

MACROECONOMICS I

Class 7. The IS-LM model

March 28th, 2014

Announcements

✓ **NO** class next week (April 4th)

✓ Midterm exam: April 11th, at 12:00, S6

✓ Homework # 2. Deadline: April 11th (before exam)

Midterm: All topics including today's class + all handouts

N!B! A written form exam (bring paper and calculator)

Contacting me: email + skype for urgent matters

Review: The Money Market

Explain how the following developments would affect the supply of money, the demand for money, and the interest rate.

- a. The Fed's bond traders buy bonds in open market operations.
- b. An increase in credit-card availability reduces the cash people hold.
- c. The Federal Reserve reduces banks' reserve requirements.
- d. Households decide to hold more money to use for holiday shopping.
- e. A wave of optimism boosts business investment and expands aggregate demand.

Review: Equilibrium Interest Rate

The money demand is:

$$MP = \frac{1}{i}$$

Personal income is equal to \$100

Money supply: \$20

1. Find the equilibrium in the money market
2. If the central bank wants to increase i by 10 % (from 2 % to 12 %), to what level should it set the money supply?

The Goods Market and the Role of Interest Rate

- Linking goods market and money market

Common element: Interest rate i

$$Y = C + I + G$$

- The goods' market:

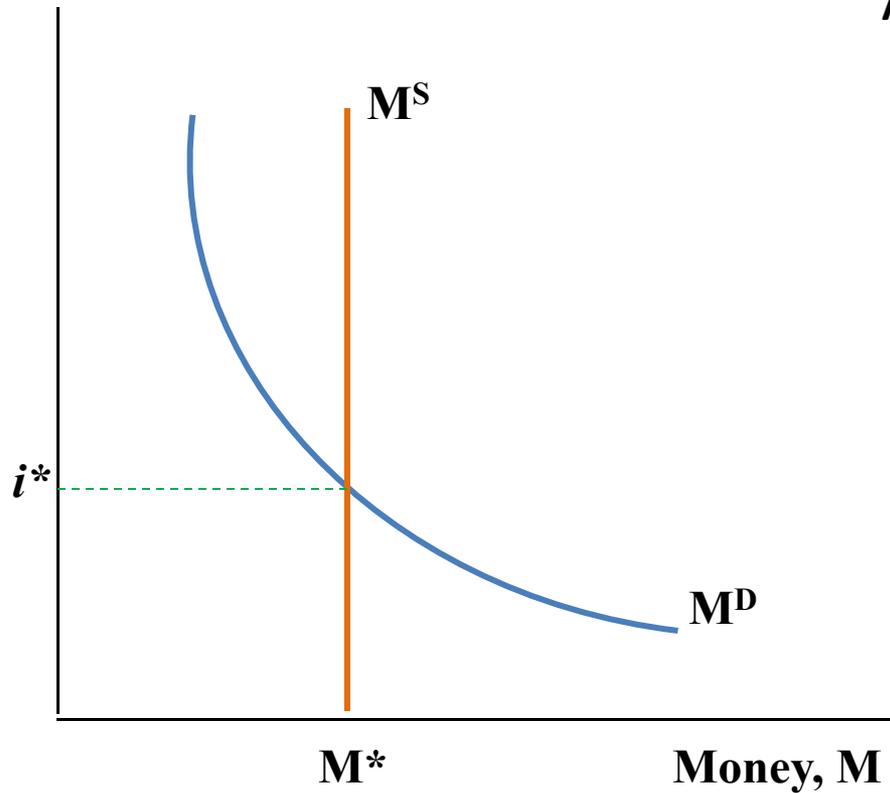
$$I = I(i)$$

$$Y = C + I + G$$

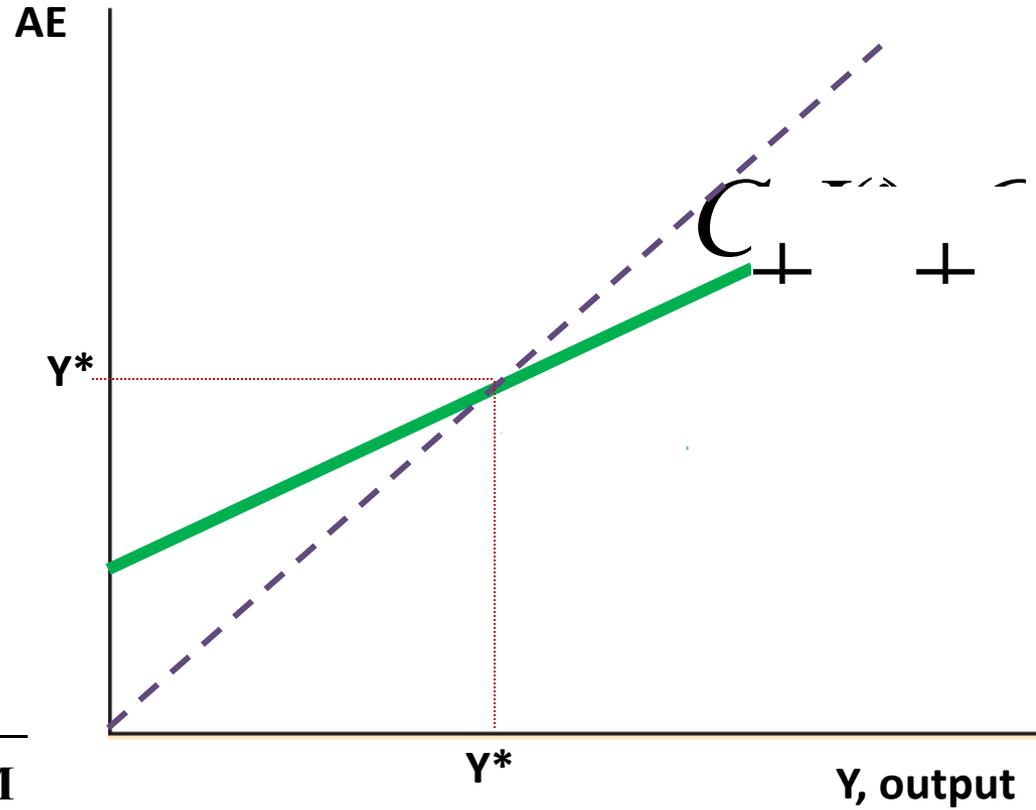
N!B! Monetary policy affects aggregate output (GDP)

