schedule



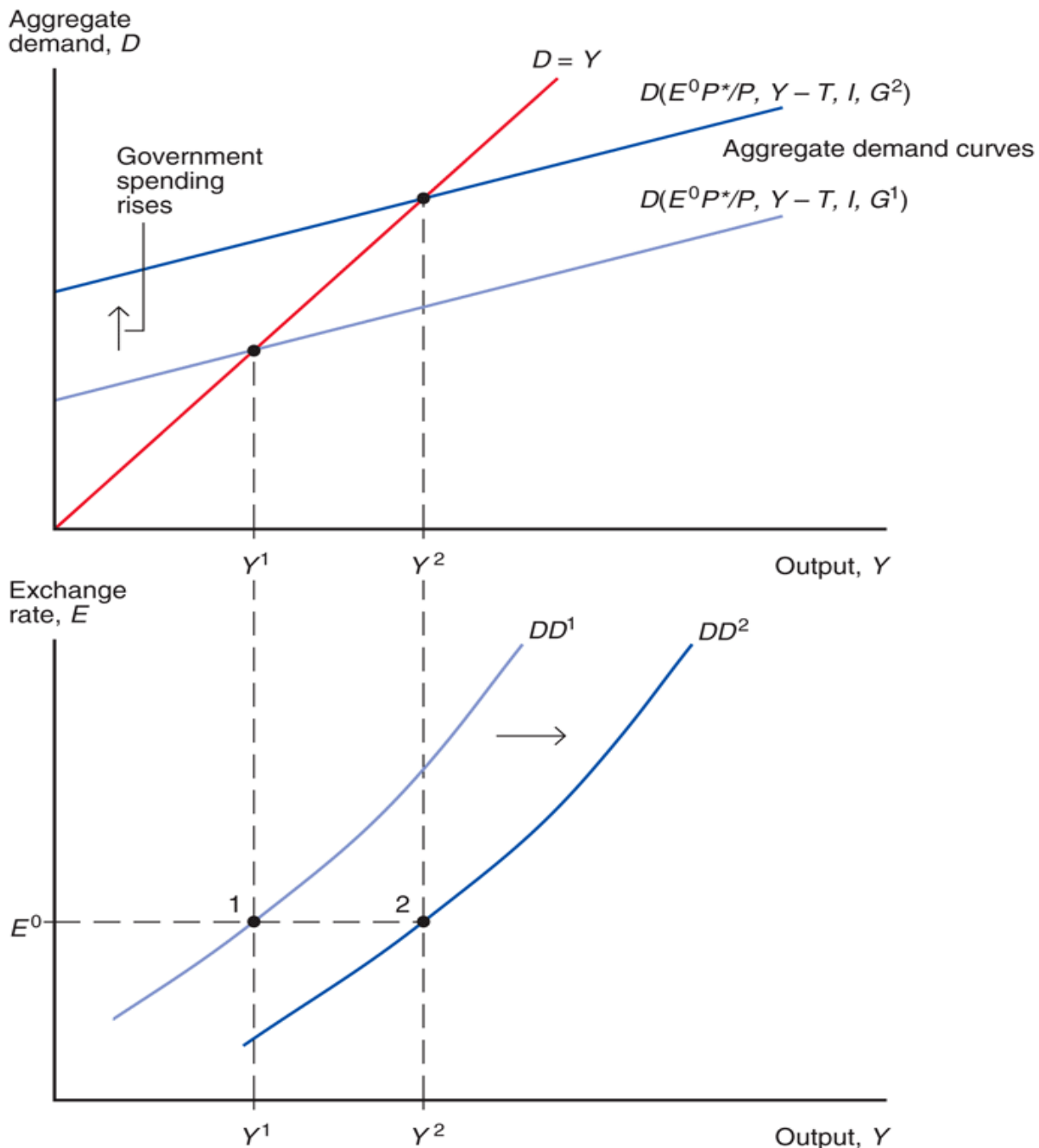
## the *DD* schedule

- shows combinations of output and the exchange rate at which the output market is in short-run equilibrium (such that aggregate demand = aggregate output).
- It has a positive slope because a rise in the exchange rate causes aggregate demand and aggregate output to rise.
- **Note: changes in the exchange rate cause movements along a DD curve. Changes in other variables may cause it to shift ...**



# Shifting the DD Curve

**Changes in  $G$ :**  
more government purchases cause higher aggregate demand, for every exchange rate: the  $DD$  curve shifts to the right.



