6.1 Output and Exchange Rates in the Short Run

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Output and Exchange Rates in the Short Run

- Now we assume that Y can differ from Y^f in the short run

- Equilibrium in the output market in the short run: The *DD* Schedule

- Equilibrium in the asset market in the short run: The *AA* Schedule

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

  Schedules Together

6.1 DD Schedule

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Aggregate Demand

- Aggregate demand for domestic goods

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

- C(Y-T) = private consumption

  Evidence from microeconomic data suggests that

  $$C(Y-T) \approx c \times (Y-T)$$

  where c is the marginal propensity to consume $\in [0.5, 0.75]$

- I = Investment
- G = Government consumption
- CA(EP*/P, Y – T) = current account, which depends on the real exchange rate and disposable income
- Assume that imports have price EP*, exports have price P (producer currency pricing)

Modeling the Current Account

$$CA = EX - IM = \underline{CA} + \alpha \cdot EP^*/P - m \cdot c \cdot (Y-T), \, m \in [0,1], \, \alpha > 0$$

- As $(EP^*/P) \uparrow$, the relative price of foreign goods increases relative to domestic goods $\rightarrow$ exports increase and imports decrease $\rightarrow$ CA $\uparrow$
- Imports depend on disposable income: $m \times C = m \cdot c \cdot (Y-T), \, m \in [0,1]$
- m = fraction of C that falls on imports; higher (and close to 1) for small open economies; lower (close to 0) for large relatively closed economies
- Demand for domestic goods is $(1-m) \cdot c \cdot (Y-T)$
- As disposable income increases, $(Y-T) \uparrow$, C $\uparrow \rightarrow$ IM $\uparrow \rightarrow$ CA $\downarrow$
- Nevertheless, $(Y-T) \uparrow \rightarrow$ D $\uparrow$ because 1-m > 0
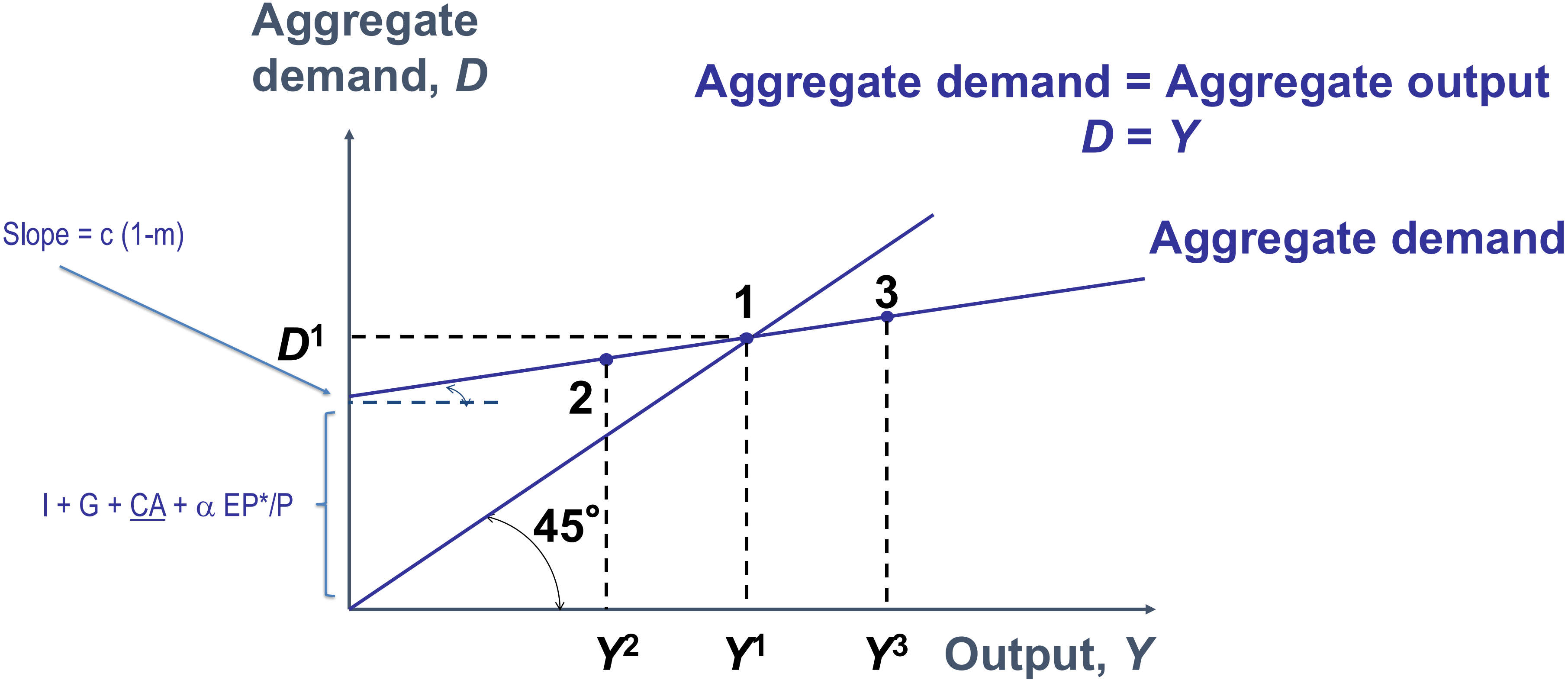
Aggregate Demand

- Aggregate demand

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

Output in the Short Run

- In the long run, $Y = Y^f$

- Y^f depends on technology and the country's factors of production

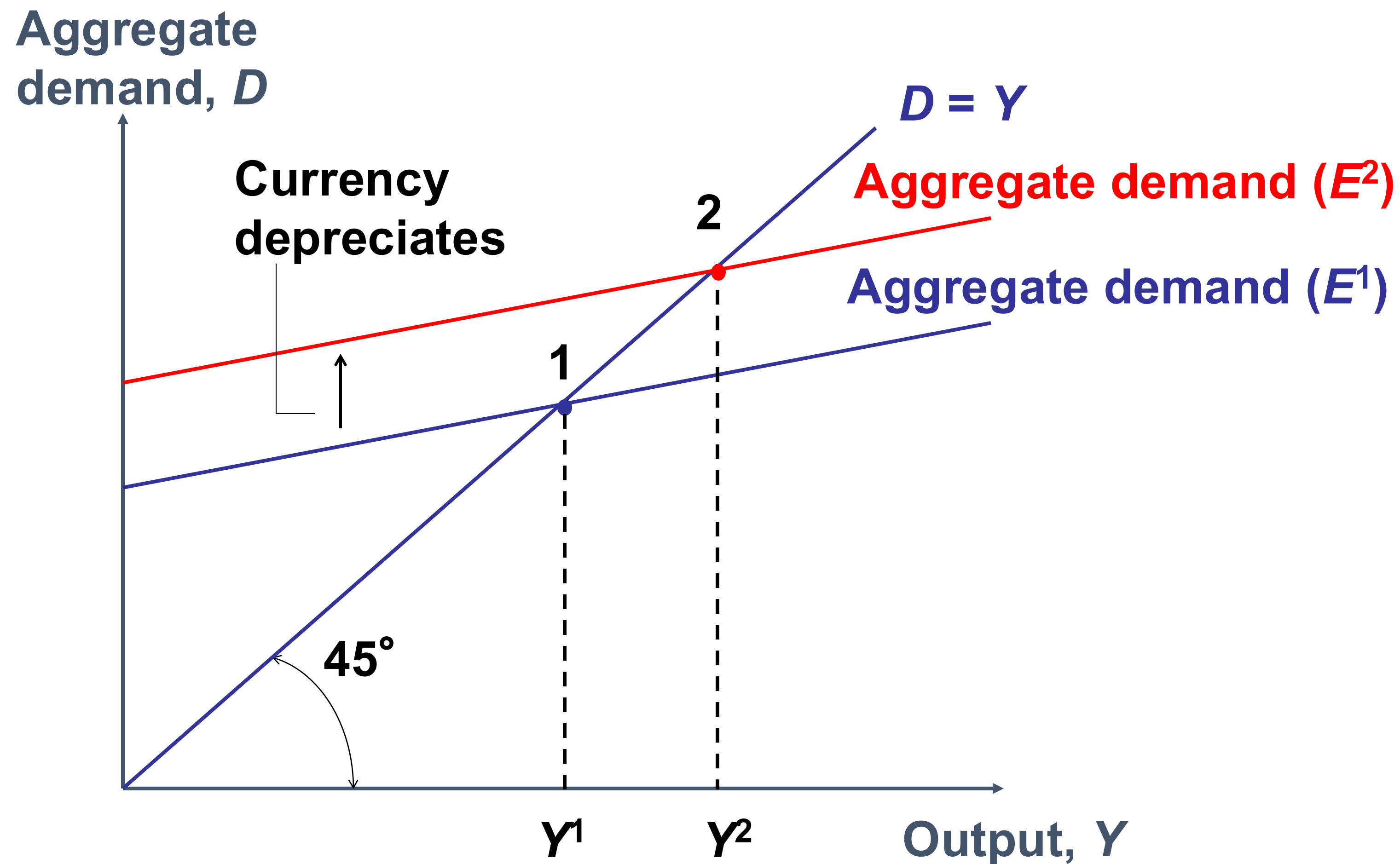- Short run: Output market is in <u>equilibrium</u> when output supply equals aggregate demand:

$$Y = D(EP^*/P, Y - T, I, G) = (1-m) \, c \, (Y-T) + I + G + \underline{CA} + \alpha \, EP^*/P,$$

- We continue to assume that prices of goods and services are *temporarily fixed,* i.e. constant in the short run
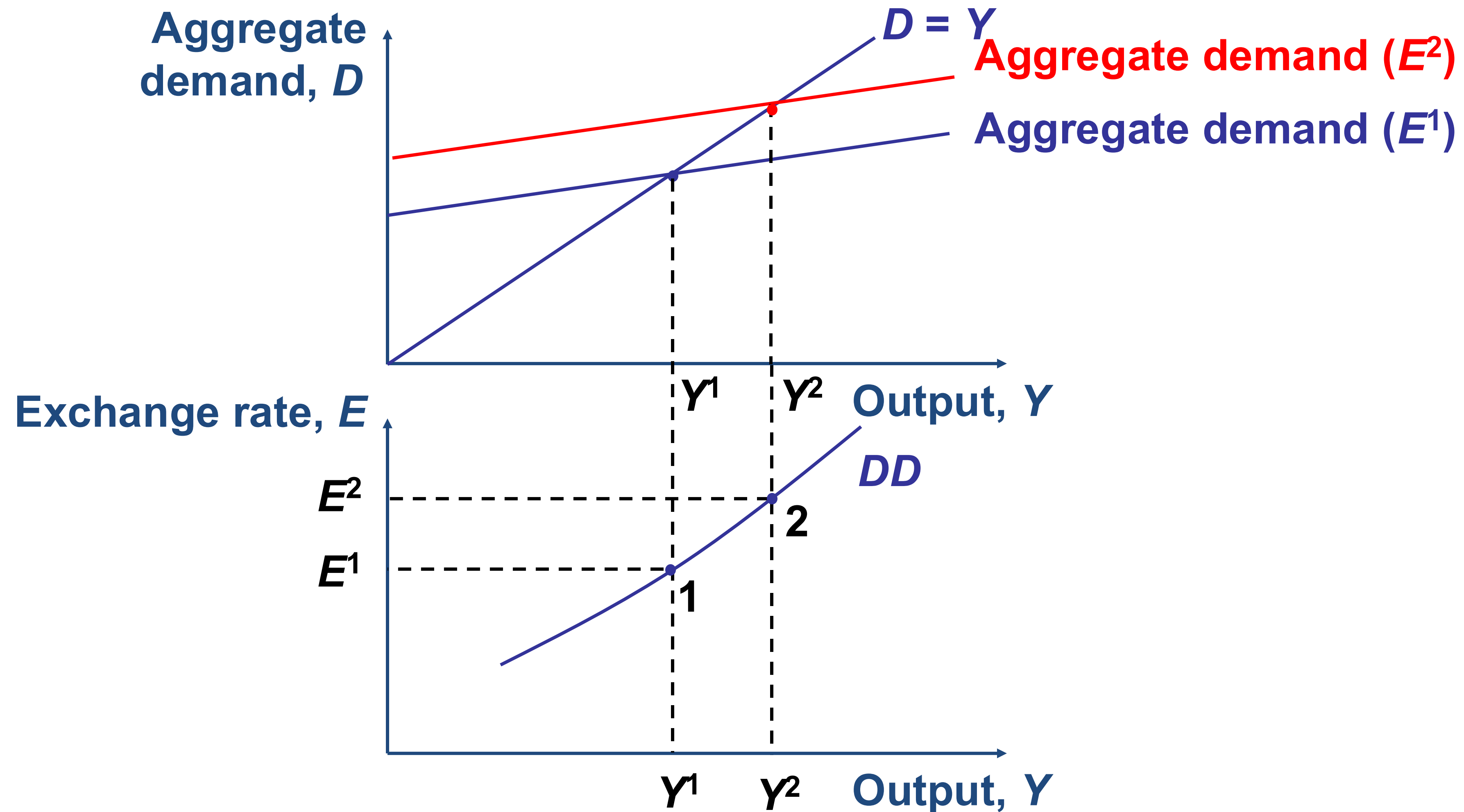
Output in the Short Run

Aggregate demand, D

Aggregate demand = Aggregate output
$D = Y$

Slope = c (1-m)