The Equilibrium

Interest rate, i

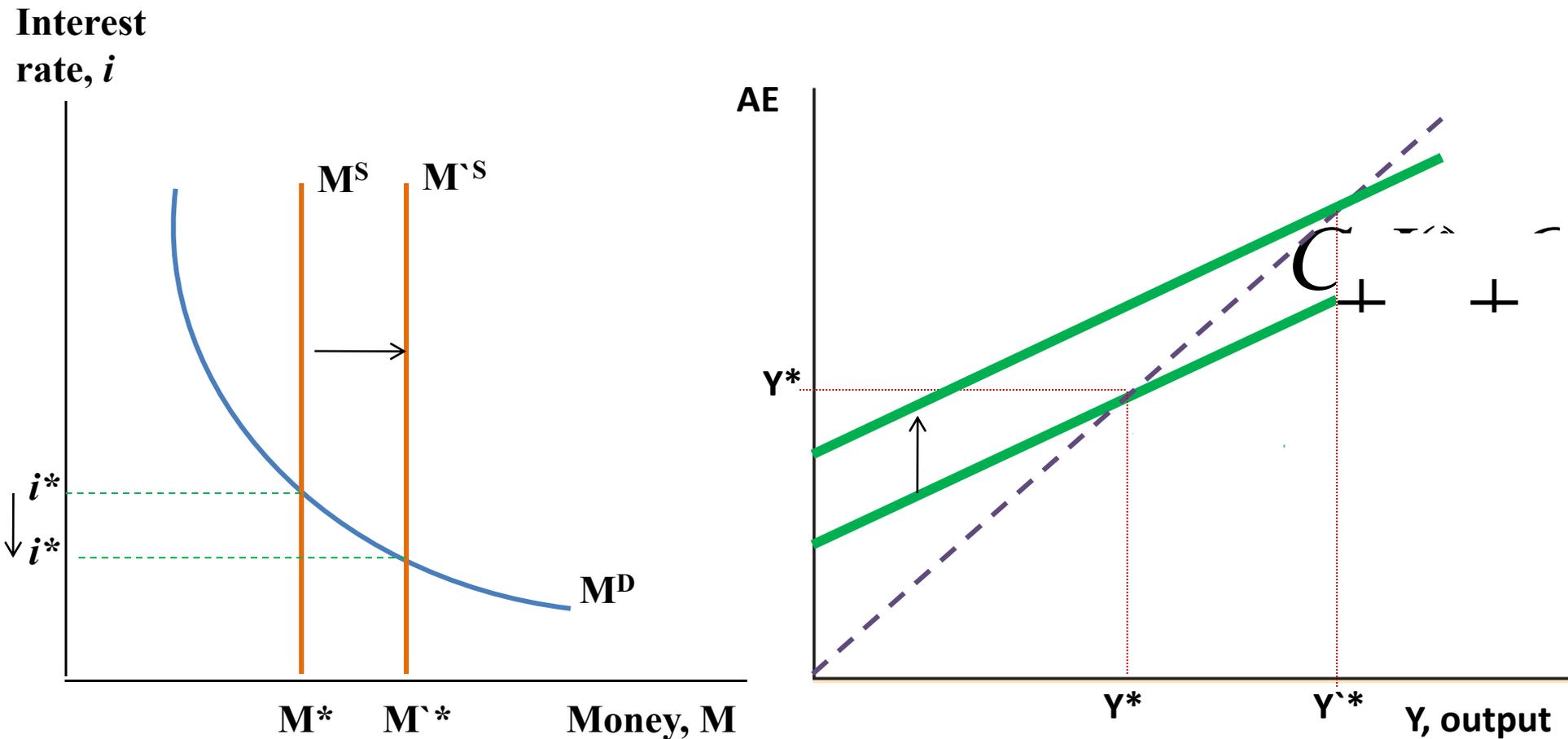


Equilibrium: i^*



Equilibrium: Y^*

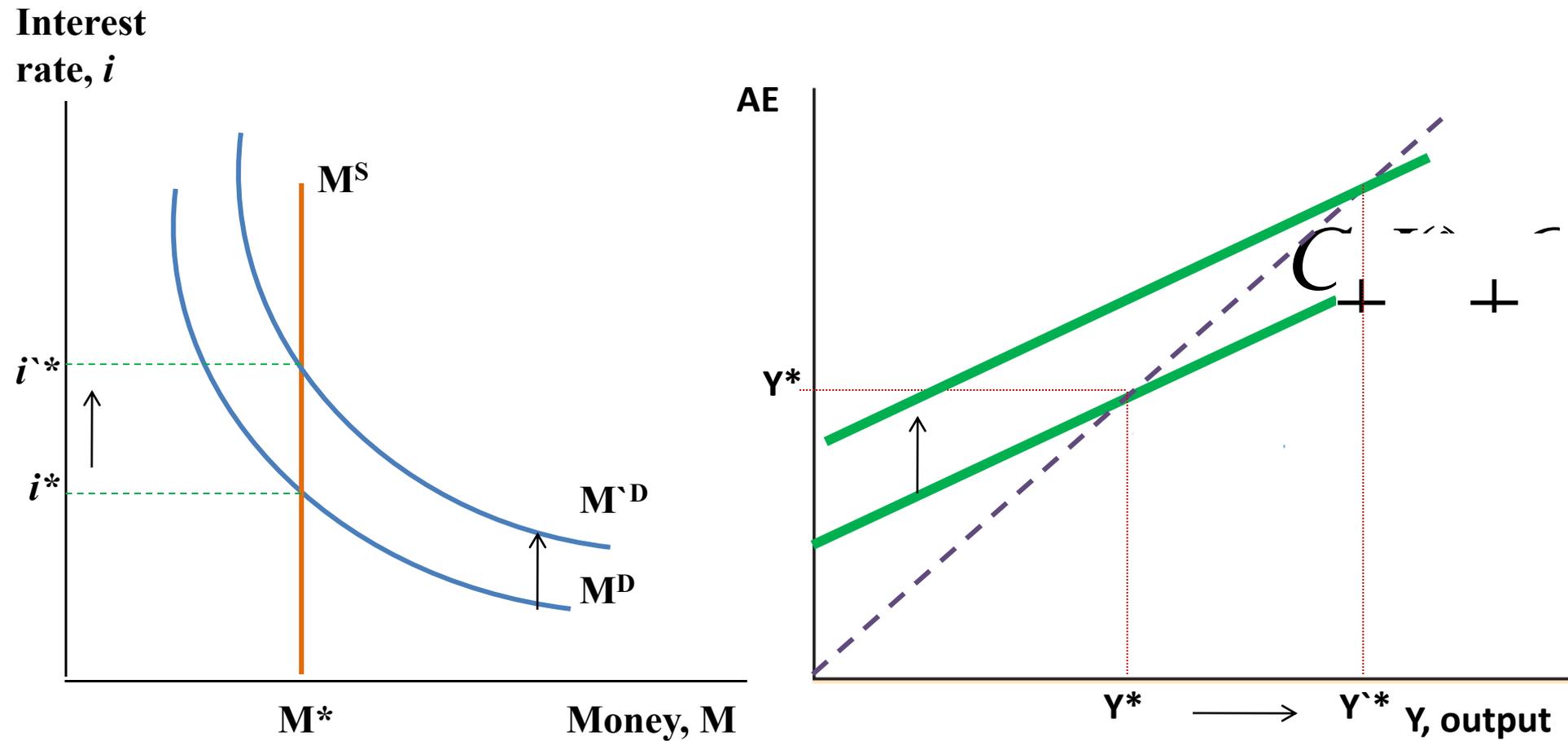
Expansionary Monetary Policy



Show the effect of increase in money supply in both markets

N!B! Expansionary monetary policy lowers interest rate and increases output

Expansionary Fiscal Policy



Show the effect of expansionary fiscal policy in both markets

N!B! Expansionary fiscal policy increases **both** output and interest rate

Feedback Effects of the Fiscal and Monetary Policy

Expansionary fiscal policy:

- Short-run gain as output growth
- But, **interest rate** increases \Rightarrow Investment drops \Rightarrow Less growth in the future

\Rightarrow A short-term gain at a long-term cost

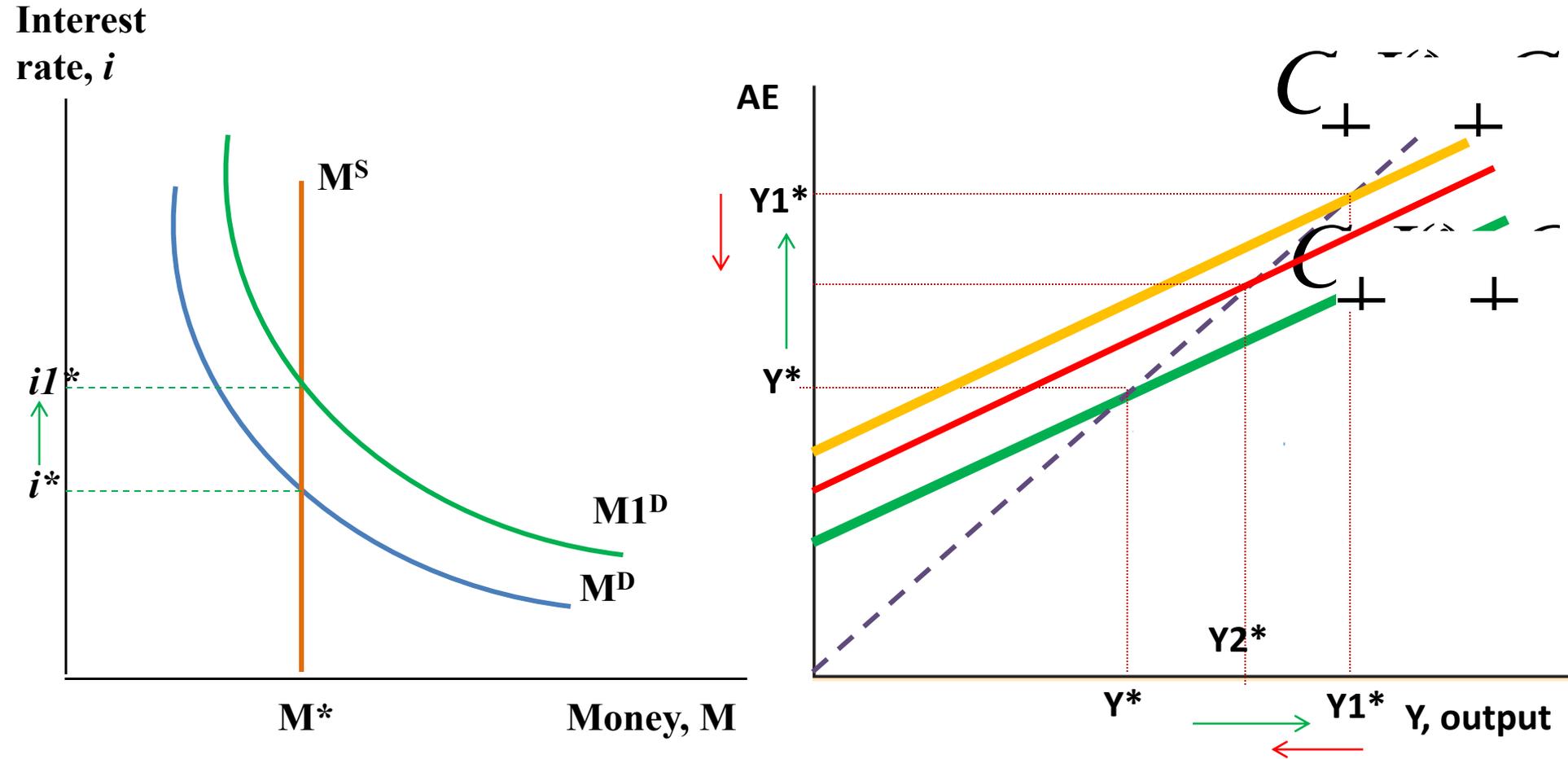
$$\mathbf{G \text{ multiplier} < 1/(1-b)}$$