# Shifting the DD Curve

**Changes in  $T$ :** lower taxes increase disposable income and consumption expenditure, and increase aggregate demand for every exchange rate: the  $DD$  curve shifts right.

For similar reasons:

**Changes in  $I$ :** higher investment expenditure is represented by shifting the  $DD$  curve right.

**Changes in  $P$  relative to  $P^*$ :** lower domestic prices relative to foreign prices are represented by shifting the  $DD$  curve right.

**Changes in demand of domestic goods relative to foreign goods:** willingness to consume more domestic goods relative to foreign goods is represented by shifting the  $DD$  curve right.

**IN GENERAL: WHATEVER INCREASES (DECREASES) AGGREGATE DEMAND FOR DOMESTICALLY PRODUCED GOODS SHIFTS THE  $DD$  CURVE TO THE RIGHT (LEFT)**

# Short-Run Equilibrium in Asset Markets

- We consider two sets of asset markets:
  1. Foreign exchange (FX) market
    - Uncovered Interest Parity (UIP) condition for equilibrium in the FX market:
$$R = R^* + (E^e - E)/E$$

## 2. Money market

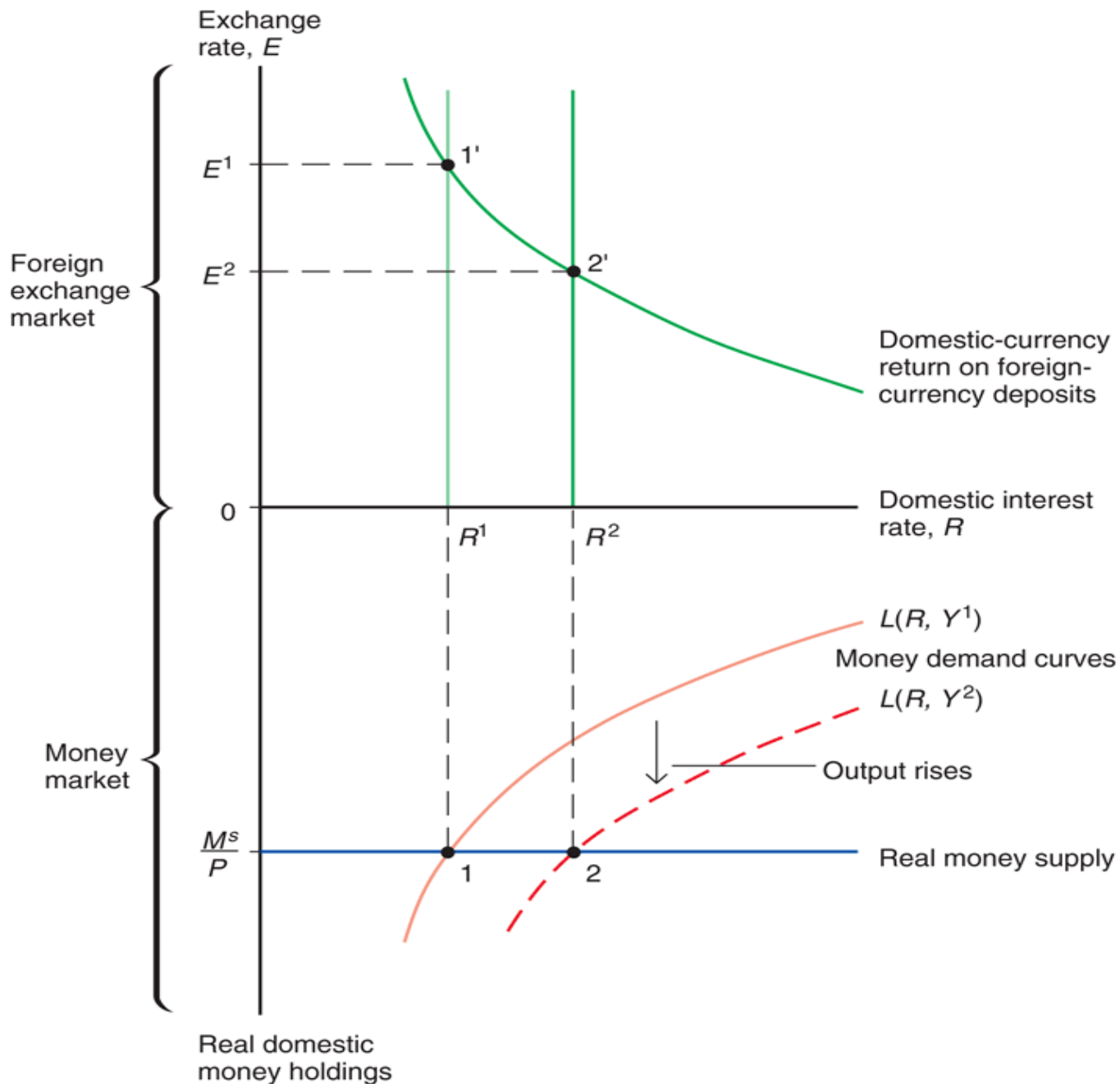
- Equilibrium occurs when real money supply is equal to (real) money demand:  $M^s/P = L(R, Y)$