Aggregate demand

D^1

1

3

2

$I + G + \underline{CA} + \alpha\, EP^*/P$

45°

Y^2 Y^1 Y^3 Output, Y

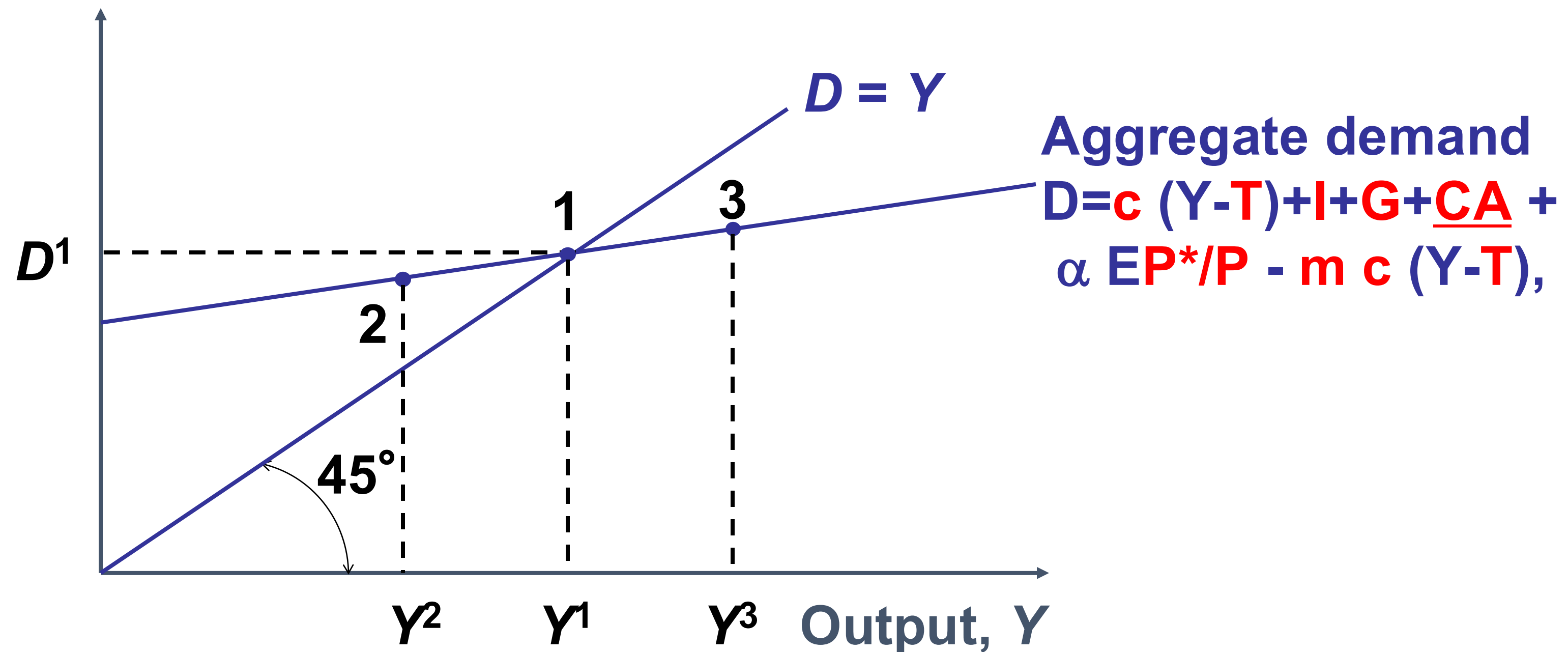# Exchange Rate Depreciation

DD Schedule

- It shows all combinations of output (Y) and the exchange rate (E) for which the output market is in short-run equilibrium (aggregate demand = aggregate output)

- It slopes upward because a depreciation raises aggregate demand and causes output to increase in the short run
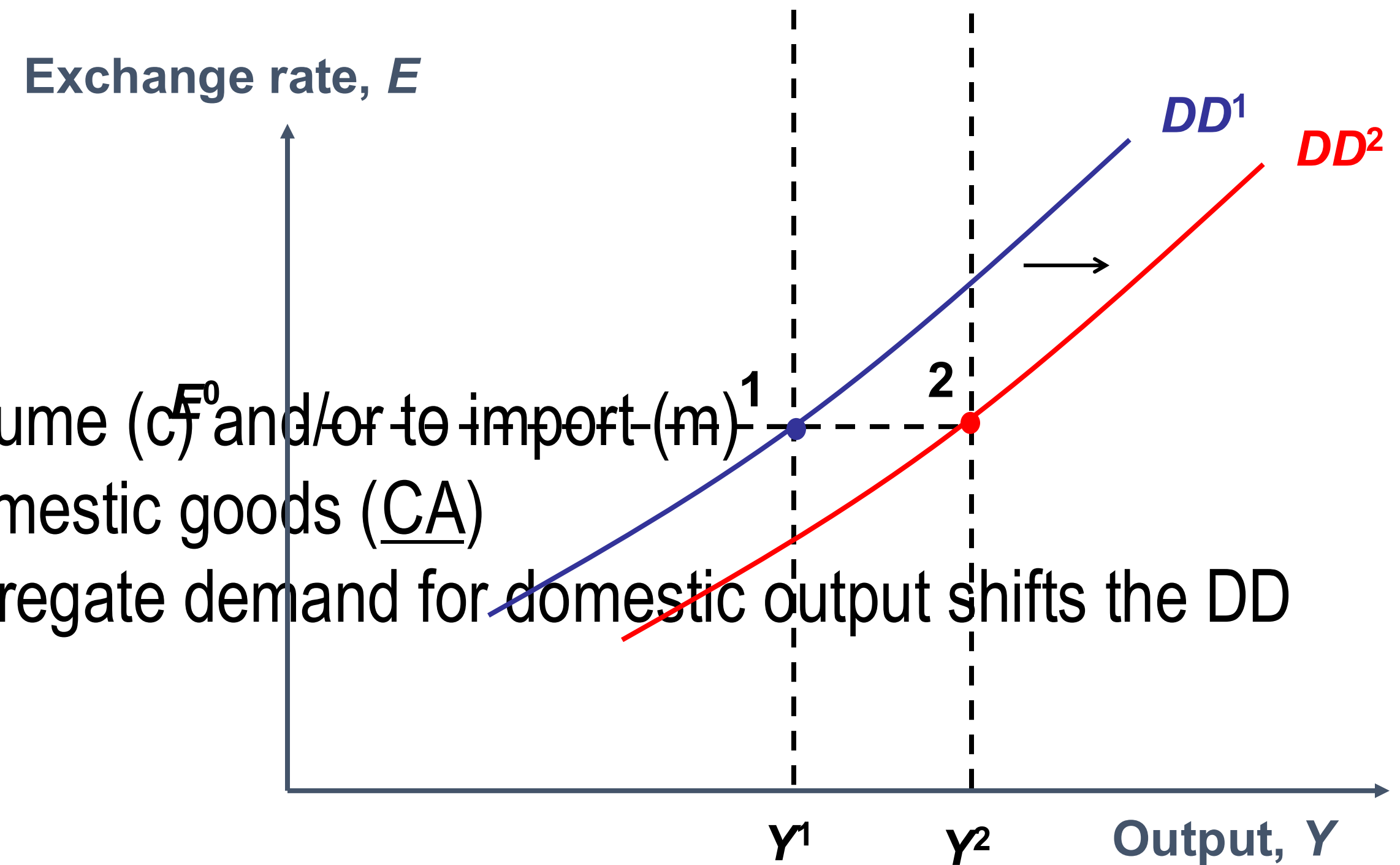
DD Schedule

Aggregate demand, D

$D = Y$

Aggregate demand (E^2)

Aggregate demand (E^1)

Y^1 Y^2 Output, Y

Exchange rate, E

DD

E^2 **2**

E^1 **1**

Y^1 Y^2 Output, Y

Factors Shifting the DD Schedule

Aggregate demand, D

$D = Y$

Aggregate demand
$D = c\,(Y-T) + I + G + \underline{CA} +$
$\alpha\,EP^*/P - m\,c\,(Y-T),$

D^1

1

2

3

45°

Y^2 Y^1 Y^3 **Output, Y**

- Government purchases (G)
- Taxes (T)
- Investment (I)
- Domestic price levels (P)
- Foreign price levels (P*)
- Domestic marginal propensity to consume (c) and/or to import (m)
- Demand shift between foreign and domestic goods (CA)
- A disturbance that raises (lowers) aggregate demand for domestic output shifts the DD schedule to the right (left)

Exchange rate, *E*

DD^1

DD^2

E^0

1

2

Y^1 Y^2 **Output, *Y***

- Output is flexible in the short run

- Short-run equilibrium in the output market

- DD Schedule

6.2 AA Schedule

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AA Schedule

- AA schedule: output (Y) and exchange rate (E) combinations such that asset markets (money + Forex) are in equilibrium
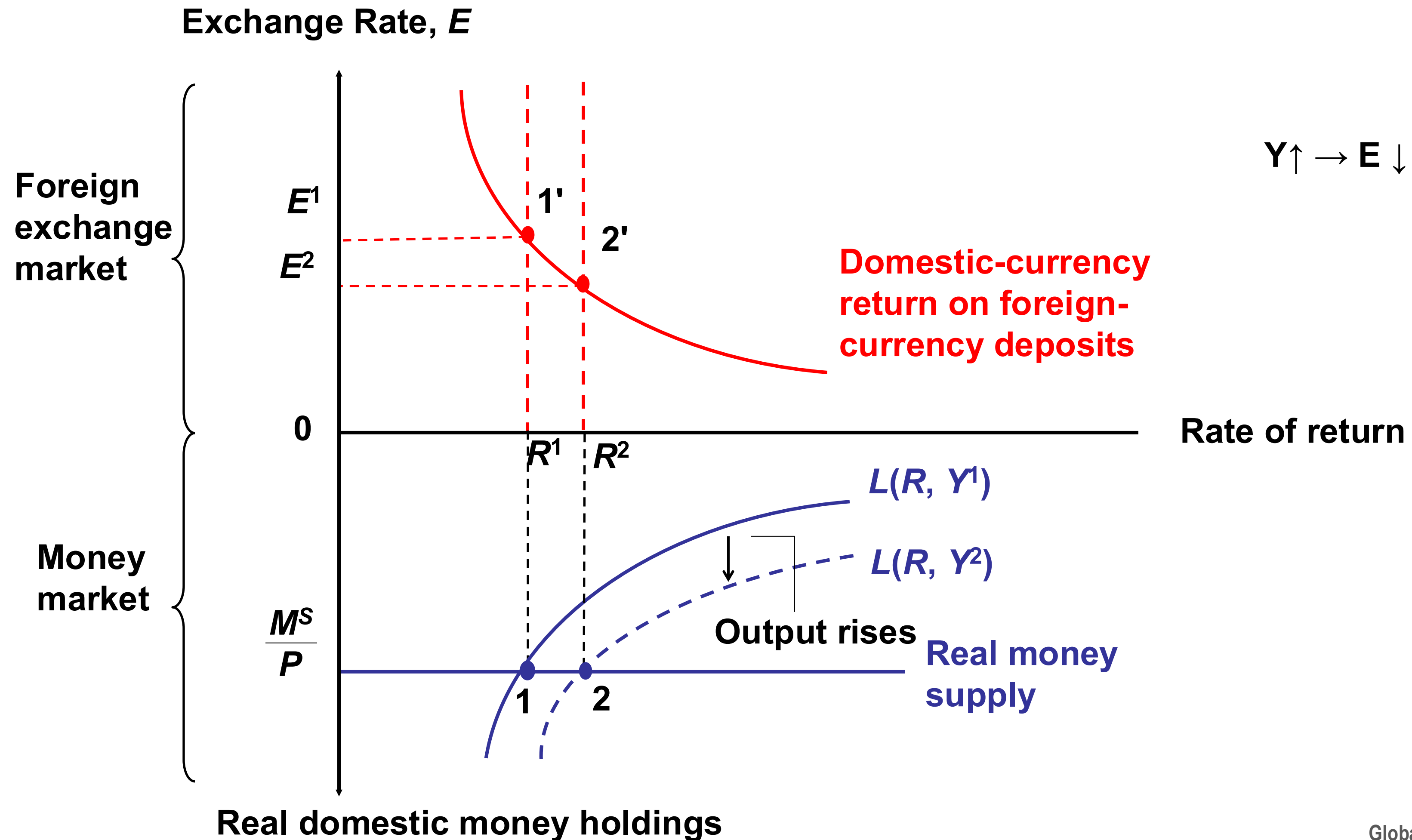
- Interest Parity Condition (IPC)

$$R = R^* + (E^e - E)/E$$
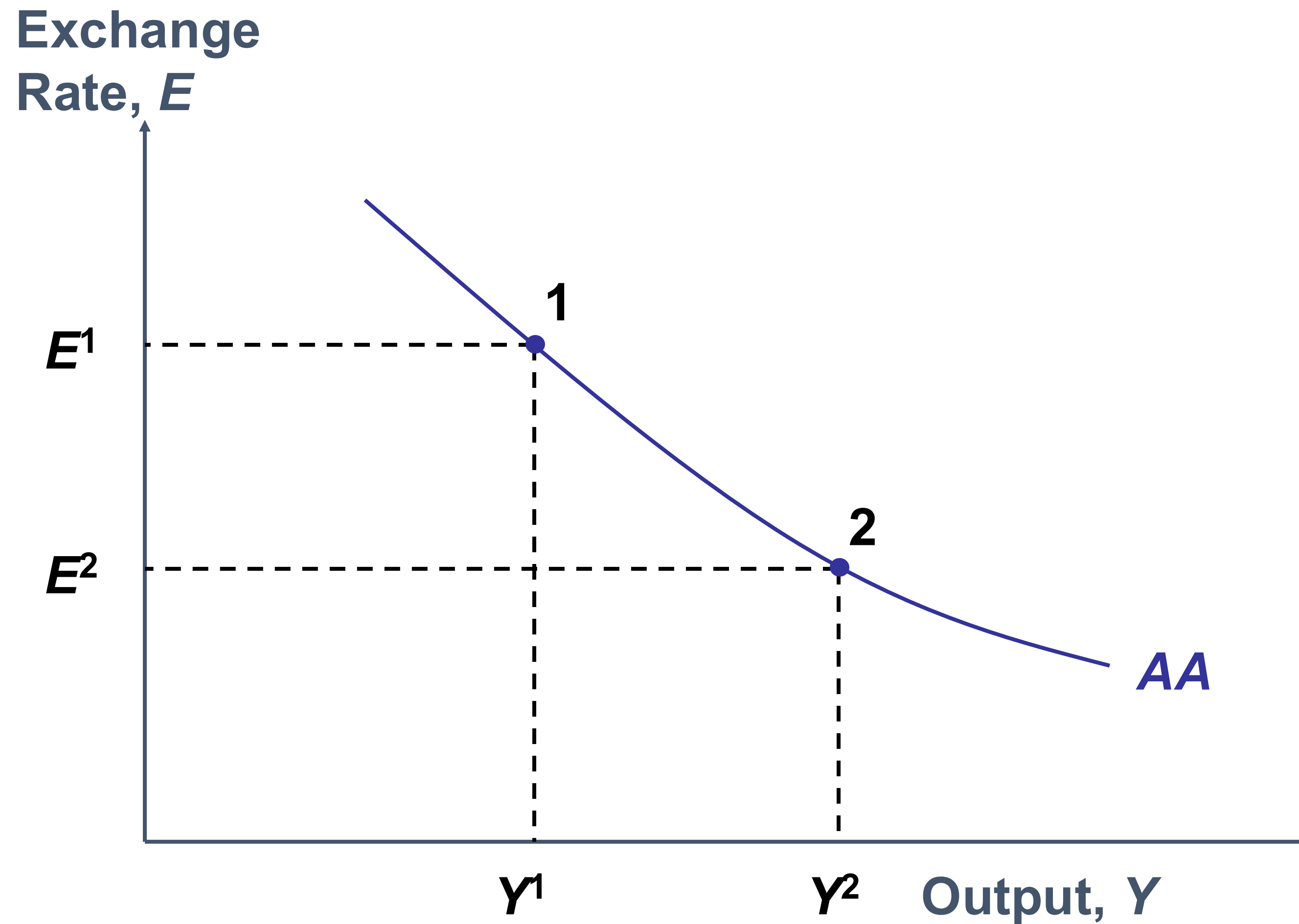
- Equilibrium in the money market