Expansionary monetary policy:

- Short-run gain as output growth
- **Drop in interest rate** \Rightarrow Rise of investment \Rightarrow More growth in the future

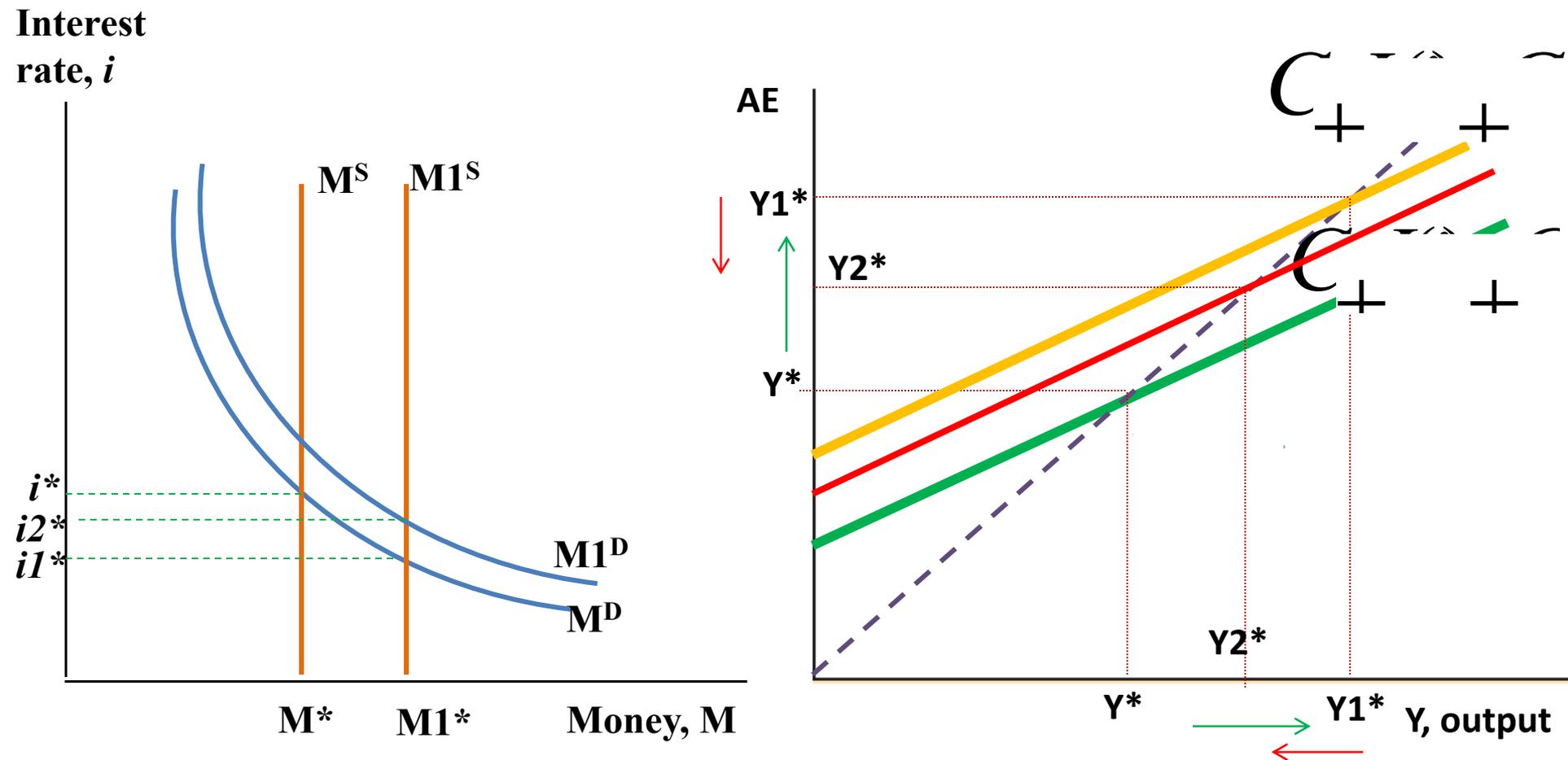
\Rightarrow A win-win situation

The Feedback Effect of Fiscal Policy



N!B! The initial effect of increased G is diminished through the interaction with the money market

The Feedback Effect of Monetary Policy



N!B! The initial effect of increased in money supply is diminished through the interaction with the goods' market

The Liquidity Trap: Zero Lower Bound

- A situation when monetary policy is ineffective
- Nominal interest rate is close to 0 % and cannot go below 0.

But: Firms do not want to invest despite free capital

Consumers do not want to save

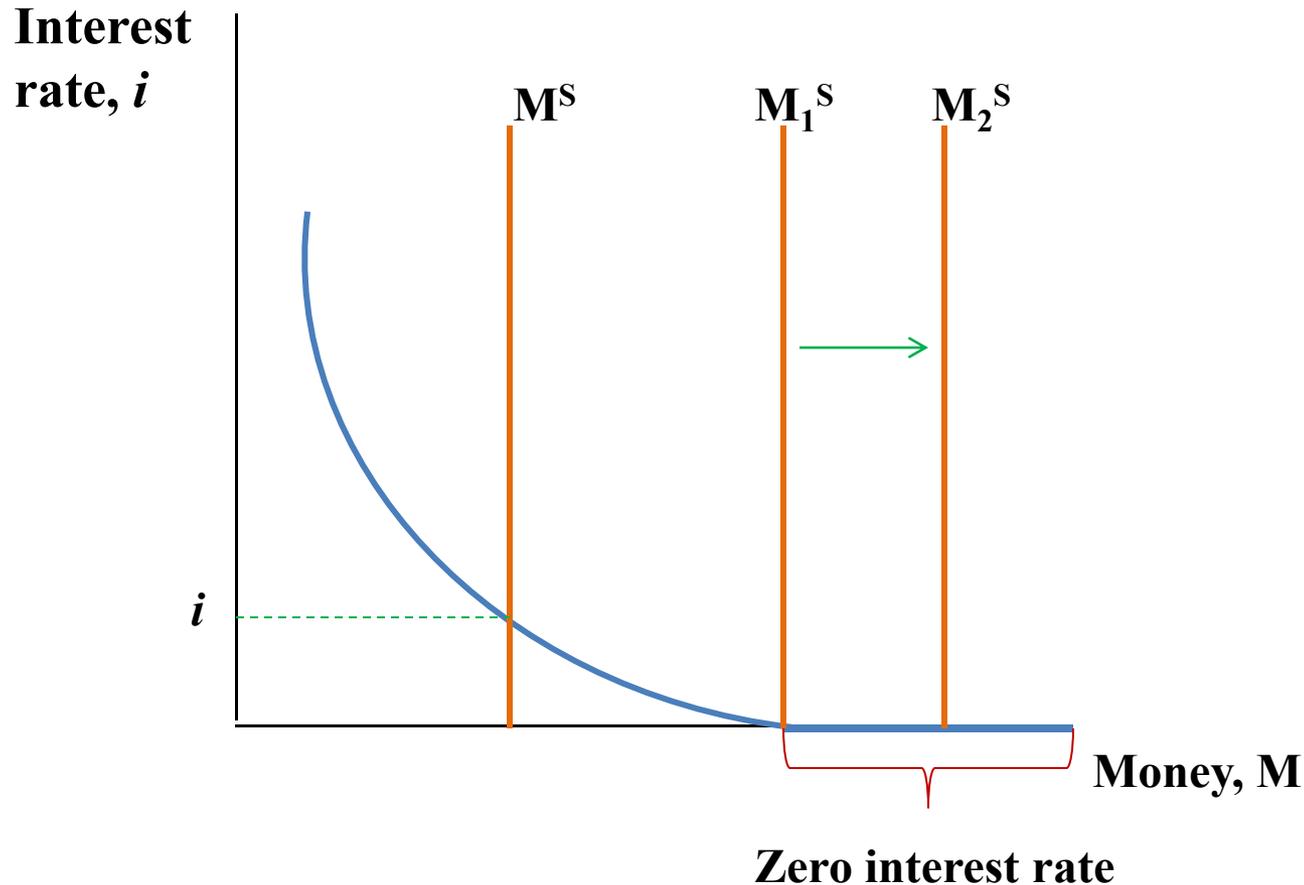
- Anticipation of a bad economic situation
- Increase in money supply => More liquid wealth portfolios of the households