We assume that:

- A rise in income increases money demand
- A rise in the interest rate decreases money demand

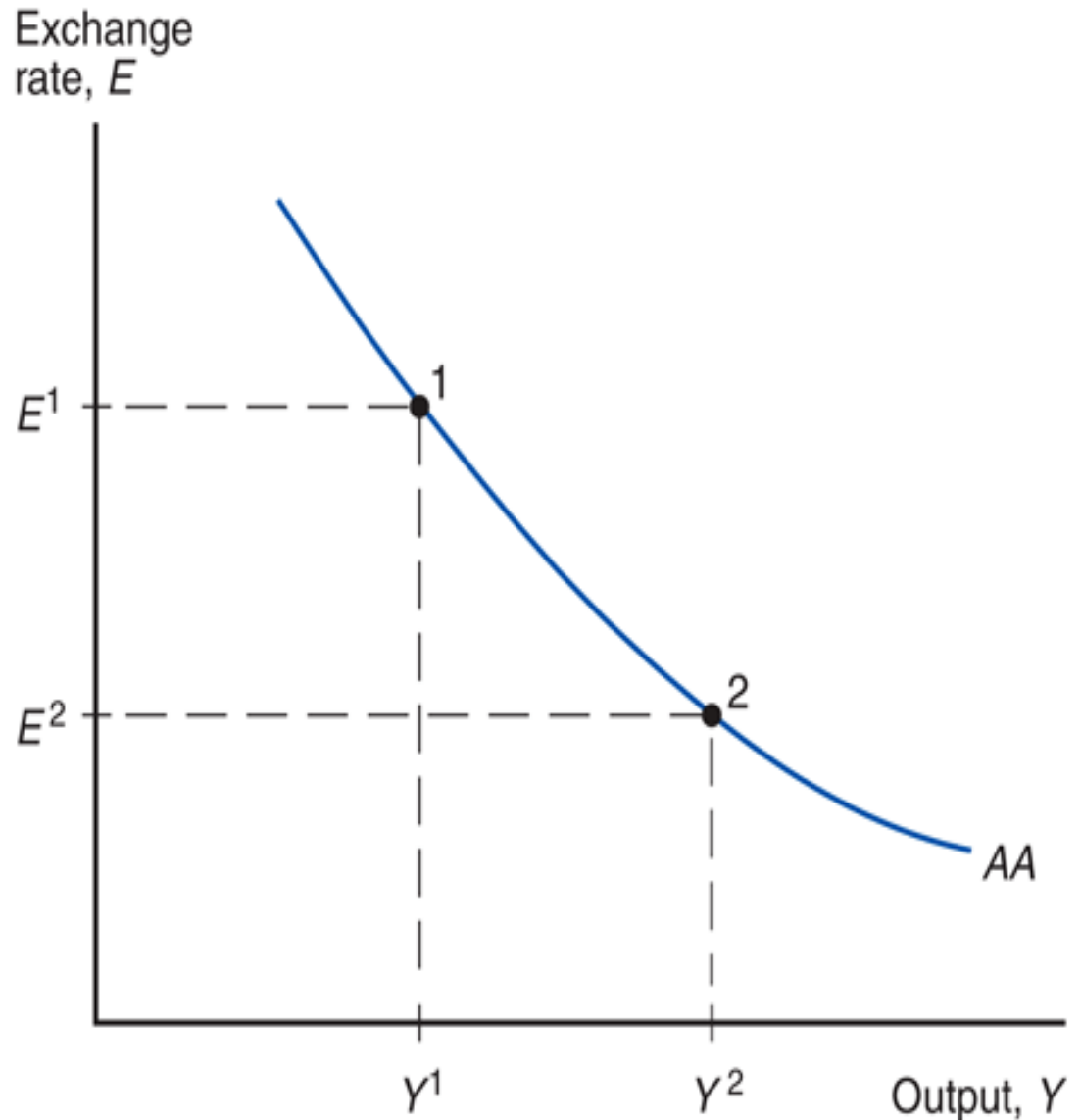
# Output and the Exchange Rate in Asset Market Equilibrium: When income increases:

- Real money demand increases
- leading to an increase in the domestic interest rate,
- leading to an appreciation of the domestic currency.



# The **AA** Curve

The inverse relationship between output and exchange rates needed to keep the foreign exchange markets and the money market in equilibrium is summarized as the **AA** curve.



# Shifts in the AA Curve

**Changes in  $M^s$ :** an increase in the money supply reduces interest rates in the short run, causing the domestic currency to depreciate (a rise in  $E$ ) for every  $Y$ : the AA curve shifts up (right).

**Changes in  $P$ :** An increase in the level domestic prices decreases the real money supply, increasing interest rates, causing the domestic currency to appreciate (a fall in  $E$ ): the AA curve shifts down (left).

**Changes in the demand for real money balances:** if domestic residents are willing to hold a lower amount of real money balances (the opposite of what happened in the recent period in Greece!), interest rates would fall, leading to a depreciation of the domestic currency (a rise in  $E$ ): the AA curve shifts up (right).

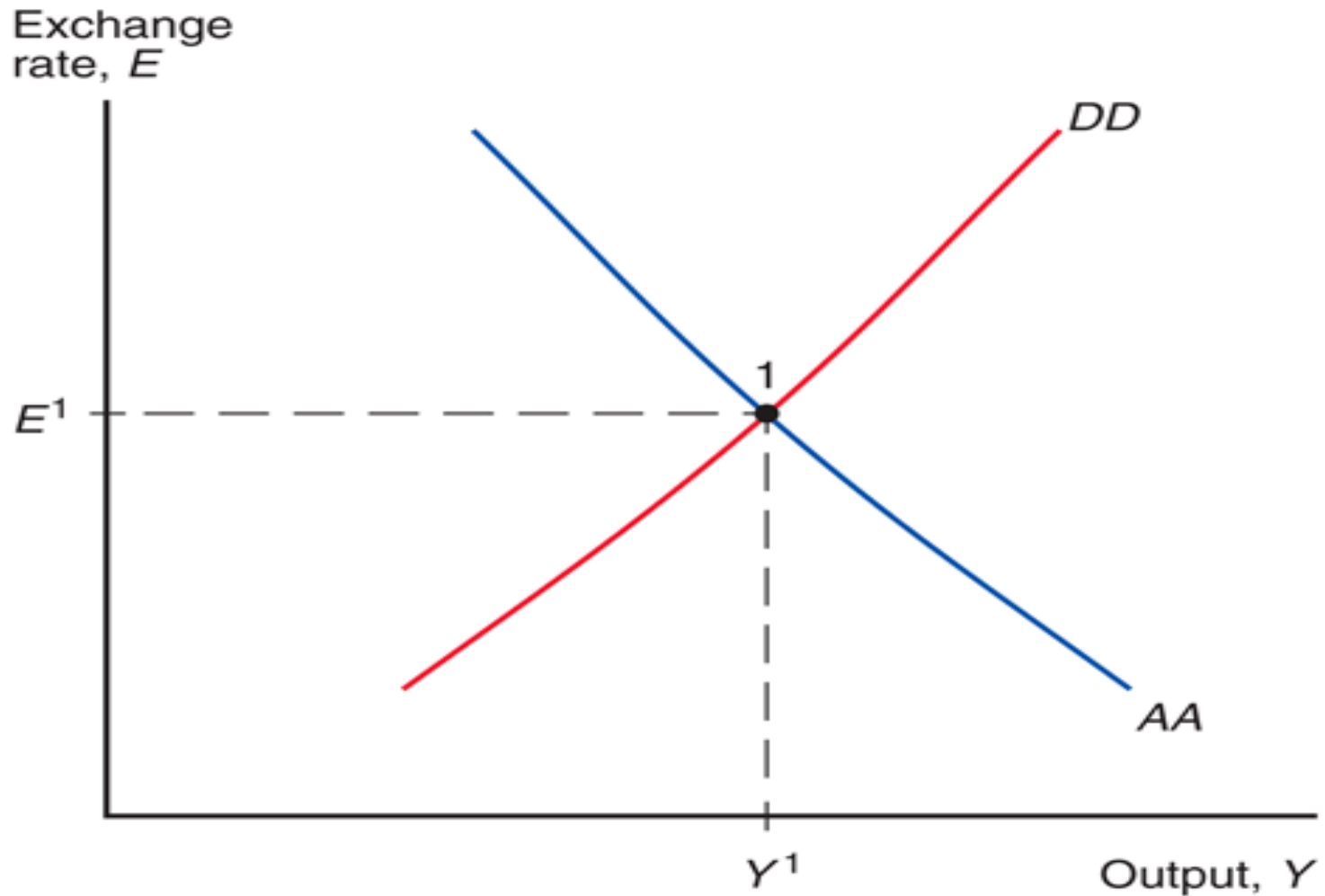
**Changes in  $R^*$ :** An increase in the foreign interest rate makes foreign currency deposits more attractive, leading to a depreciation of the domestic currency (a rise in  $E$ ): the AA curve shifts up (right).