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

- $Y \uparrow \rightarrow L \uparrow$. If M^s unchanged, $R \uparrow \rightarrow E \downarrow$ all else equal

- Negative relationship between Y and E along AA
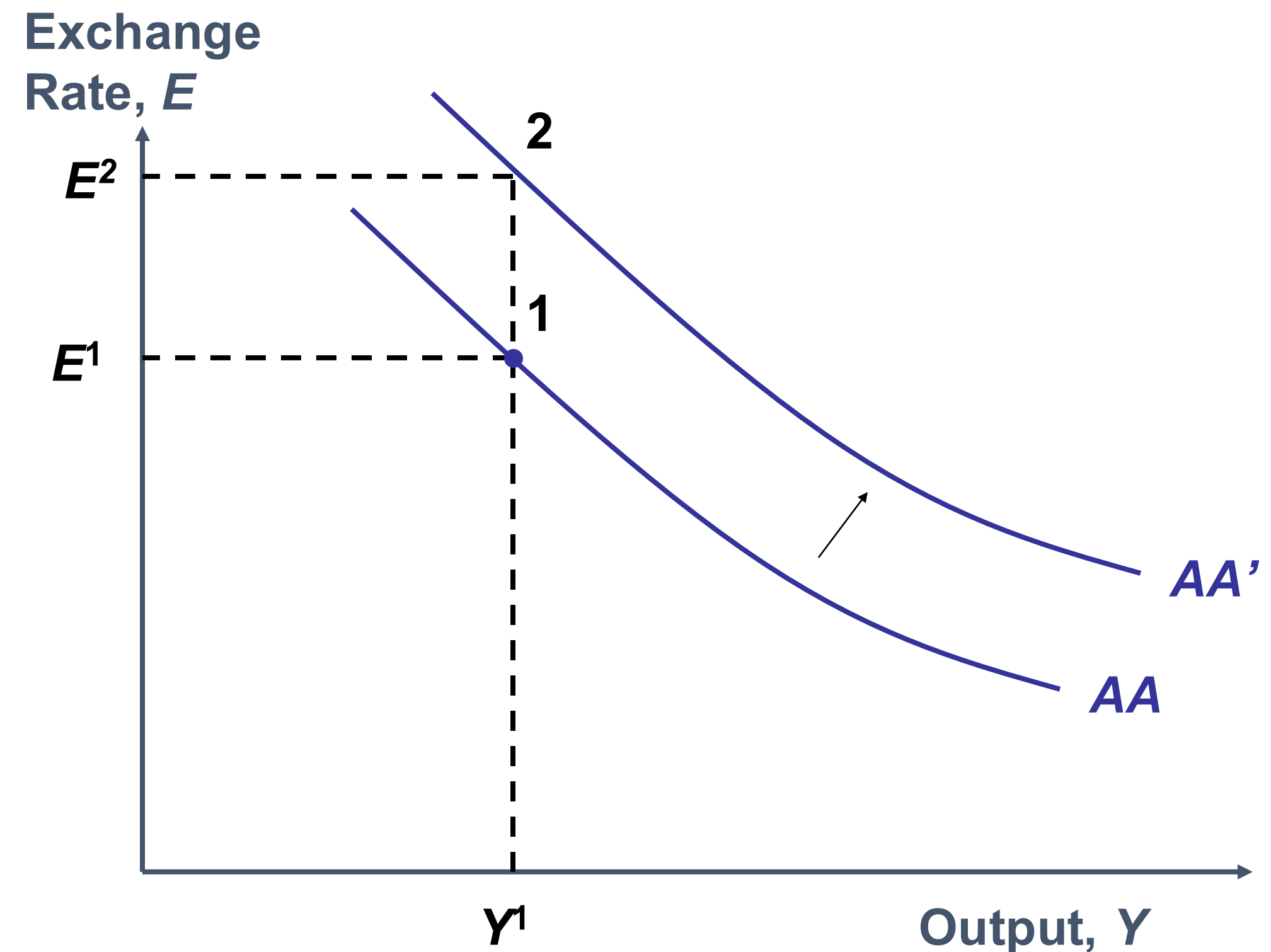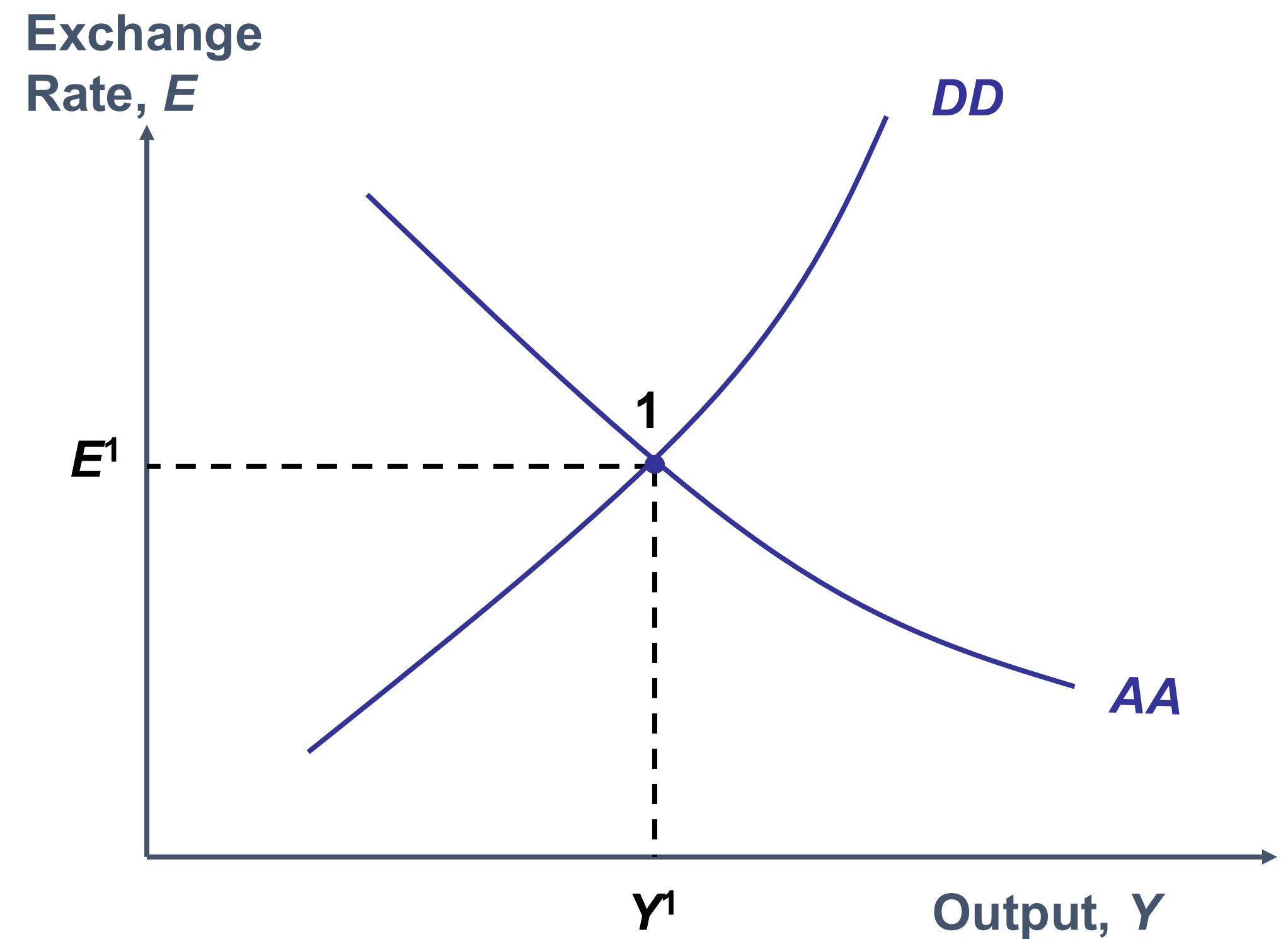
Asset Markets Equilibrium

Exchange Rate, E

Foreign exchange market

$Y \uparrow \rightarrow E \downarrow$

E^1 — 1'

E^2 — 2'

Domestic-currency return on foreign-currency deposits

0 — **Rate of return**

R^1 R^2

$L(R, Y^1)$

$L(R, Y^2)$

Money market

$\dfrac{M^S}{P}$

Output rises

Real money supply

1   2

Real domestic money holdings

AA Schedule

Factors Shifting the AA Schedule

- Domestic money supply (M^s)

- Domestic price level (P)

- Expected future exchange rate (E^e)

- Foreign interest rate (R*)

- Shifts in the aggregate real money demand schedule (L)

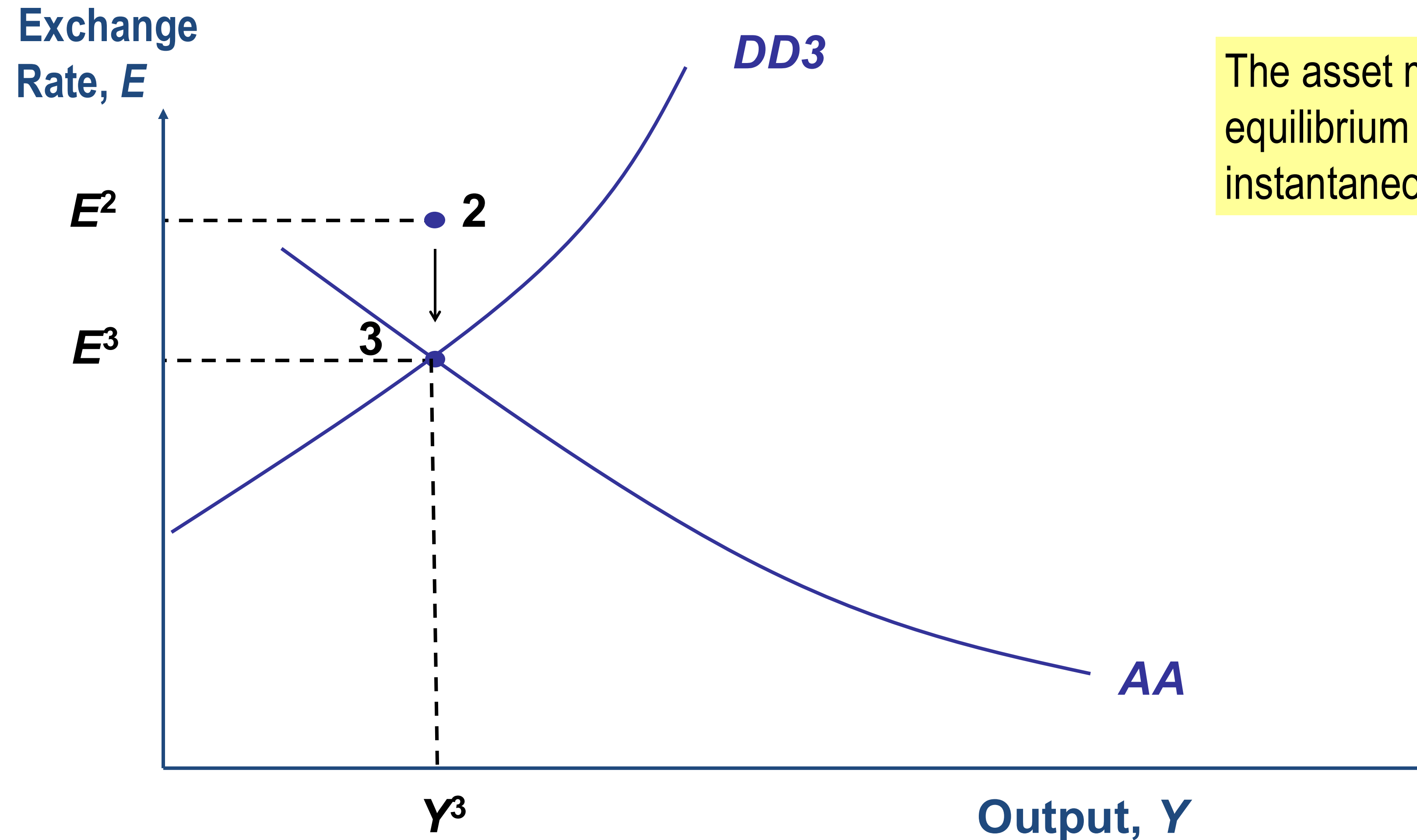- Outward shift of the AA curve: $\Delta M > 0$, $\Delta P < 0$, $\Delta E^e > 0$, $\Delta R^* > 0$, $\Delta L < 0$