TE The US in 1930th and 2008 had the interest rate between 0-0.25 %

Japan in the second half of 1990s

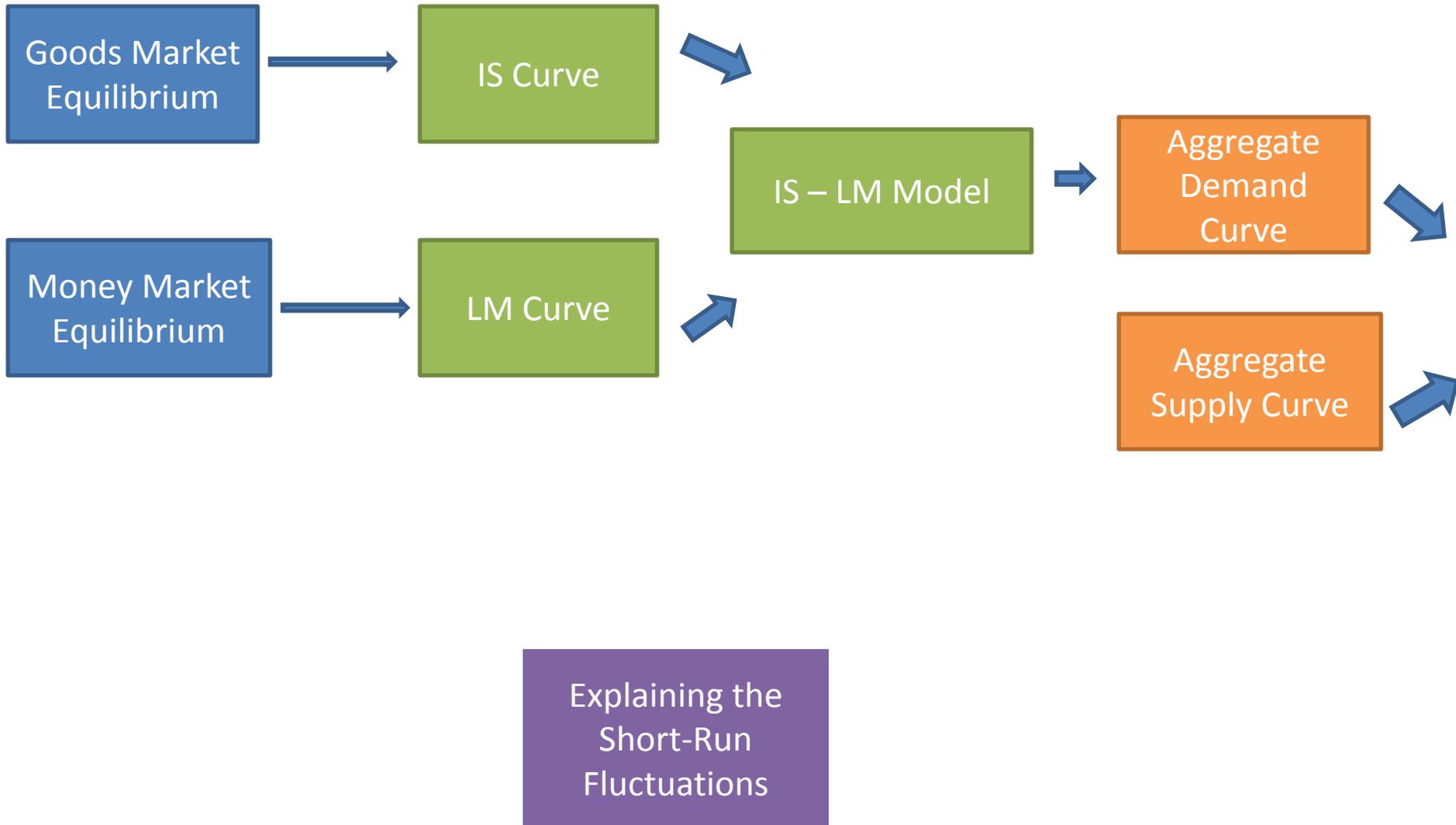
The Liquidity Trap (Cont.)

- Demand for money becomes horizontal
- Further increase in money supply has no effect on interest rate



Further increase in money supply through quantitative easing

The Theory of Short-Run Fluctuations



The IS-LM Model: Introduction

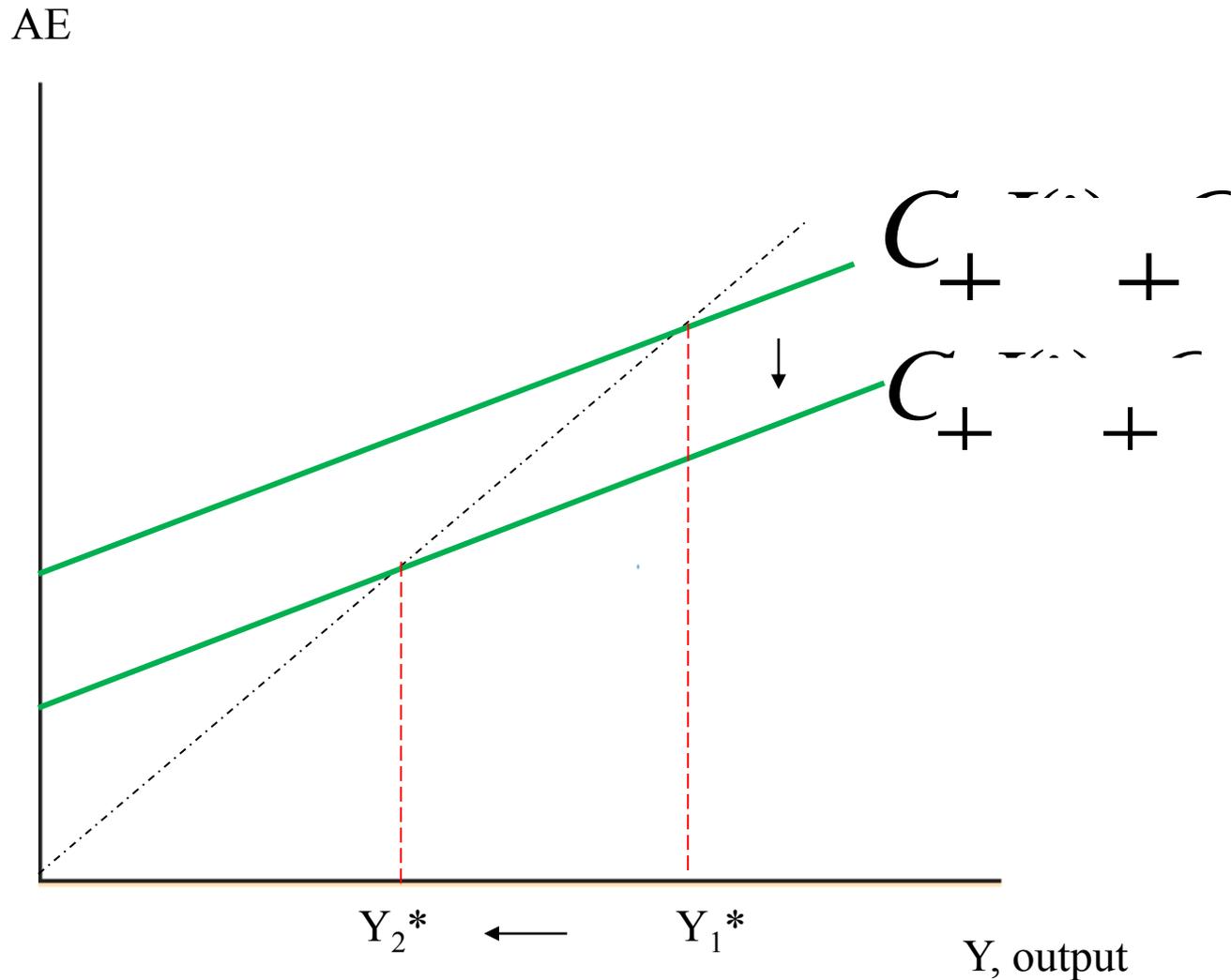
Equilibrium (short-run): a combination of interest rate (i^*) and output (Y^*) that simultaneously satisfy the equilibrium conditions in goods and money markets