**Changes in  $E^e$ :** if market participants expect the domestic currency to depreciate in the future, foreign currency deposits become more attractive, causing the domestic currency to depreciate (a rise in  $E$ ): the AA curve shifts up (right).

## Putting the Pieces Together: the *DD* and *AA* Curves

- A short-run equilibrium means a *nominal exchange rate* and level of *output* such that
  1. equilibrium in the output markets holds: aggregate demand equals aggregate output.
  2. equilibrium in the foreign exchange markets holds: UIP holds.
  3. equilibrium in the money market holds: real money supply equals real money demand.
- A short-run equilibrium occurs at the intersection of the *DD* and *AA* curves:
  - **output markets are in equilibrium on the *DD* curve**
  - **asset markets are in equilibrium on the *AA* curve**

# Equilibrium in All Markets





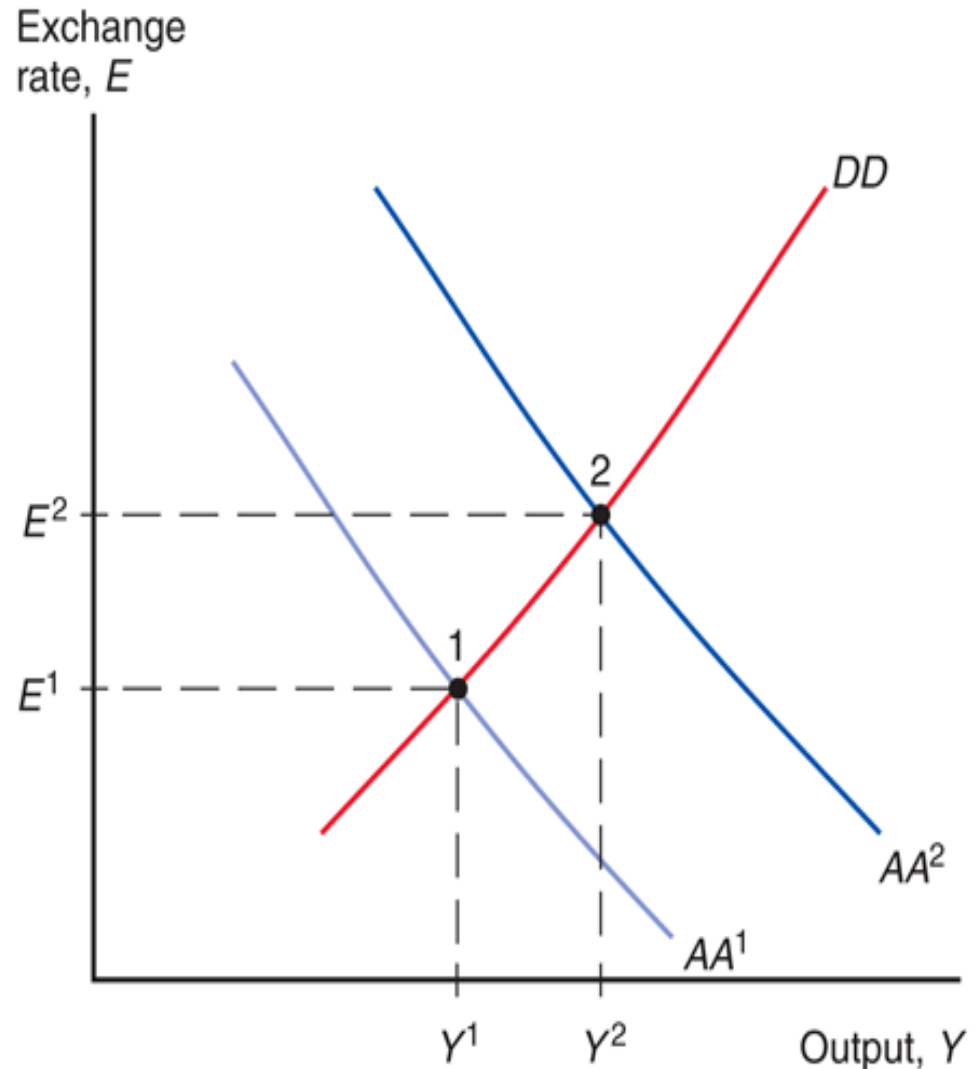
# We consider temporary changes in policy

- Temporary policy changes are expected to be reversed in the near future and thus do not affect expectations about exchange rates in the long run. (They may, nevertheless, be useful to offset declines in output due to an exogenous fall in aggregate demand.)
- **Monetary policy:** policy in which the central bank influences the money supply.
  - **Monetary policy is assumed to affect asset markets first.**
- **Fiscal policy:** policy in which governments (fiscal authorities) influence the amount of government purchases and taxes.
  - **Fiscal policy is assumed to affect aggregate demand first.**

# A Temporary Increase in the Money Supply

An increase in the money supply shifts:

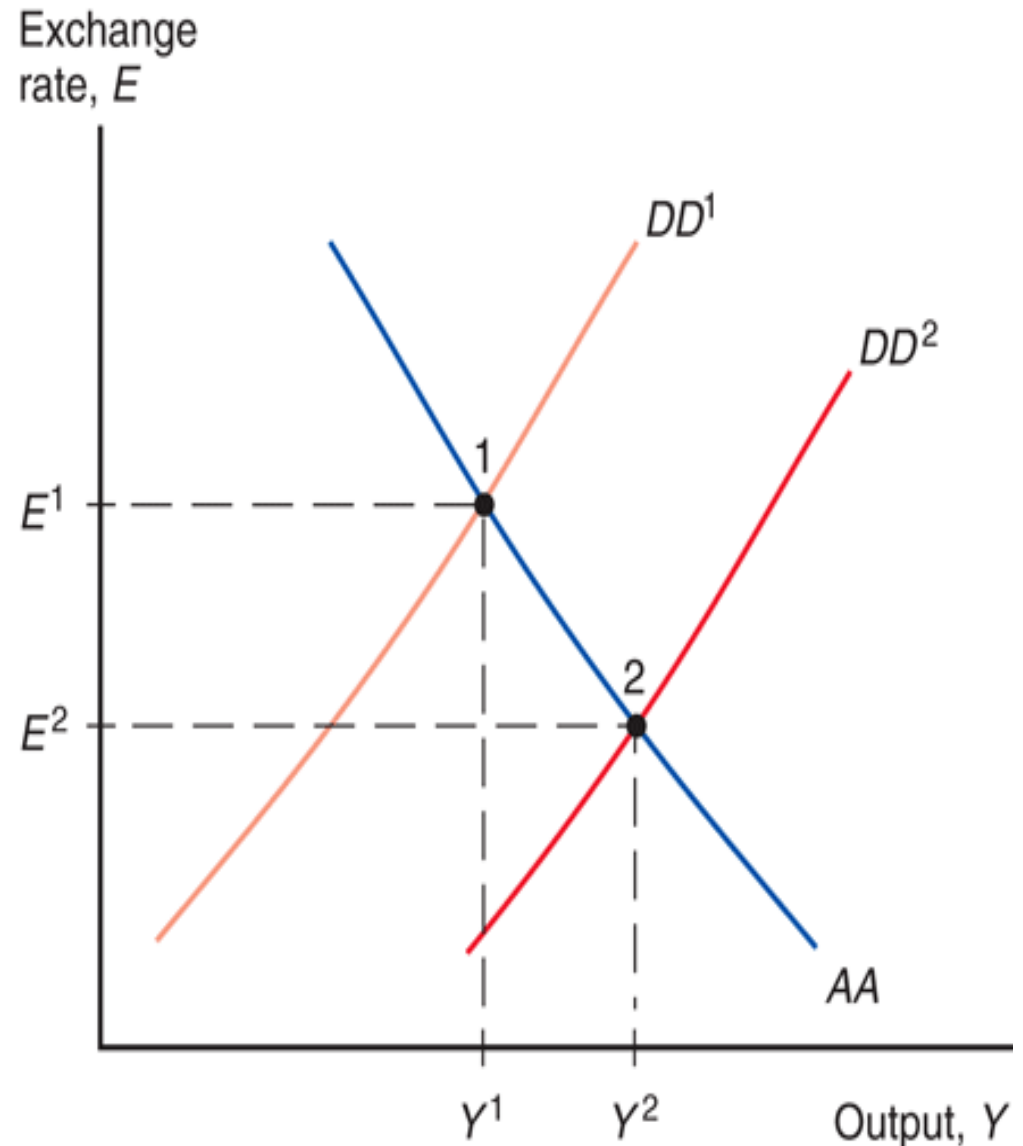
- The  $AA$  up (right).
- Domestic products relative to foreign products are cheaper, so that aggregate demand and output increase until a new short-run equilibrium is achieved.



# A Temporary Increase in Government Purchases

An increase in government purchases or a decrease in taxes increases aggregate demand and output in the short run.