Short-run Equilibrium for an Open Economy

- Output and asset markets must simultaneously be in equilibrium

- Short-run equilibrium lies on the DD and AA schedules

How the Economy Reaches its Short-Run Equilibrium

Exchange Rate, *E*

DD3

E² • 2

E³ 3

AA

Y³

Output, *Y*

The asset market equilibrium is achieved instantaneously from 2 to 3

- Output flexible in the short run

- Short-run equilibrium in asset markets

- AA Schedule

- Y and E in the short run: putting together the DD and AA schedules

6.3 Monetary and Fiscal Policies
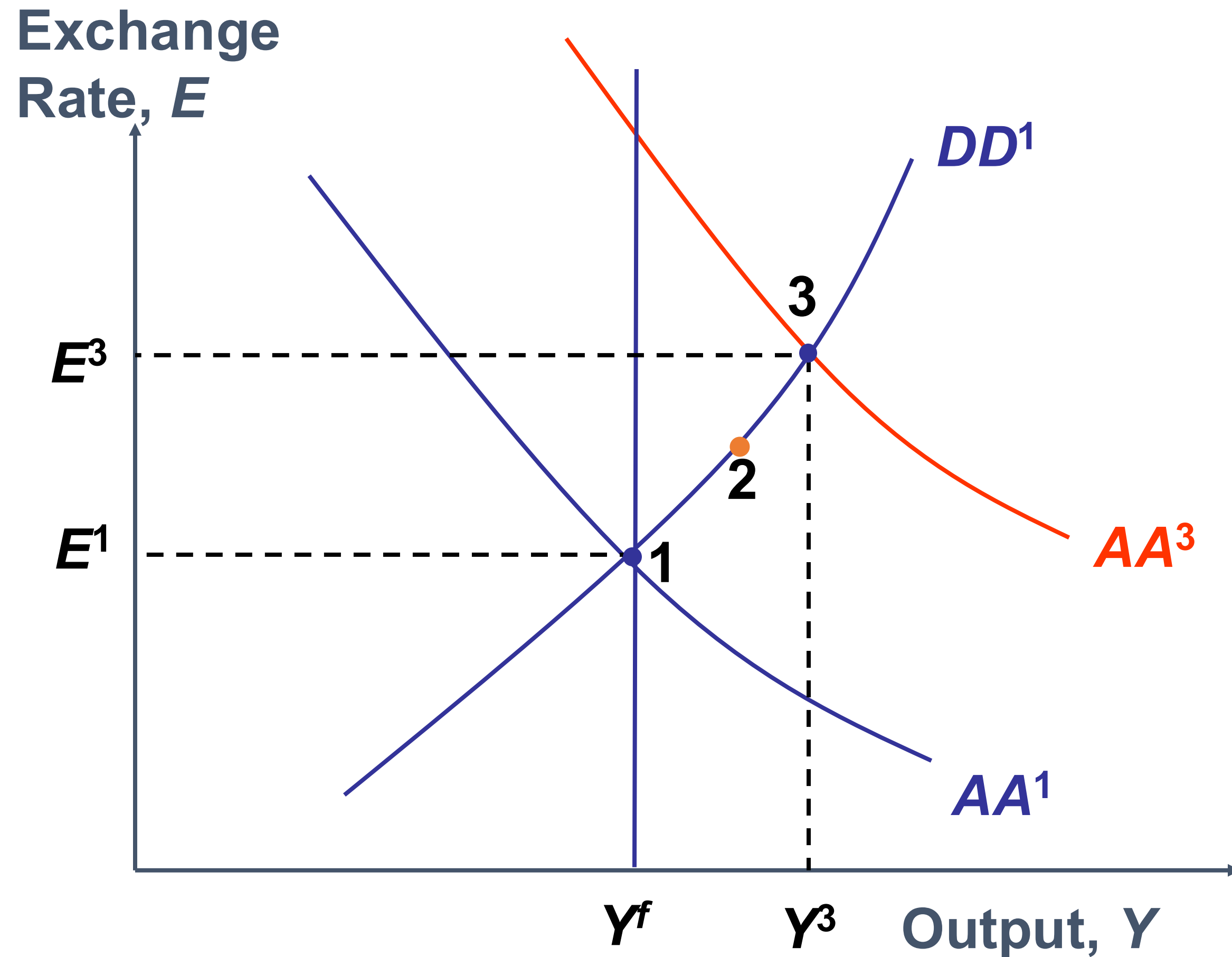
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Changes in Monetary and Fiscal Policy

- **Monetary** policy: It works through changes in the money supply/reference interest rate

- **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 E^e

- **Permanent** policy changes are expected not to be reversed and they affect the long-run expected exchange rate E^e
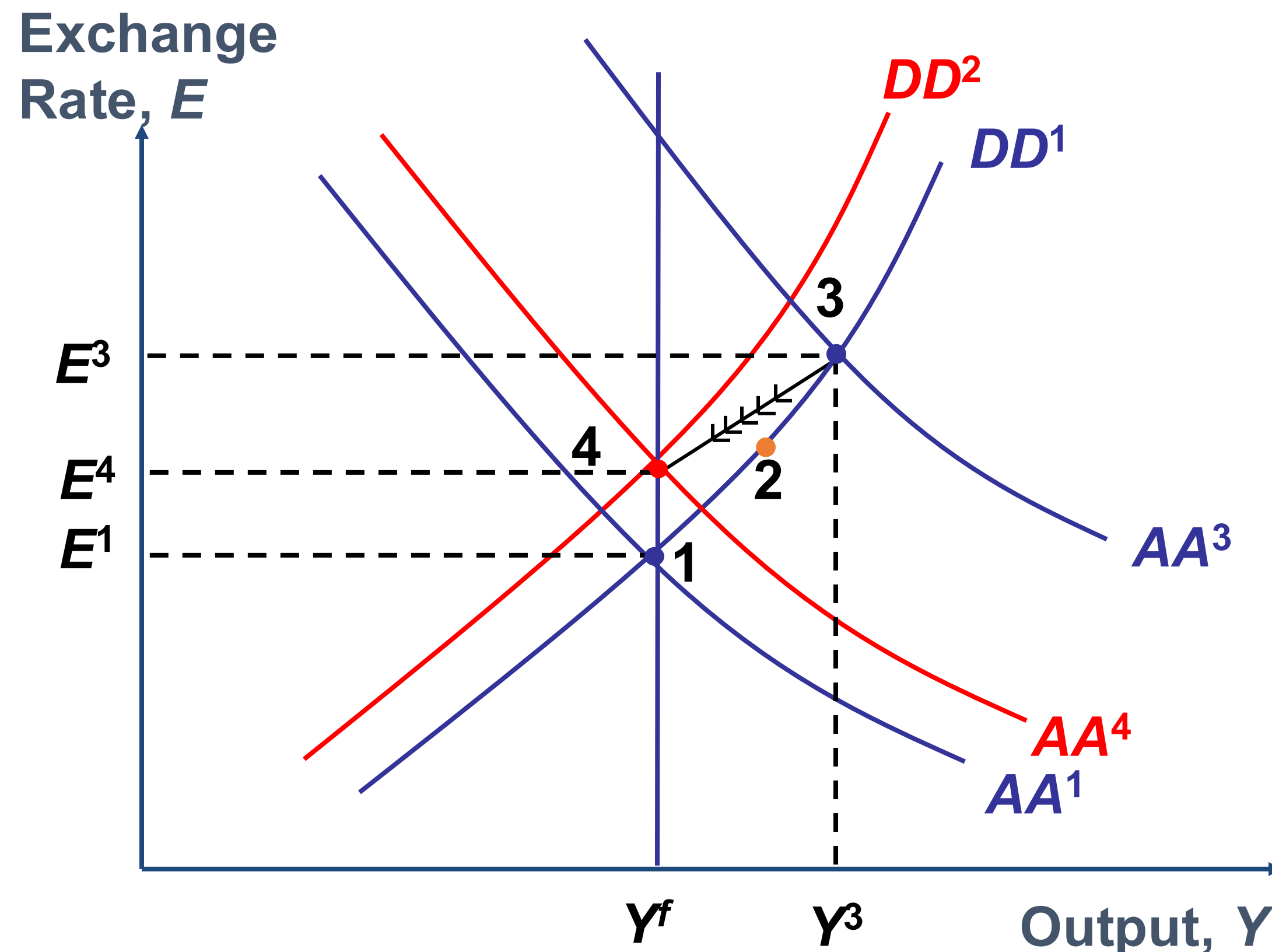
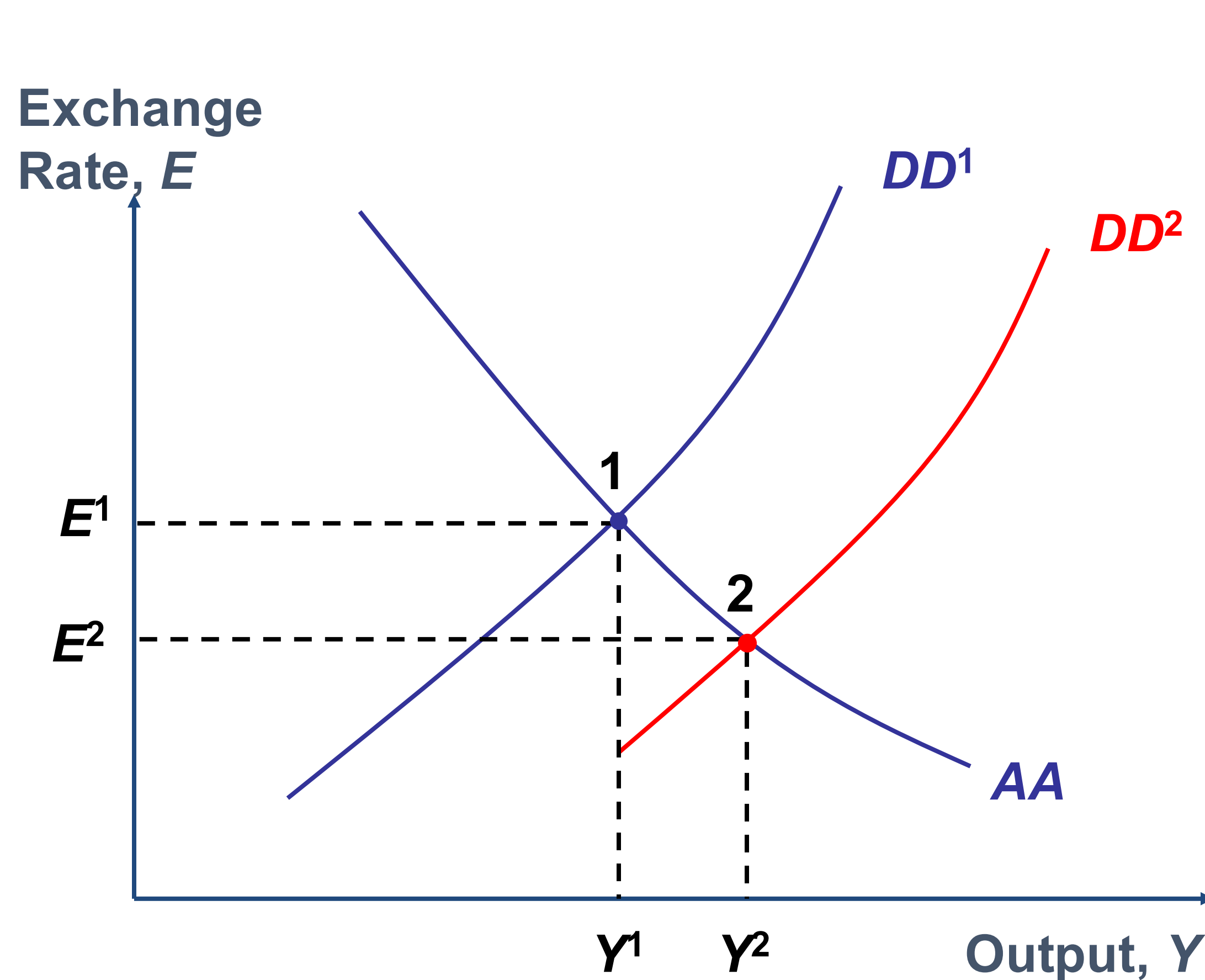# A Temporary Increase in Money Supply

Exchange Rate, E

DD

$M \uparrow \rightarrow R \downarrow \rightarrow E \uparrow \rightarrow Y \uparrow$
Notice: E^e is unchanged

E^2

E^1

2

1

AA^2

AA^1

Y^1 Y^2 Output, Y

A Permanent Increase in Money Supply

Exchange Rate, E

DD^1

3

E^3

2

E^1

1

AA^3

AA^1

Y^f Y^3 Output, Y

- Permanent increase in money supply $M^3 > M^1$
- The AA curve shifts out more than in the case of a temporary increase in money (2), to AA^3
- Why?
- Long run exchange rate is
  $$E=q\ (M/L)\ (L^*/M^*)$$
- If M↑ permanently, E↑ in the long run. Hence E^e↑
- As E^e↑, the expected return of investing in foreign deposits↑ and E↑
- Short-run equilibrium at 3

Long-run Adjustment
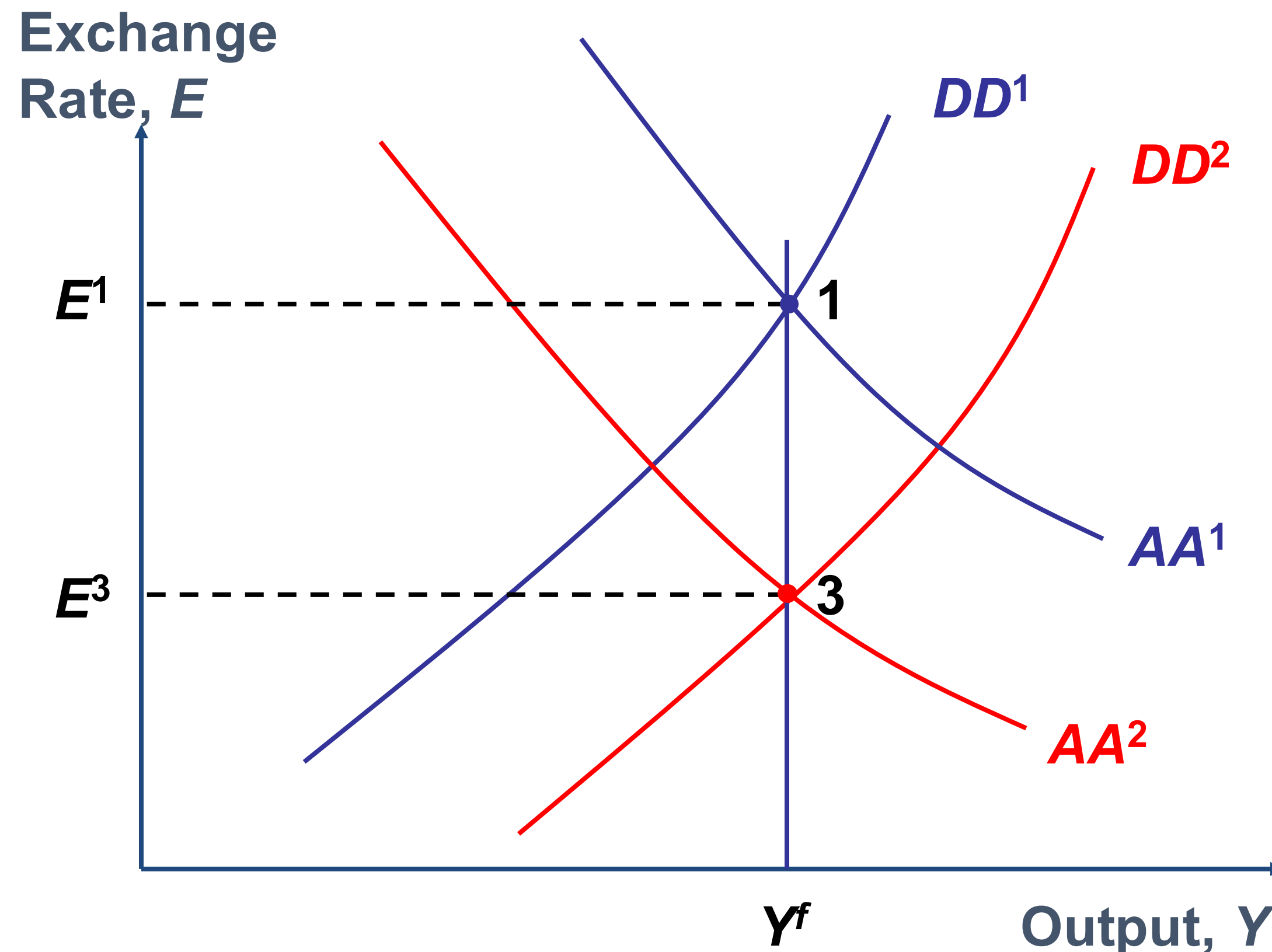
- Long run: P↑ because Y>Y^f causes wage pressure and inflation
- As P↑, the AA curve shifts back to AA^4 and the DD curve shifts to DD^2
- Why doesn't the AA curve shift all the way back to AA^1?
- Because the long-run equilibrium level of the exchange rate E^4 is more depreciated than E^1 (same % as the increase in money supply)