- A model of general equilibrium

Equilibrium in goods' market: $IS: Y = C + I + G$

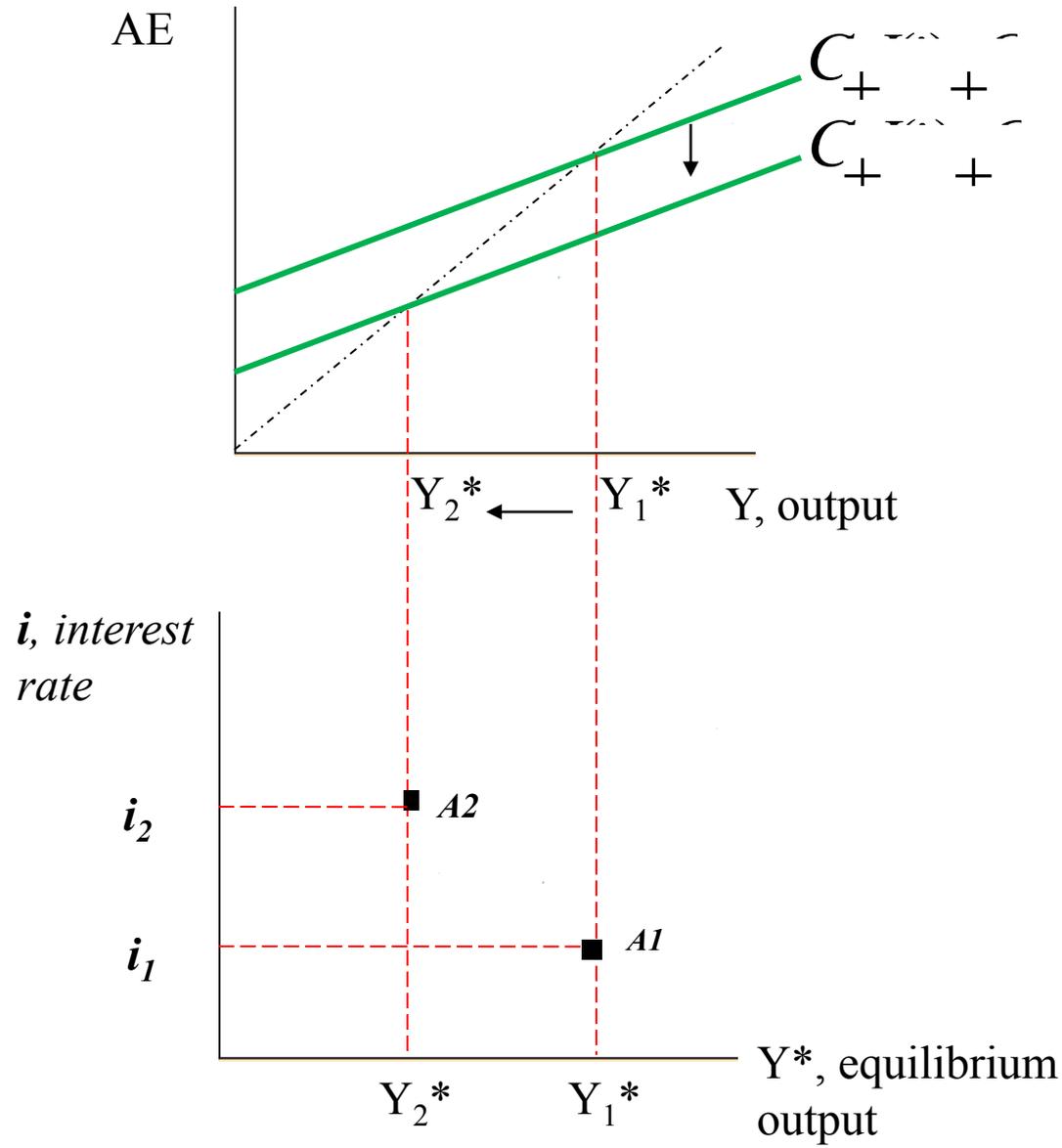
Equilibrium in money market: $LM: M = M^d$

IS Curve: Goods' Market



- For any value of i , we have a different Y^*

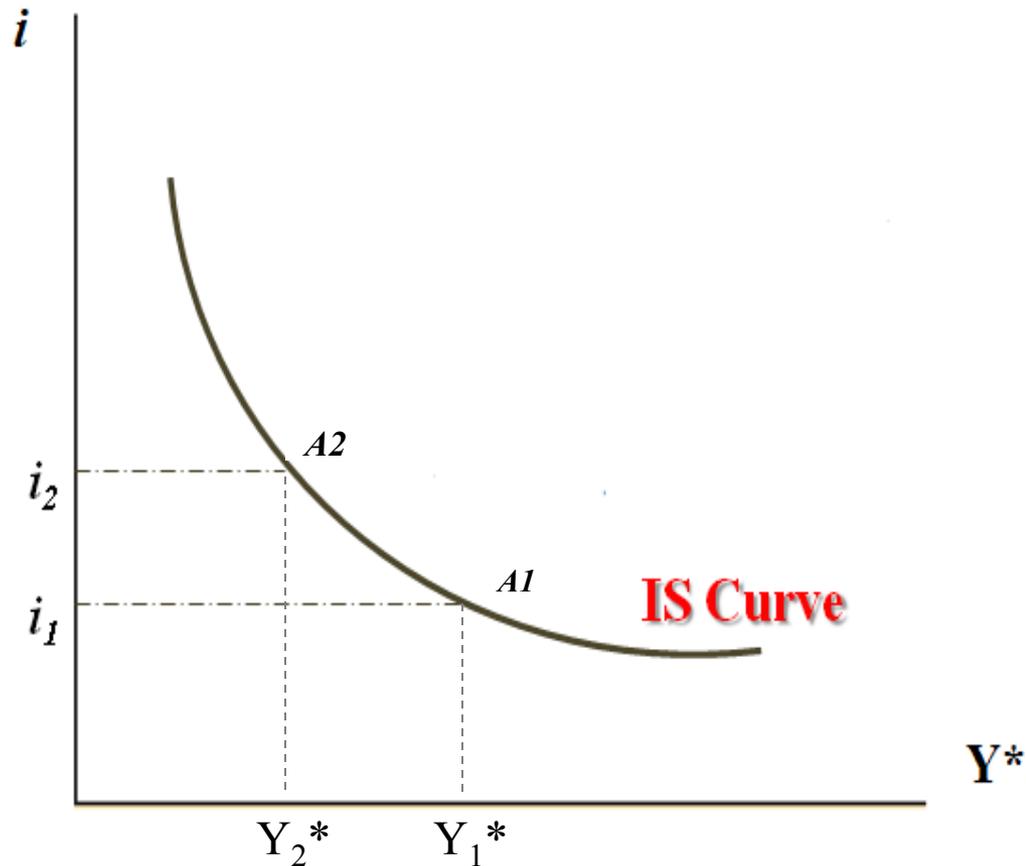
IS Curve: Relationship between Y^* and i



IS Curve: Relationship between Y^* and i

IS curve: for any given level of interest rate what is the level of income that brings the goods market into equilibrium

- **All possible combinations** of the interest rate and equilibrium output.