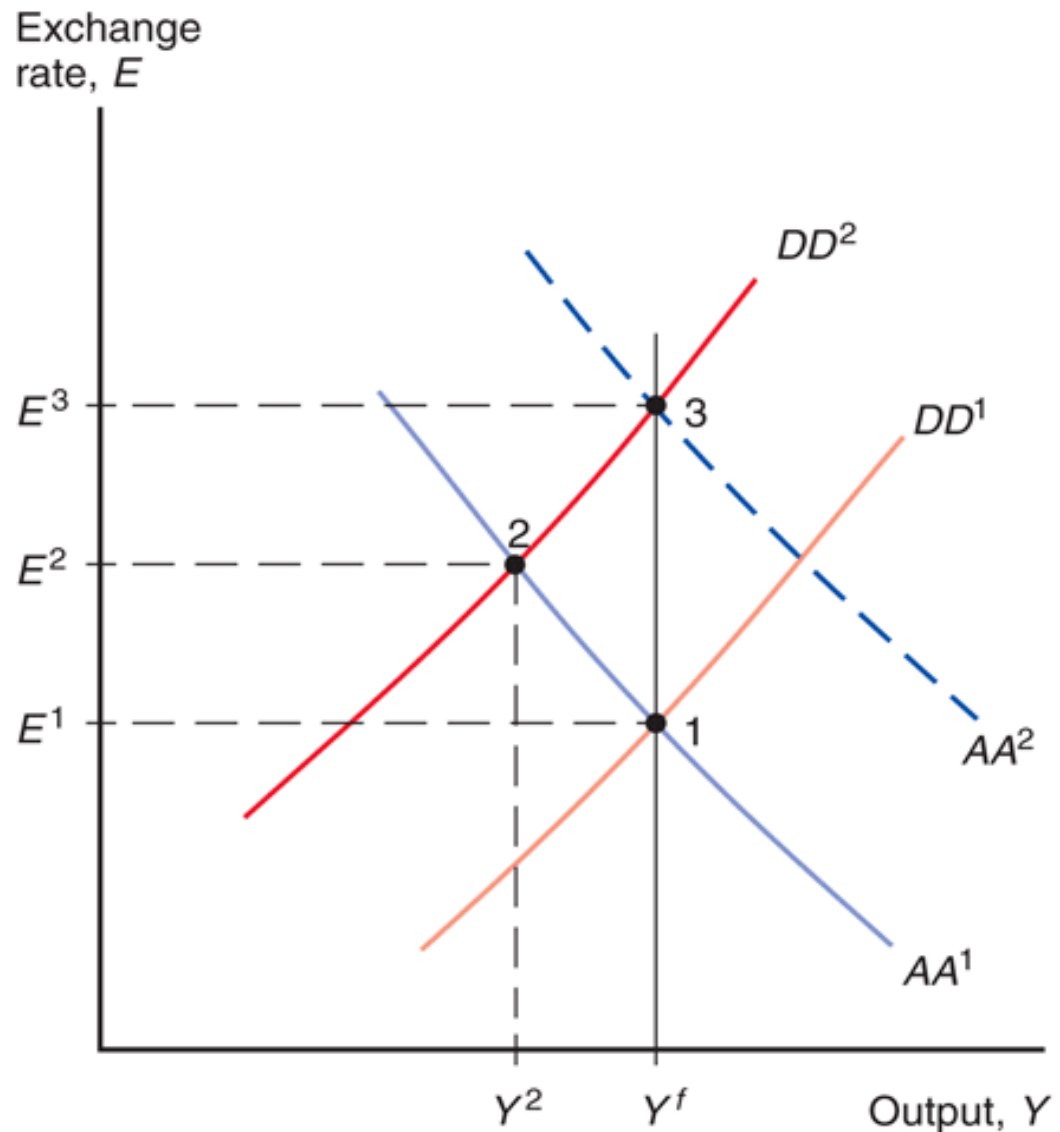
- The  $DD$  curve shifts right.
- Higher output increases the demand for real monetary assets,
  - thereby increasing interest rates,
  - causing the domestic currency to appreciate ( $E$  falls).



# Policies to Maintain Full Employment

- Resources (i.e. Labour, Capital) used in the production process can either be over-employed or underemployed.
- When resources are used effectively and sustainably, we say that production is at its potential or natural level.
  - When resources are underemployed: high unemployment, few hours worked, idle equipment, lower than normal production.
  - When resources are not used sustainably, labor is over-employed: low unemployment, many overtime hours, over-utilized equipment, higher than normal production.

**A MONETARY EXPANSION TO UNDO THE EFFECTS OF DEMAND DECLINES:** In response to a decline in world demand for domestic products ( $DD$  to the left), which would take the economy to point 2, with output lower than the full-employment output, the central bank increases the money supply, shifting the  $AA$  to the right until full-employment is re-established at point 3. **Caution: Implementing such a policy may be harder in practice...**



# Internal and External Balance

**Internal** balance occurs when production is at potential output or when “full employment” equals aggregate demand:

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

- An increase in  $G$  (or a decrease in  $T$ ) increases aggregate demand and output above its full employment level.
- To restore internal balance in the short run, a revaluation (a fall in  $E$ ) must occur.

**External** balance occurs when the current account achieves some value  $X$  (*usually close to zero*):

$$CA(EP^* / P, Y - T) = X$$

- An increase in  $G$  (or a decrease in  $T$ ) implies higher domestic spending (denoted by  $A$ , for absorption), output and income, decreasing the current account.
- To restore external balance, a devaluation (a rise in  $E$ ) must occur.

# Internal Balance (II), External Balance (XX), and the “Four Zones of Economic Discomfort”

- At any point in time, a country may find itself on any of the four zones.
- In 2009, Greece found itself in Zone 3.
- In 2015, with the CA in balance it finds itself on line XX (down and to the left of point 1).
- On the other hand, some Eurozone countries may be on the borderline between zones 1 and 4. This creates discord regarding the desirable value of the (common) exchange rate.