A Temporary Increase in Government Spending

Exchange Rate, E

DD^1

DD^2

1

2

E^1

E^2

AA

Y^1 Y^2 Output, Y

G ↑→ Aggregate demand ↑
→ DD curve shifts out
Move along AA: Y ↑ → L↑→
R ↑ → E ↓

A Permanent Increase in Government Spending

Exchange Rate, E

DD^1

DD^2

E^1 — 1

AA^1

E^3 — 3

AA^2

Y^f

Output, Y

- A permanent increase in G is a permanent increase in world relative demand for domestic products
- Last class we saw that an increase in demand for domestic products brings an increase in domestic relative prices
- This is q↓, a permanent real exchange rate appreciation
- Long run exchange rate is
  E=q (M/L) (L*/M*)
- If q↓, E↓ in the long run, E^e↓
- The AA curve instantaneously shifts inward.
- A permanent increase in G instantaneously appreciates E with no output effect (if we start at Y^f). Short run eq is 3

The XX Schedule

- It shows combinations of Y and E at which the C*A* balance is equal to a certain level, for example zero

- Above XX, CA higher than zero; below XX, CA lower than zero

- It slopes upward. Intuition: Y $\uparrow\rightarrow$ IM $\uparrow\rightarrow$CA$\downarrow$. For Δ CA = 0, E$\uparrow\rightarrow$EX$\uparrow$.

- Formally

$$CA = \underline{CA} + \alpha \, EP^*/P - m \, c \, (Y\text{-}T)$$

$$\Delta \, CA = 0 \; \rightarrow \alpha \, (P^*/P) \, \Delta \, E = m \, c \, \Delta \, Y$$

$$(\Delta \, E \, / \, \Delta \, Y \,)_{XX} = m \, c \, / \, \alpha \, (P^*/P) > 0$$

Slope of the XX curve

- It is flatter than the DD curve
- DD curve:

$$Y = (1 – m)\ c\ (Y – T) + I + G + \underline{CA} + \alpha\ EP^*/P$$

- Along the DD curve

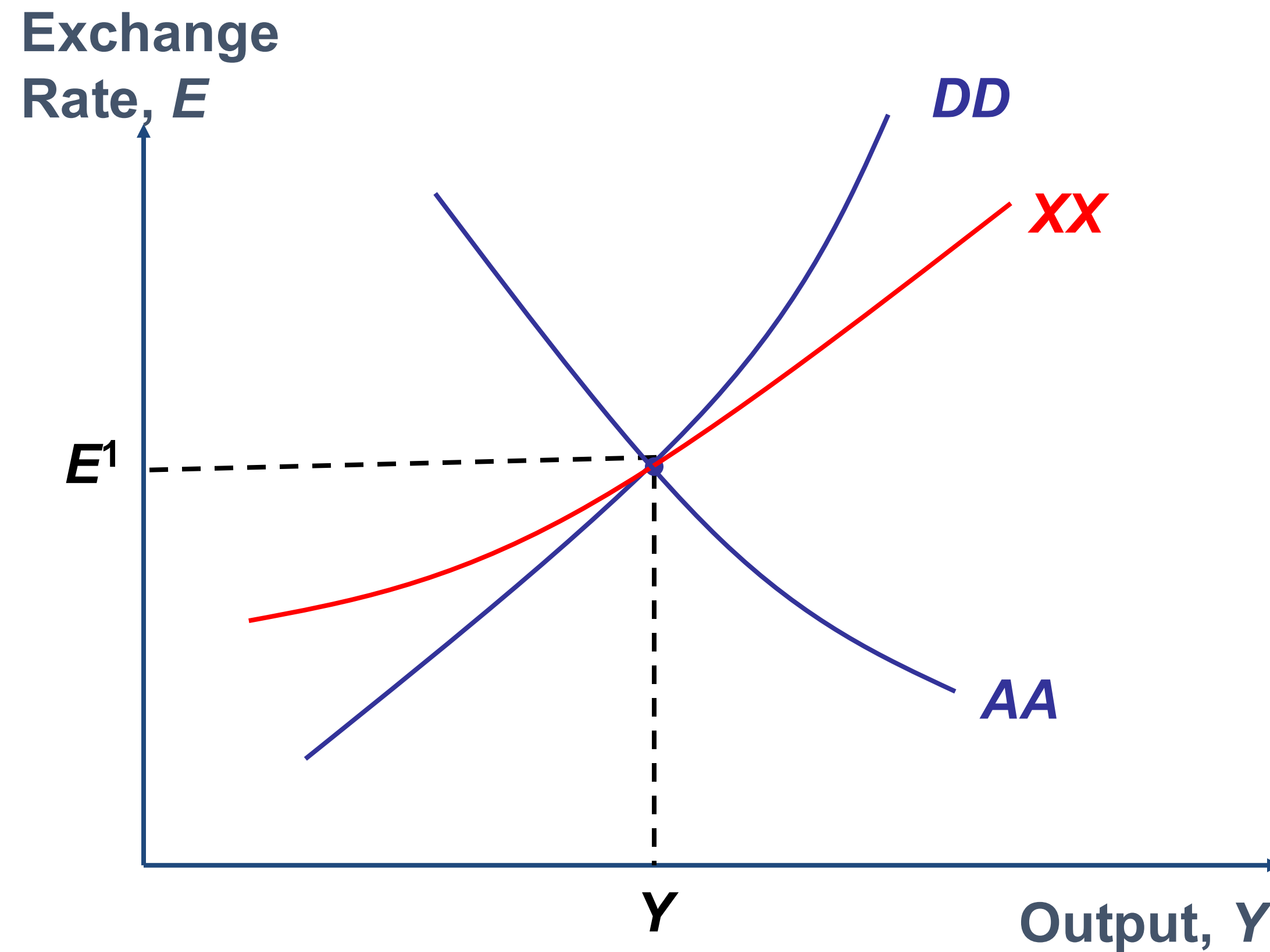$$\Delta Y = \Delta D$$

$$= \Delta Y\ (1 - m)\ c + \Delta E\ \alpha\ (P^*/P)$$

- Slope of DD curve

$$(\Delta E / \Delta Y)_{DD} = (1 – c + m\ c) / \alpha\ (P^*/P)$$

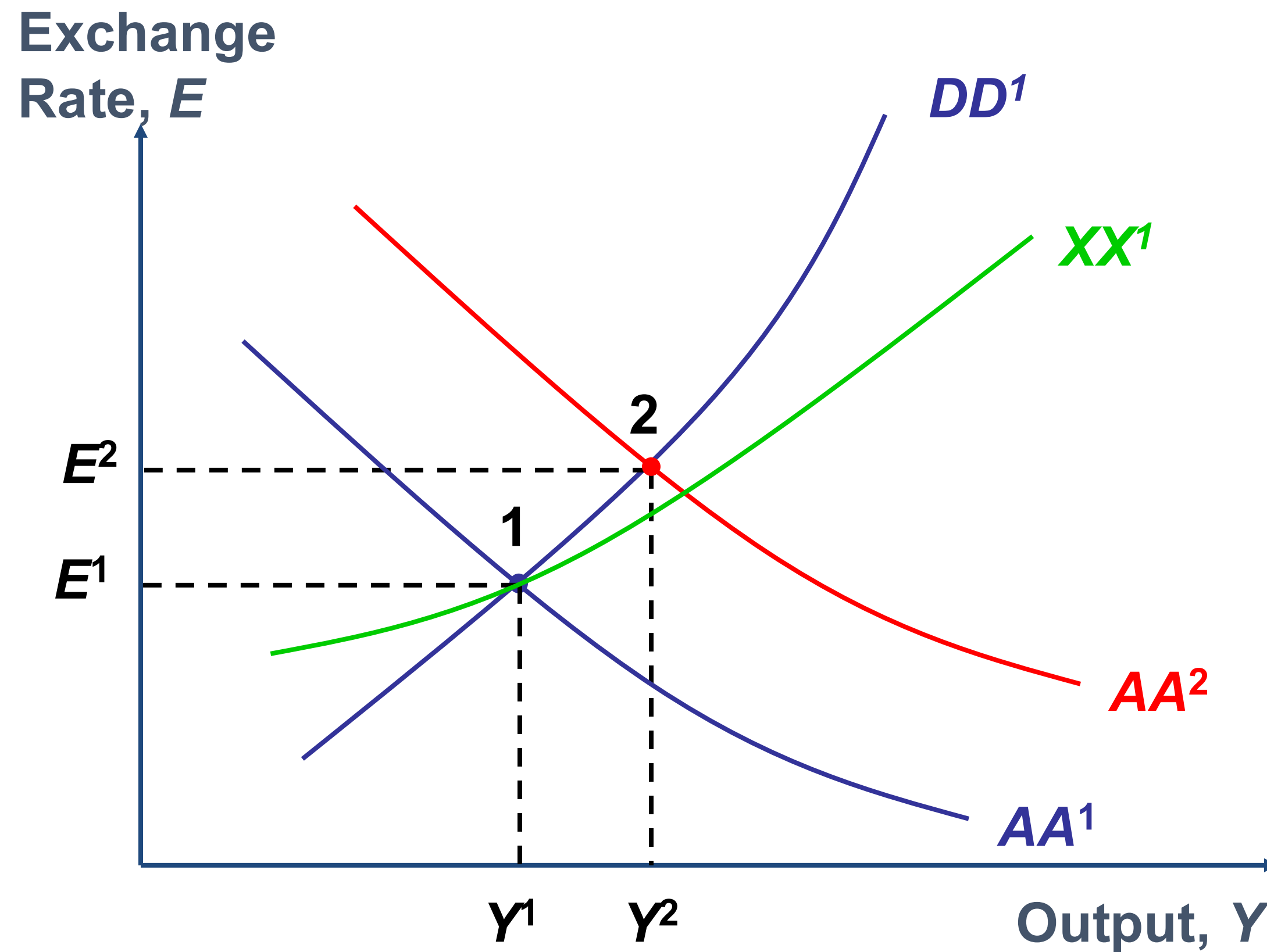- Slope of XX curve

$$(\Delta E / \Delta Y)_{XX} = m\ c\ / \alpha\ (P^*/P)$$

$$(\Delta E / \Delta Y)_{DD} > (\Delta E / \Delta Y)_{XX}$$

Putting everything together
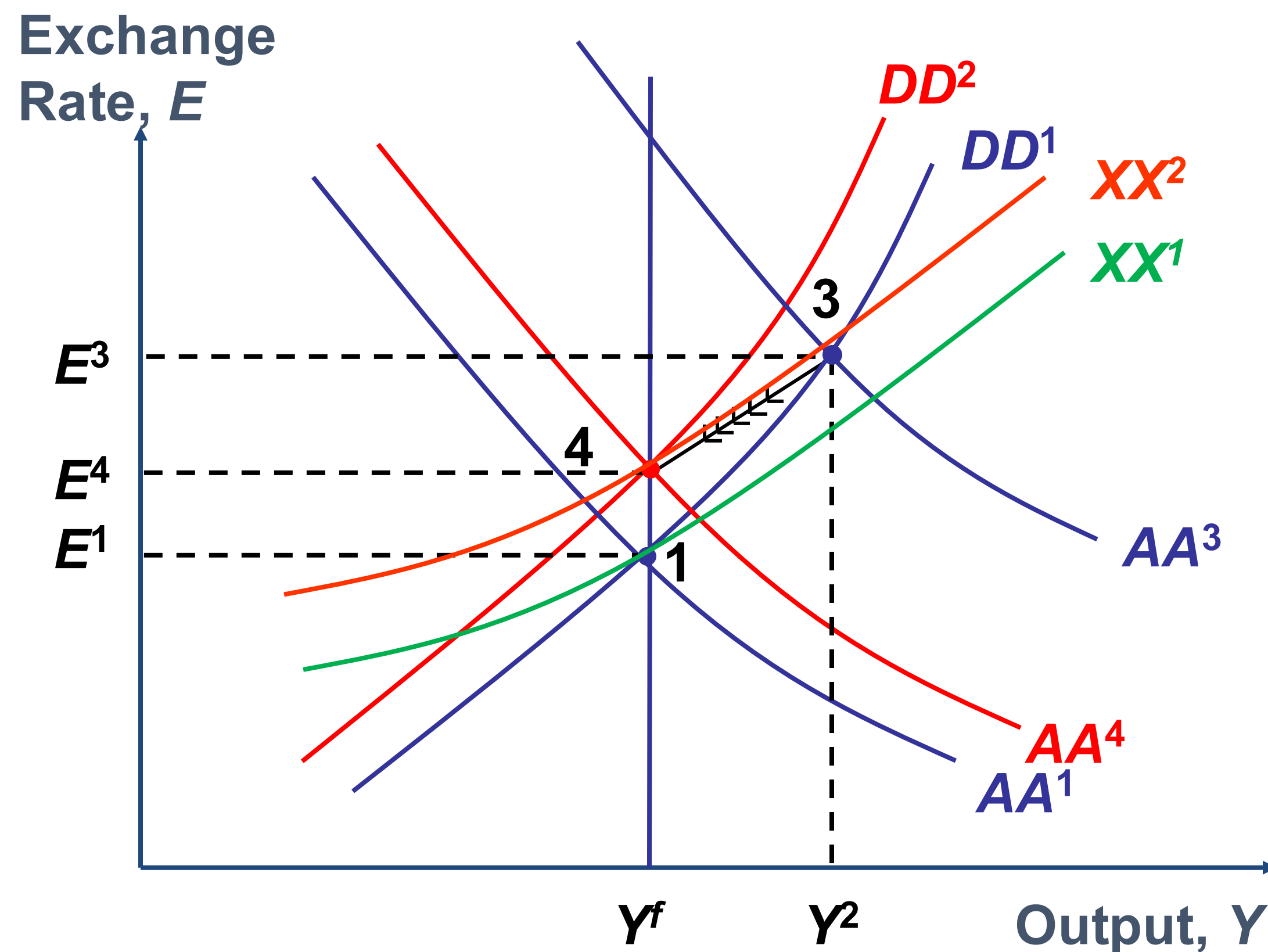
Temporary Increase in Money Supply