IS Curve Shifts

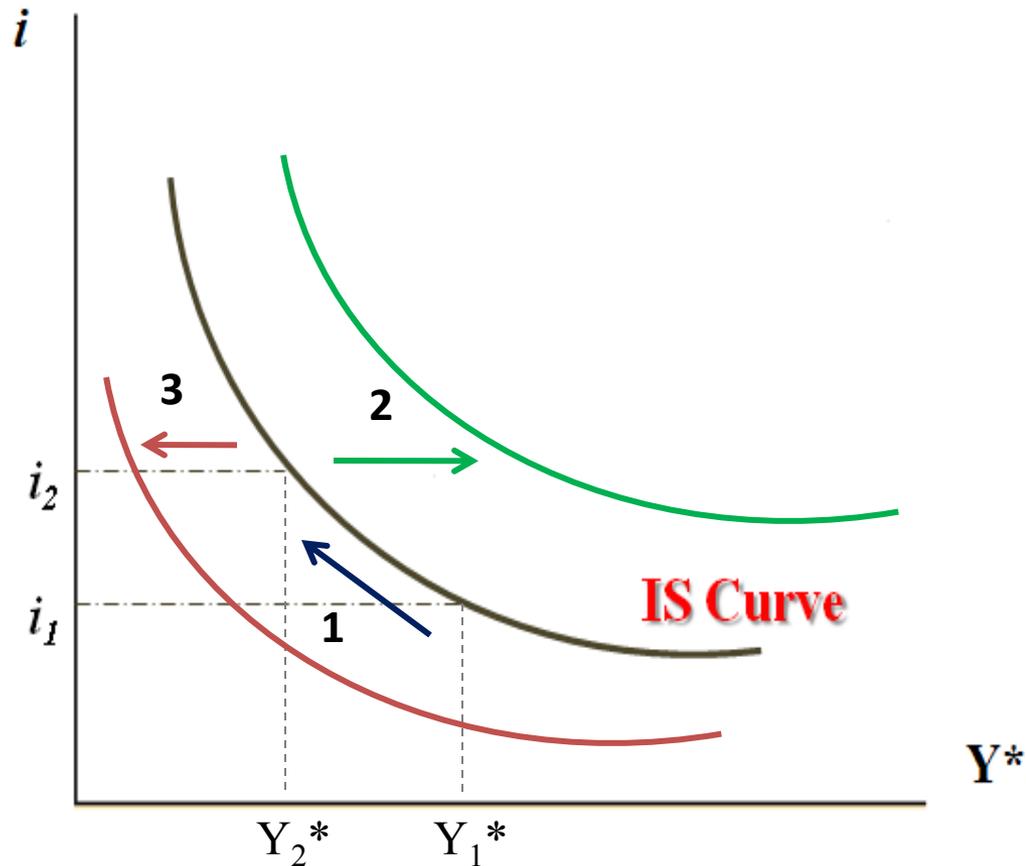
- Changes in i result in the *movement along* the IS curve.
- At any given i , the fiscal policy leads to the *shifts* of the IS curve

✓ *Show graphically the effect of tax increase on the equilibrium output. If the interest rate is constant, what would happen to the IS curve after such increase?*

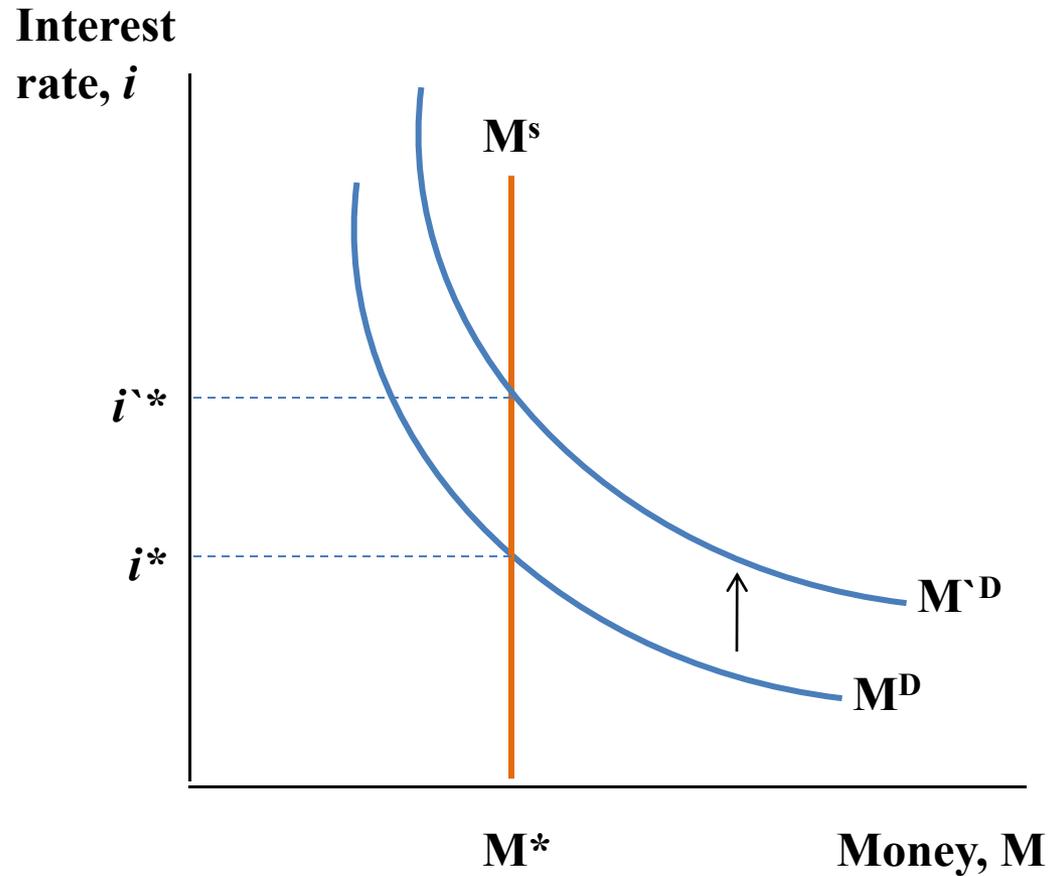
✓ *Show graphically the effect of increase in autonomous consumption. What would happen to the IS curve in this case?*

The IS curve: Relationship between Y^* and i

1. Changes in interest rate
2. Expansionary fiscal policy with any given interest rate
3. Contractionary fiscal policy with any given interest rate