Permanent Increase in Money Supply: Short-run Effects

$$M \uparrow \rightarrow R \downarrow, E^{e} \uparrow \rightarrow E \uparrow$$

E depreciates more than with temporary increase

Exchange Rate, E

DD^2
DD^1
XX^2
XX^1

E^3 — 3
E^4 — 4
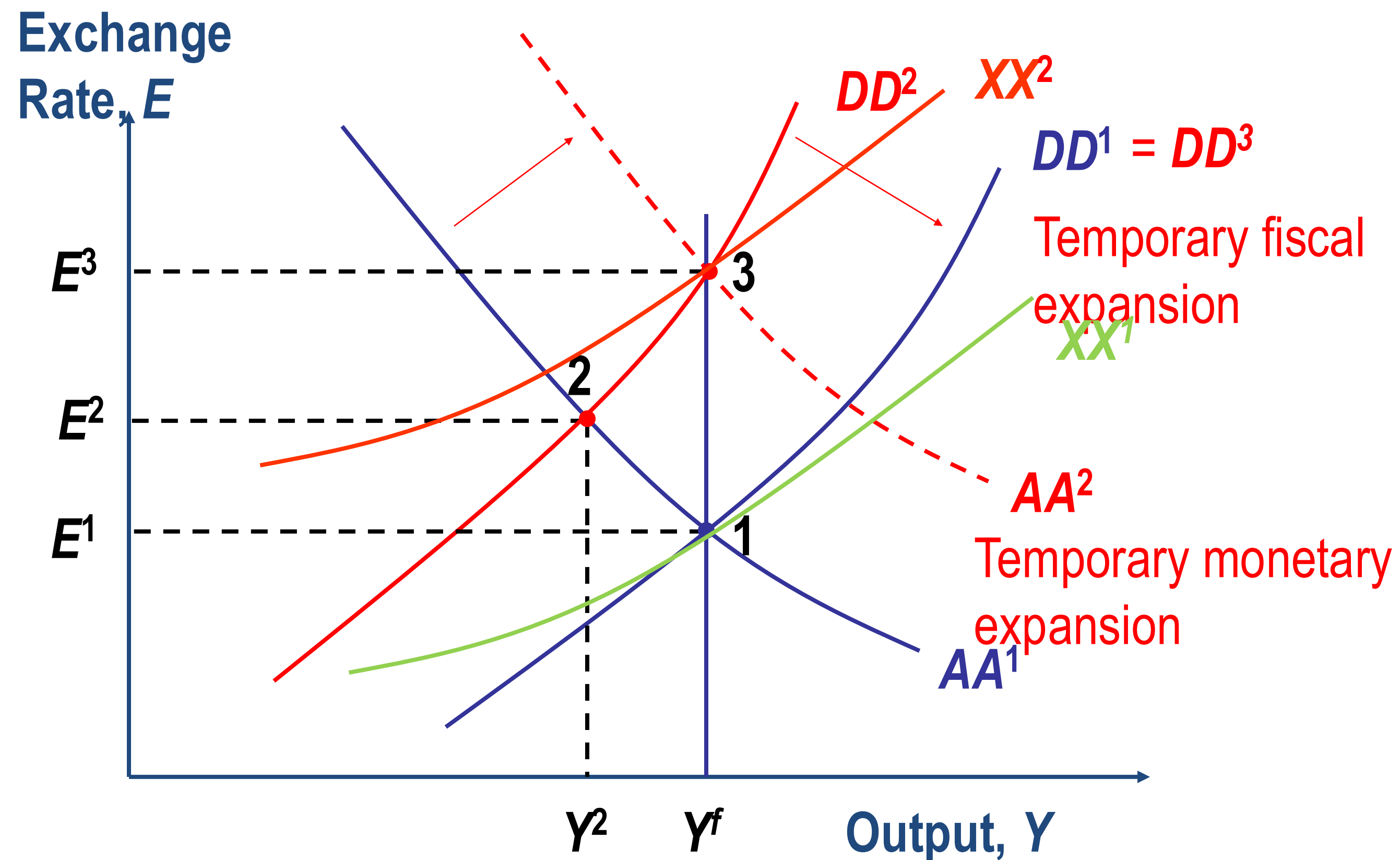E^1 — 1

AA^3
AA^4
AA^1

Y^f Y^2 Output, Y

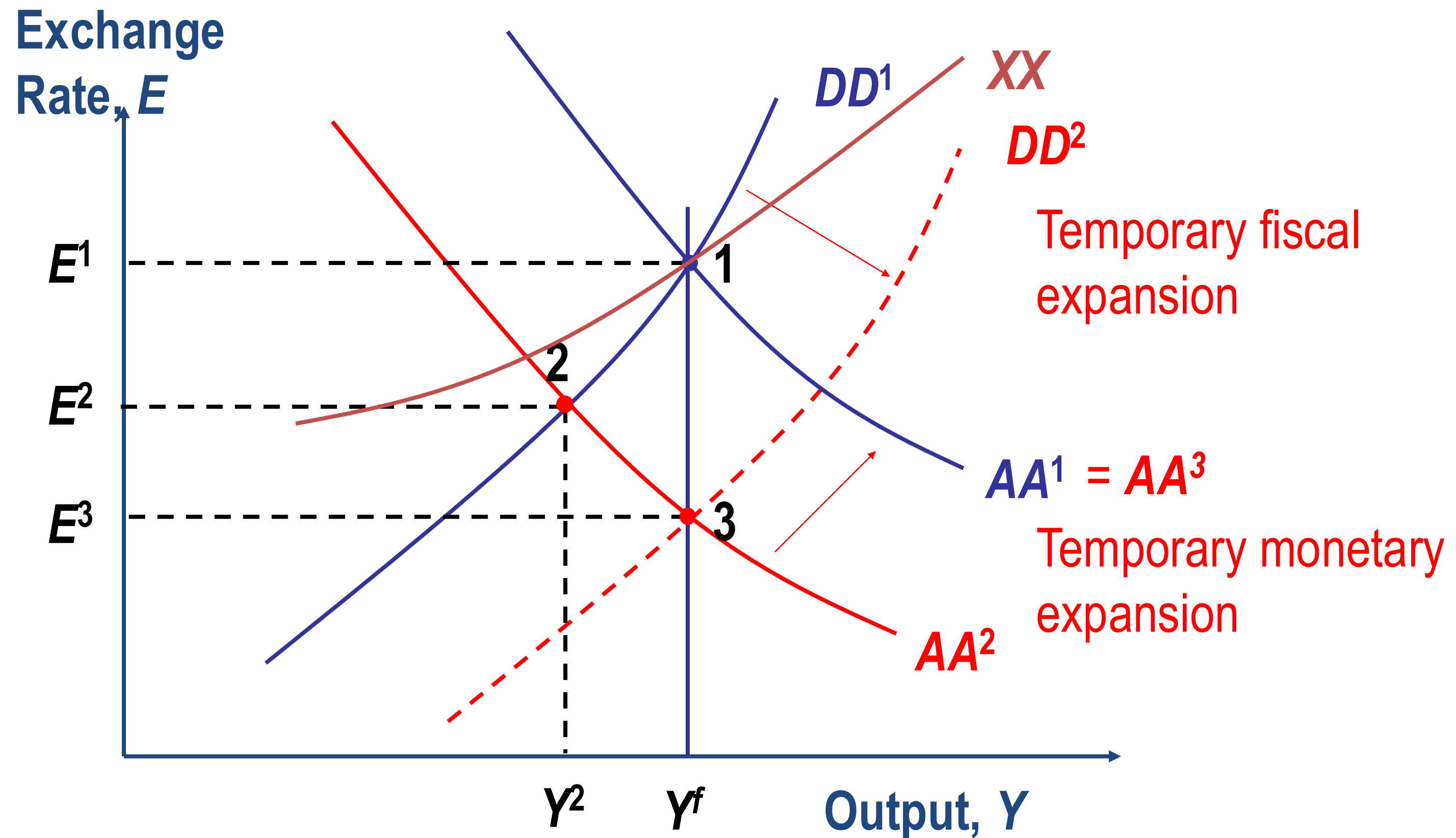$$P \uparrow \rightarrow \frac{EP*}{P} \downarrow \rightarrow D \downarrow$$

$$P \uparrow \rightarrow \frac{M}{P} \downarrow \rightarrow R \uparrow \rightarrow E \downarrow$$

$P \uparrow \rightarrow XX \uparrow$

Temporary Fall in World Demand for Domestic Products

Exchange Rate, E

DD^2 XX^2

$DD^1 = DD^3$

Temporary fiscal expansion

XX^1

AA^2

Temporary monetary expansion

AA^1

E^3 3

E^2 2

E^1 1

Y^2 Y^f Output, Y

Temporary Increase in Money Demand

Monetary and Fiscal Policies

- Temporary vs permanent

- Monetary policy

- Fiscal policy

- Policies to counteract a recession

6.4 The 2001 U.S. Recession

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~Shocks that contributed to the slowdown~
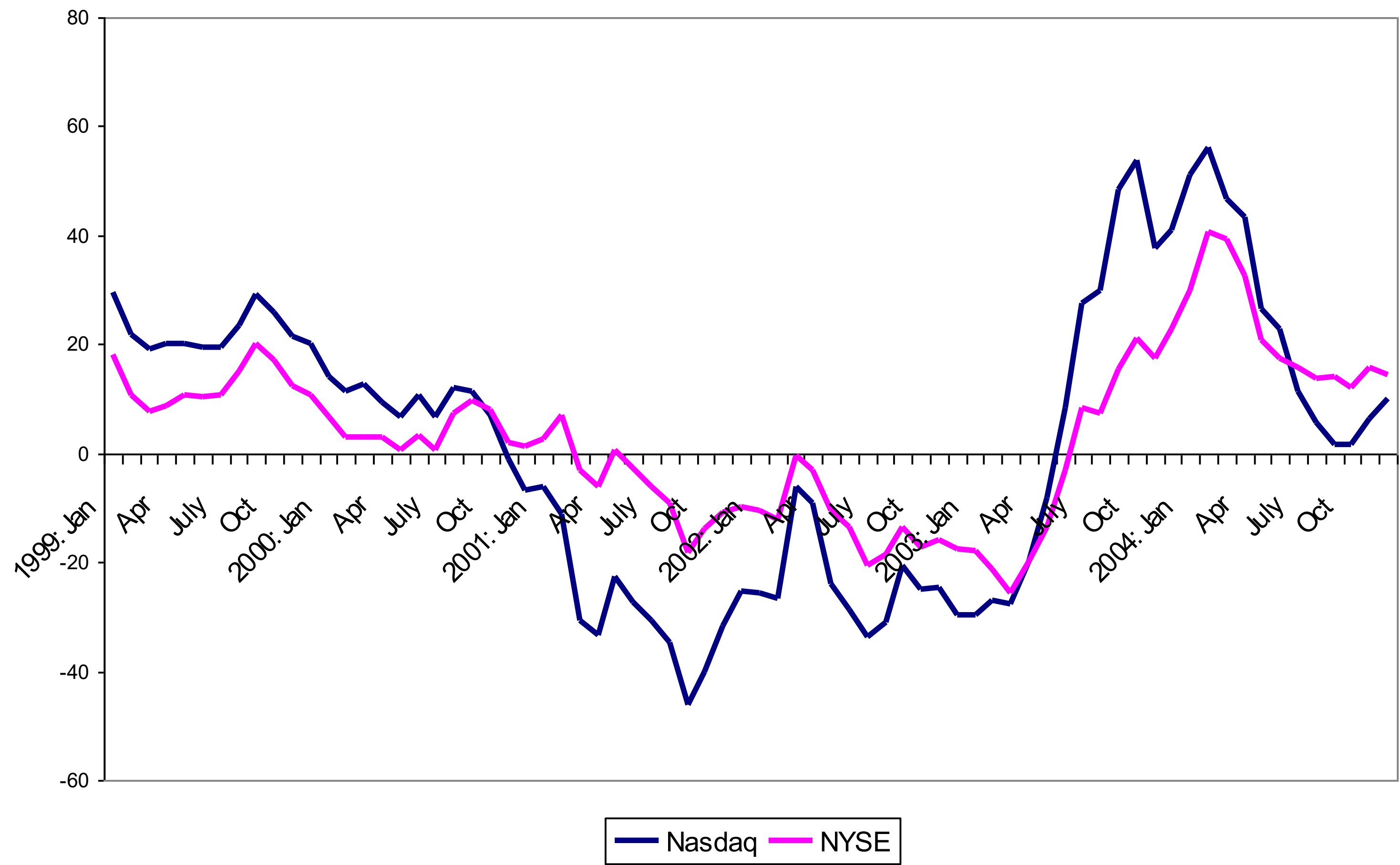
1. Falling stock prices
   From Aug 2000 to Aug 2001: -25%
   Week after 9/11: -12%

2. The terrorist attacks on 9/11
   increased uncertainty
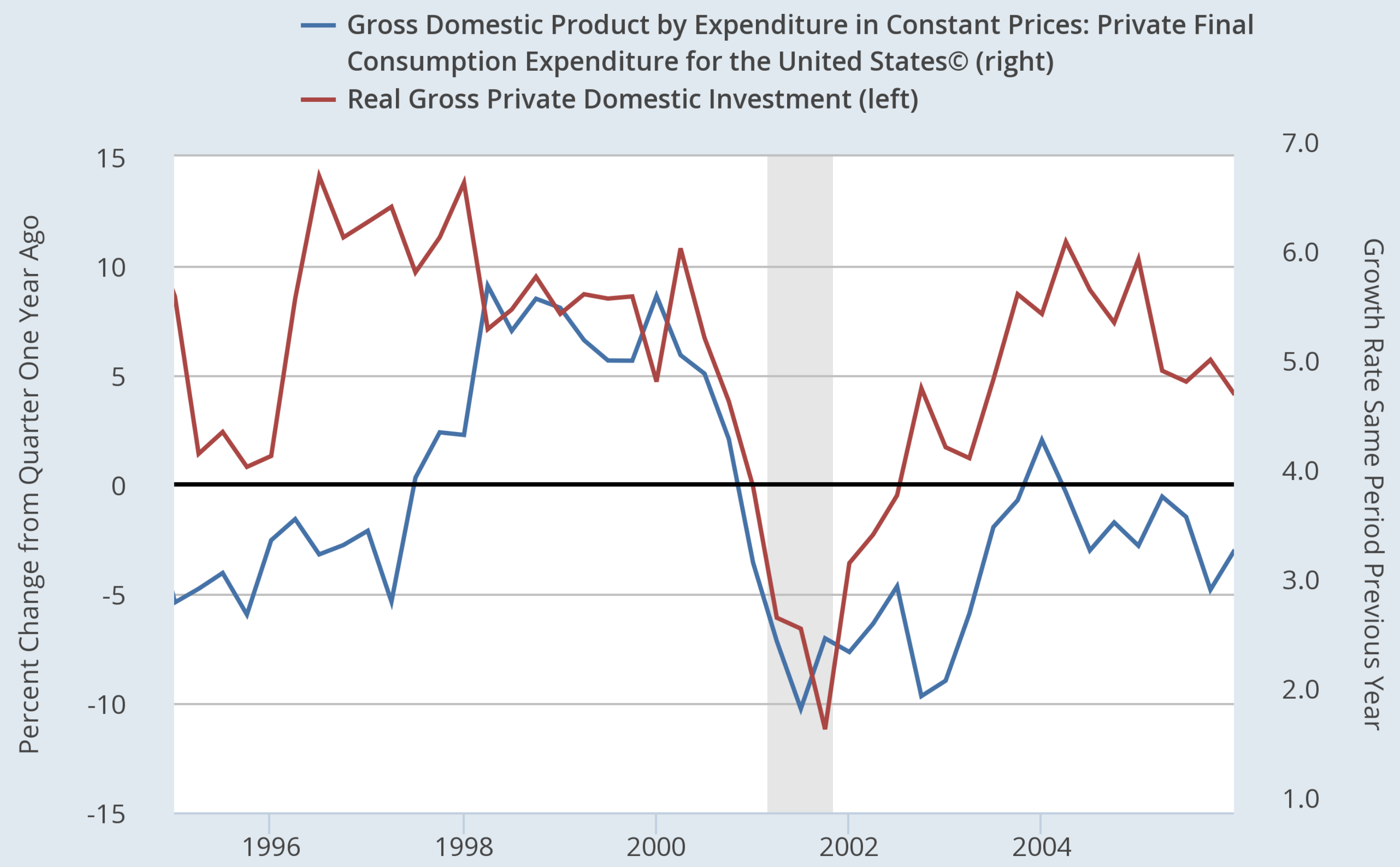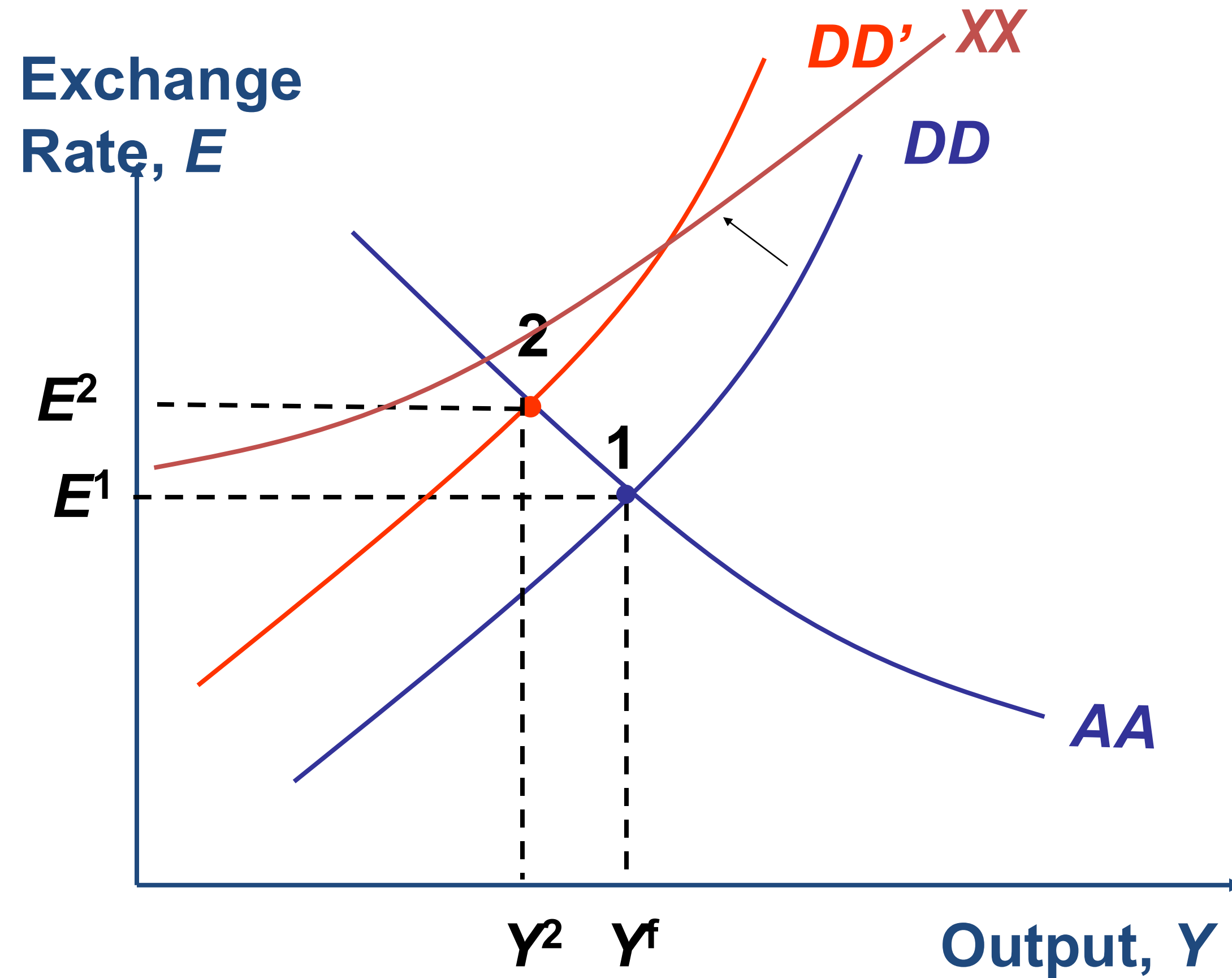   fall in consumer & business confidence

Stock Market: annual % change

- These shocks greatly reduced private consumption expenditure C (think of a fall in the marginal propensity to consume c) and investment I by firms

- Effect on the AA-DD-XX diagram: the DD curve shifts to the left

- Short-run: $Y\downarrow, E\uparrow$

Consumption and Investment

fred.stlouisfed.org

myf.red/g/bQ4x

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~*What happened*~

1. Real GDP growth rate
   - 1994-2000:   3.9% (average annual)
   - 2001:   0.8% for the year,
   - March 2001 determined to be the end of the longest expansion on record.
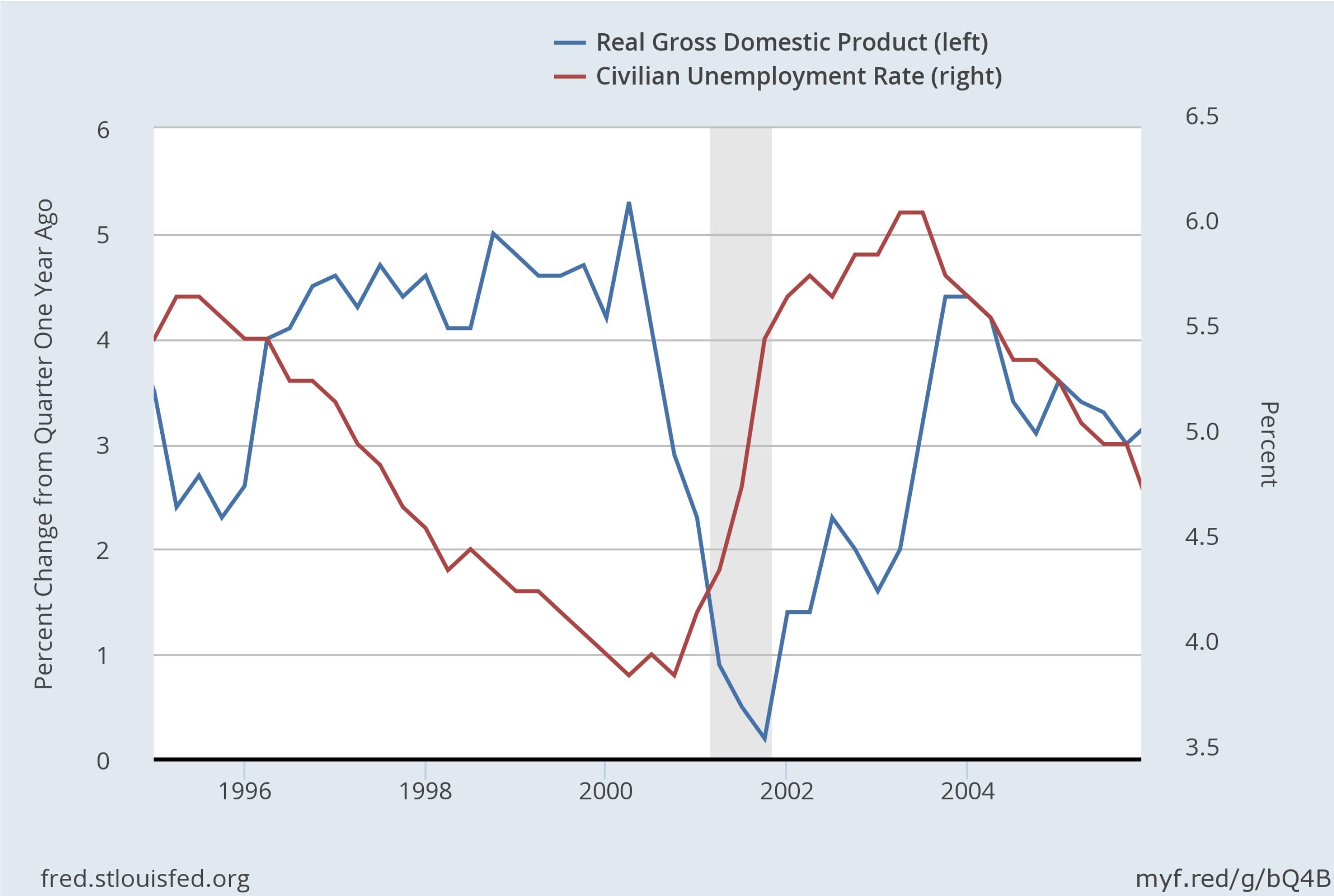
2. Unemployment rate
   - Dec 2000:   3.9%
   - Dec 2001:   5.5%
   - The number of unemployed people rose by 2.1 million during 2001!

- Official recession dates: March – November 2001

Real GDP Growth and Unemployment

Real Gross Domestic Product (left)
Civilian Unemployment Rate (right)

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myf.red/g/bQ4B

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~*The policy response*~
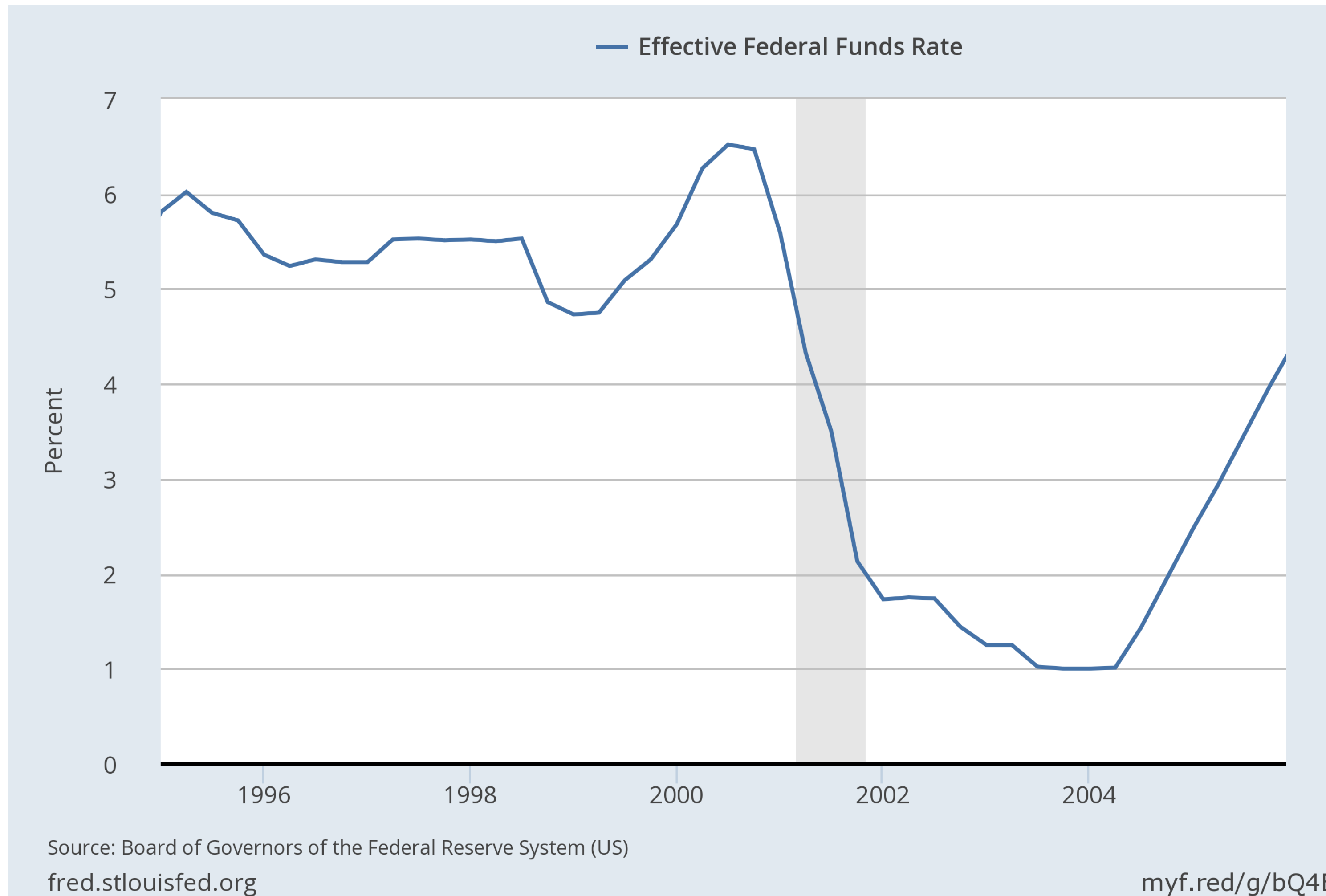
1. Fiscal policy
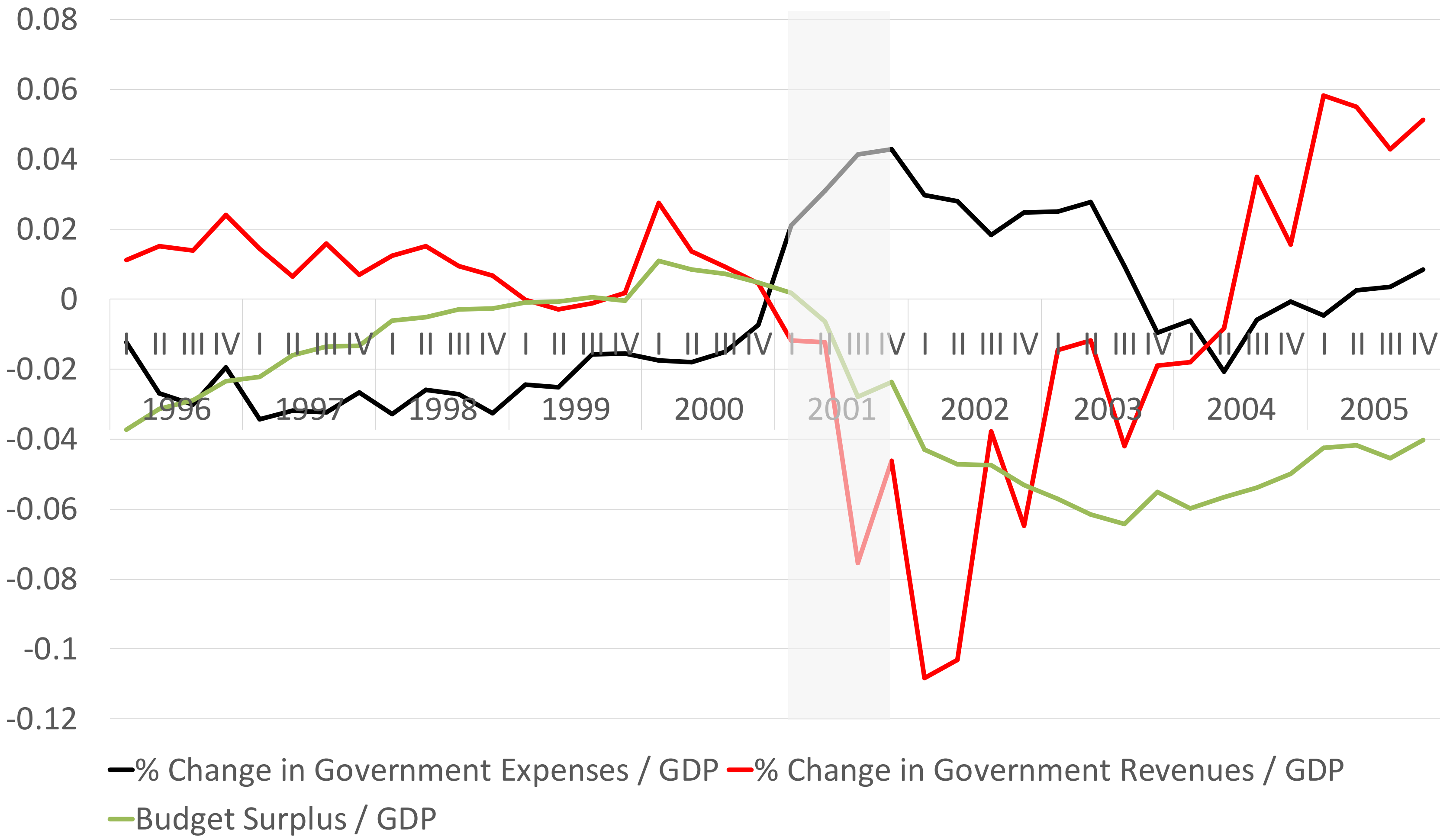   - large long-term tax cut,
     immediate $300 rebate checks, T↓

   - spending increases G↑:
     aid to New York City & the airline industry,
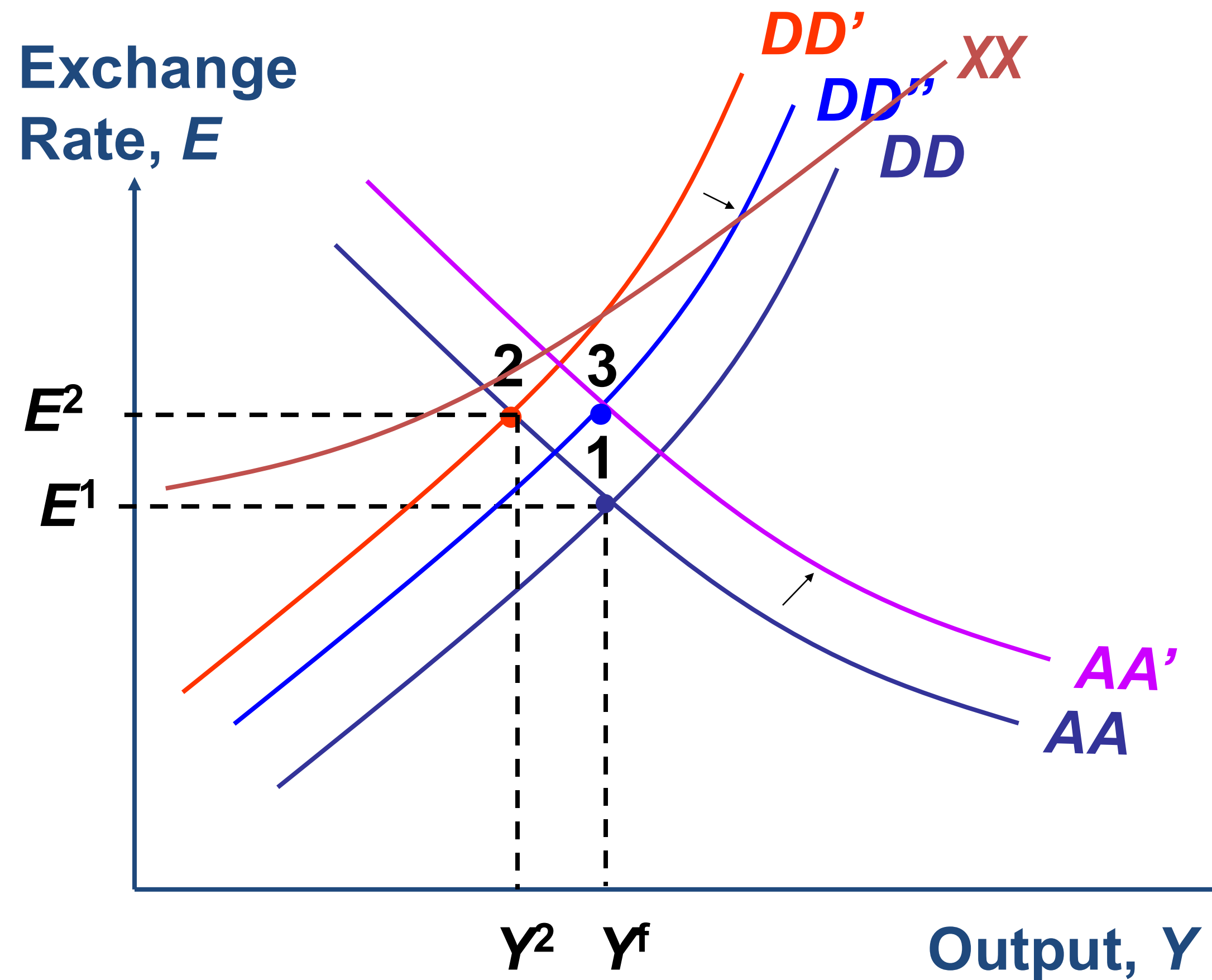   war on terrorism

2. Monetary policy
   - Fed lowered its Fed Funds rate target
     11 times during 2001, from 6.5% to 1.75%, M↑

Monetary Policy

Effective Federal Funds Rate

Source: Board of Governors of the Federal Reserve System (US)

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myf.red/g/bQ4E

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Fiscal Policy

—% Change in Government Expenses / GDP —% Change in Government Revenues / GDP
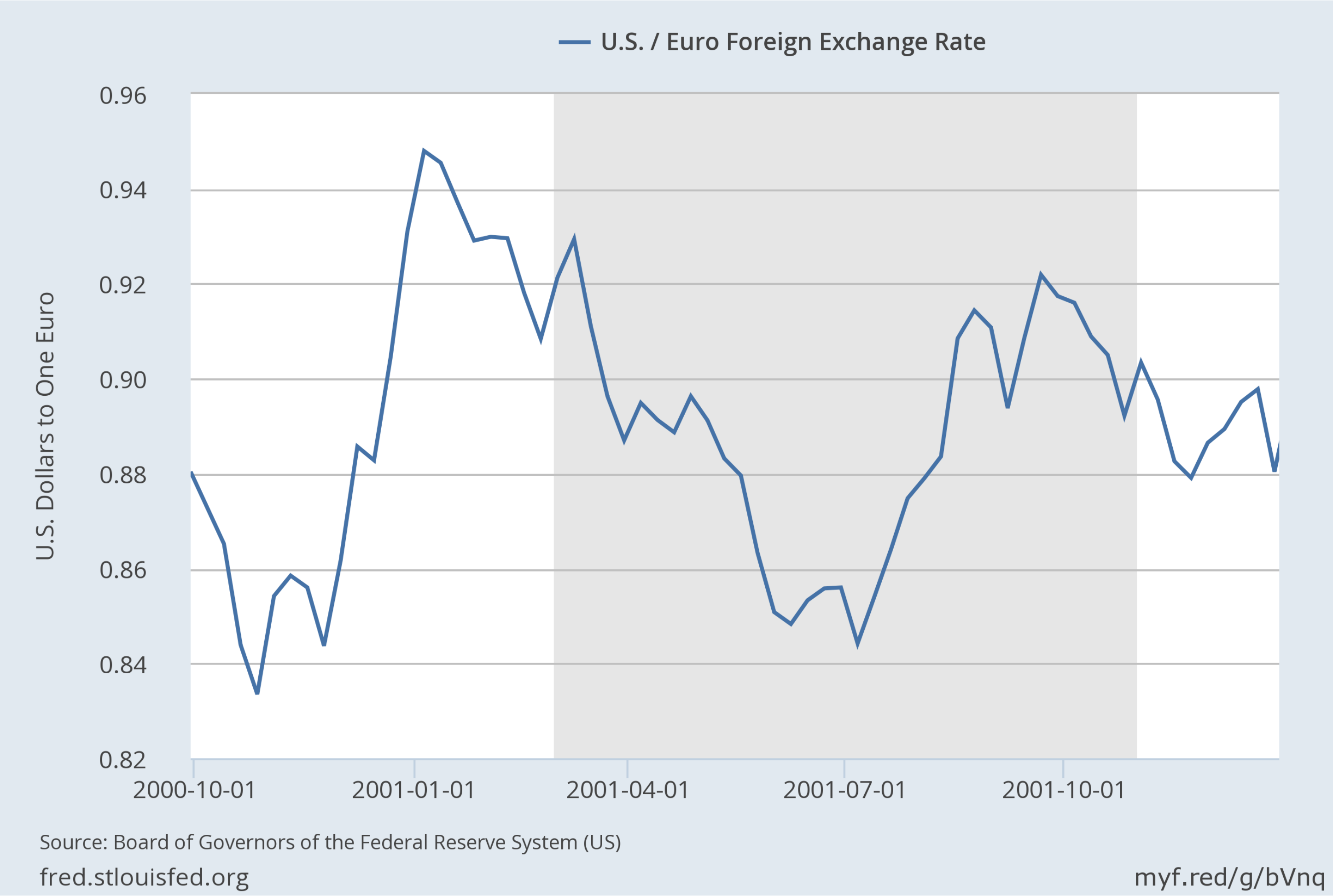
—Budget Surplus / GDP

The Effect of Macroeconomic Policies

- Fiscal expansion shifts DD' outward to DD''
- Monetary expansion shifts AA curve outward to AA'
- Short-run equilibrium at 3, with Y↑
- The effect on the exchange rate is unclear, as the two policies have opposite effects on E

The USD/EUR exchange rate

Source: Board of Governors of the Federal Reserve System (US)

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myf.red/g/bVnq

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~The recovery~

- The recession officially ended in November 2001

- Real GDP recovered, growing 2.3% in 2002 and 4.4% in 2003

- The unemployment rate lagged: 5.8% in 2002, 6.0% in 2003. This is why it was called "the jobless recovery"

- Unemployment finally responded in 2004: 5.6% for the first half of 2004