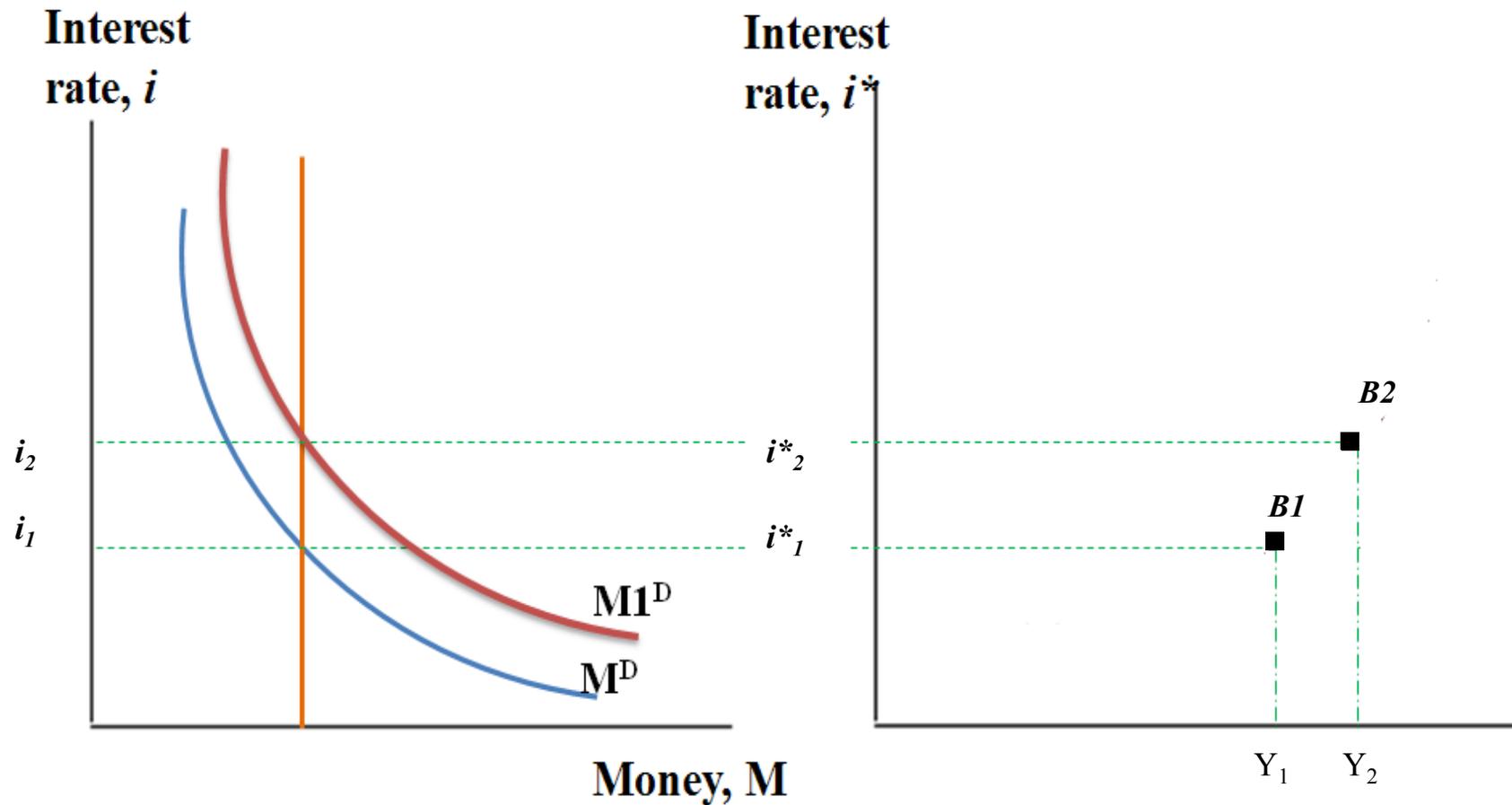
LM Curve: Money Market



$$MP = \frac{M^D}{M^s}$$

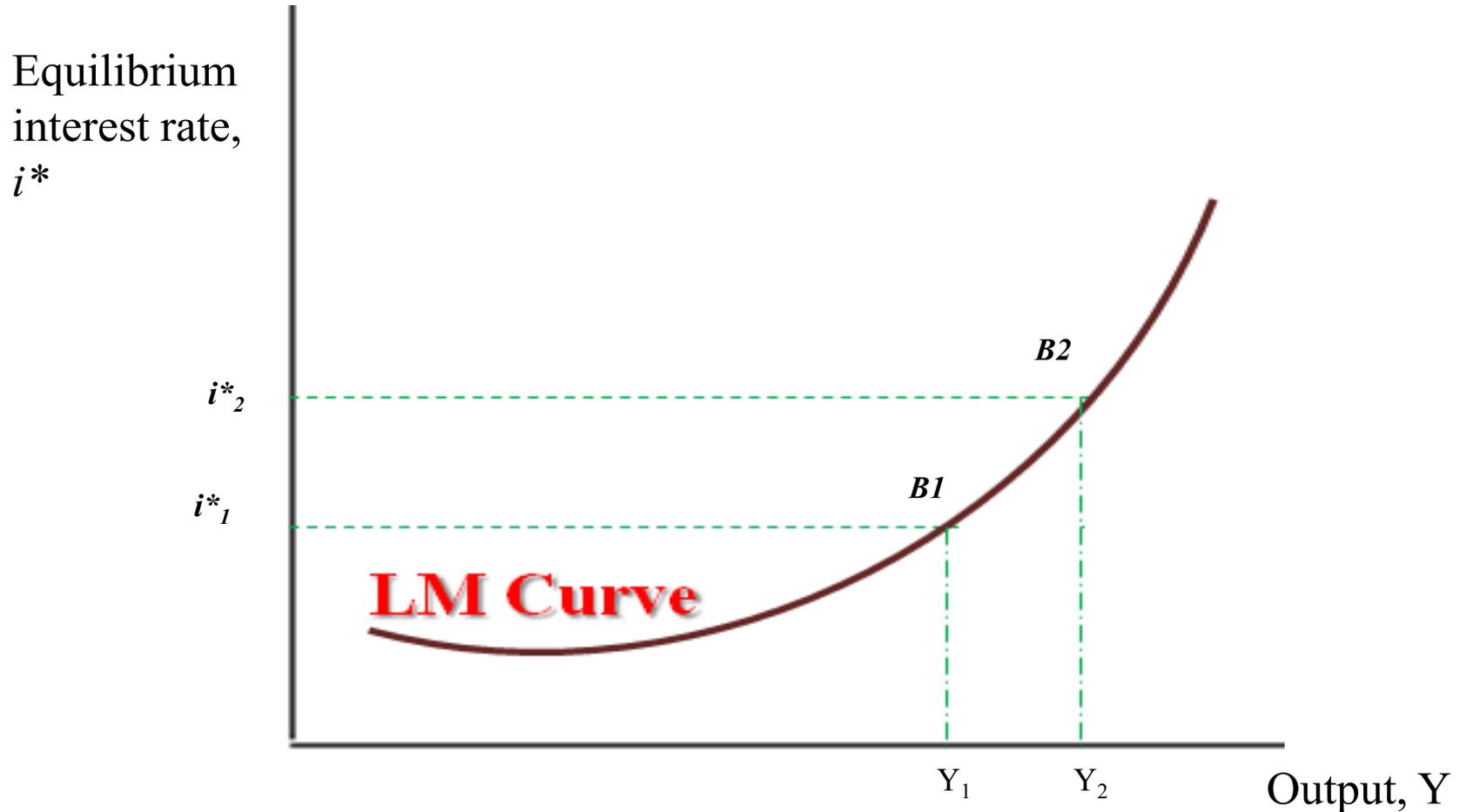
- For any value of Y , we have a different i^*

LM Curve: Relationship Between i^* and Y



LM Curve: Relationship Between i^* and Y (Cont

LM curve: all values of the equilibrium interest rate associated with any value of income for a given stock of money



LM Curve Shifts

- Increase in money demand results in movements along the LM curve
- Monetary policy leads to the shifts of the LM curve:

Expansionary monetary policy: LM curve shifts down

Contractionary monetary policy: LM curve shifts up

Equilibrium
interest rate, i^*

i^*_2

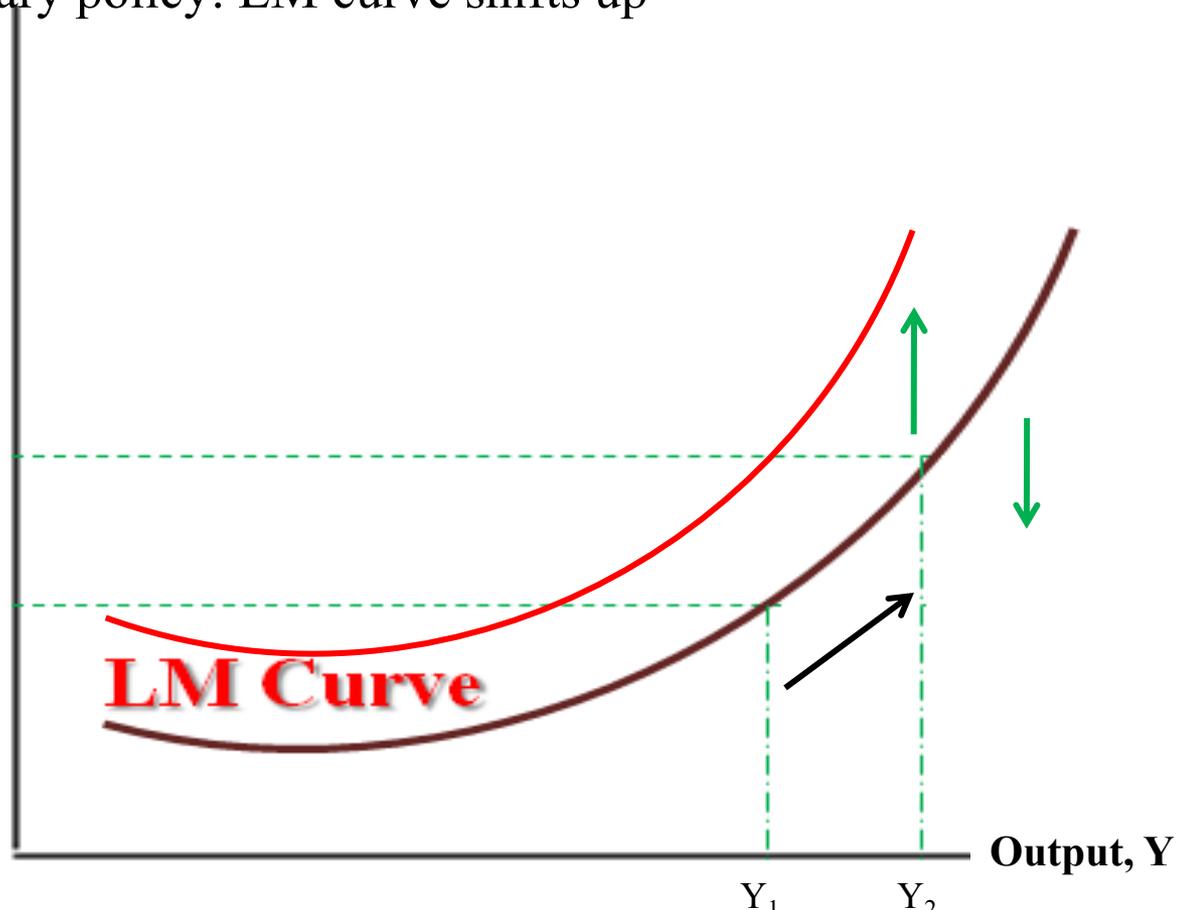
i^*_1

LM Curve

Output, Y

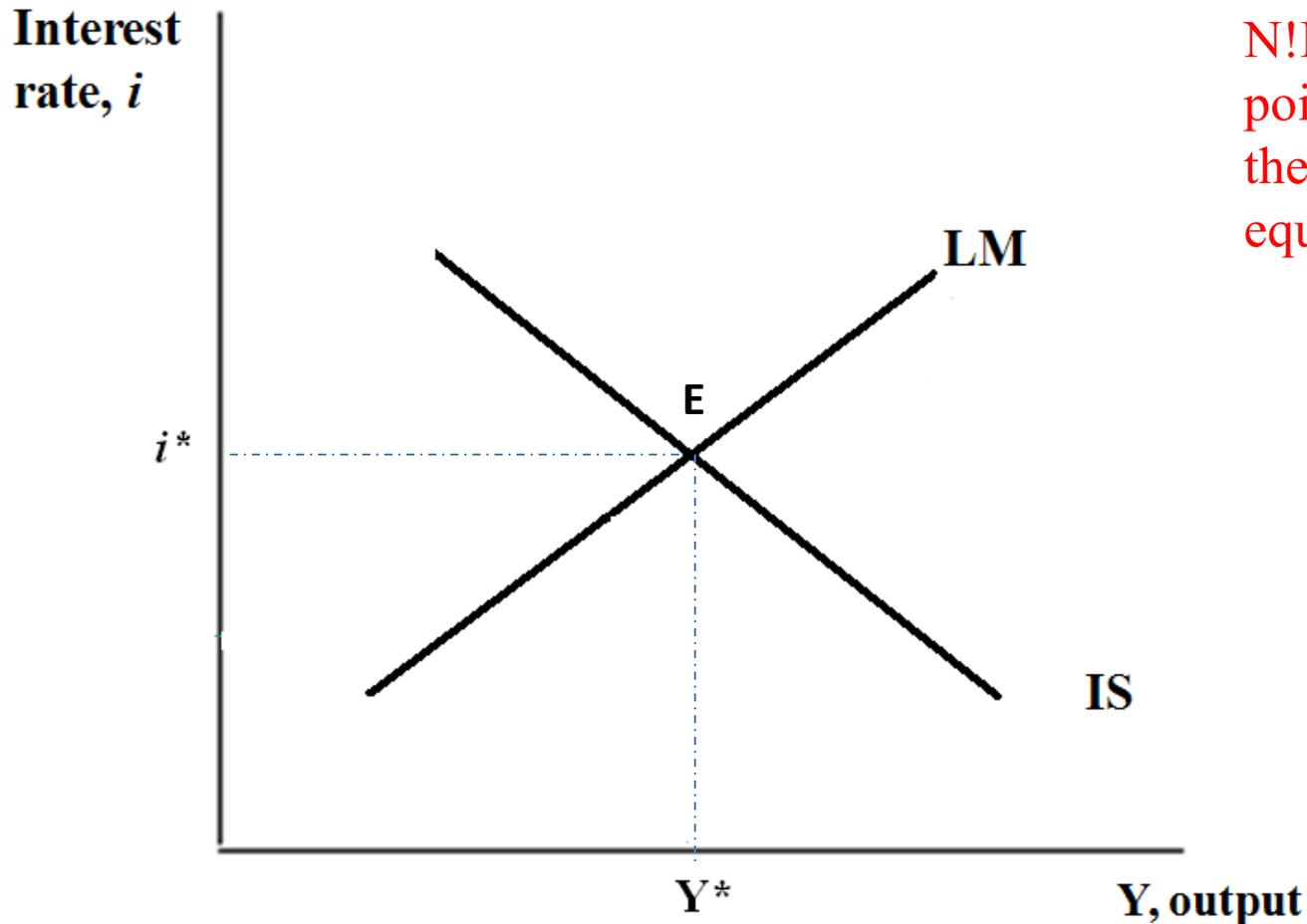
Y_1

Y_2



Short-Run Equilibrium

- Every point of IS curve stands for the equilibrium in the goods' market
- Every point of LM curve stands for the equilibrium in money market



N!B! Only one point stands for the general equilibrium

Policy Analysis with IS-LM

TE Fiscal contraction: Increase in taxes

Three-step procedure

Step 1: Effect on the goods' market equilibrium and shifts in IS-LM curves

$$T \uparrow \Rightarrow AE \downarrow \Rightarrow Y^* \downarrow$$

\Rightarrow For given i , $Y^* \downarrow \Rightarrow$ IS curve shifts 

General rule: a curve shifts in response to policy, only if this policy variable directly appears in the equation represented by this curve.

- Taxes enter only IS curve
- LM curve remains unchanged

Policy Analysis with IS-LM (Cont.)

Three-step procedure

Step 2: Effect on *general equilibrium*

IS curve shifts to the left, LM remains the same $\Rightarrow Y^* \downarrow$ & $i^* \downarrow$

Step 3: Provide intuition for the obtained result

Increase in taxes \Rightarrow lower disposable income \Rightarrow smaller consumption \Rightarrow

Decrease in demand \Rightarrow decrease in output and income

Decrease in income \Rightarrow reduction of the demand for money \Rightarrow decrease in the interest rate \Rightarrow decline in the interest rate reduces but does not completely offset the effect of higher taxes on the demand for goods

Policy Analysis with IS-LM (Cont.)

TE Expansionary monetary policy: Increase in money supply

Step 1: $M^s \uparrow \Rightarrow i^* \downarrow \Rightarrow$ **LM curve shifts down**

Step 2: IS curve remains unchanged, LM curve shifts down $\Rightarrow Y^* \uparrow$ & $i^* \downarrow$

Step 3: An increase in money supply leads to a lower interest rate. The lower interest rate leads to an increase in investment and, in turn, to an increase in demand and output.

IS-LM Model: Policy Mix

Policy mix: a combination of fiscal and monetary policies

- Using both policies in the same direction (recession of 2007-2010 in Europe and the U.S.)
- Using both policies in the opposite directions (early 1990s in the U.S.)

TE Increase in $G \Rightarrow$

Possible response of the central bank?

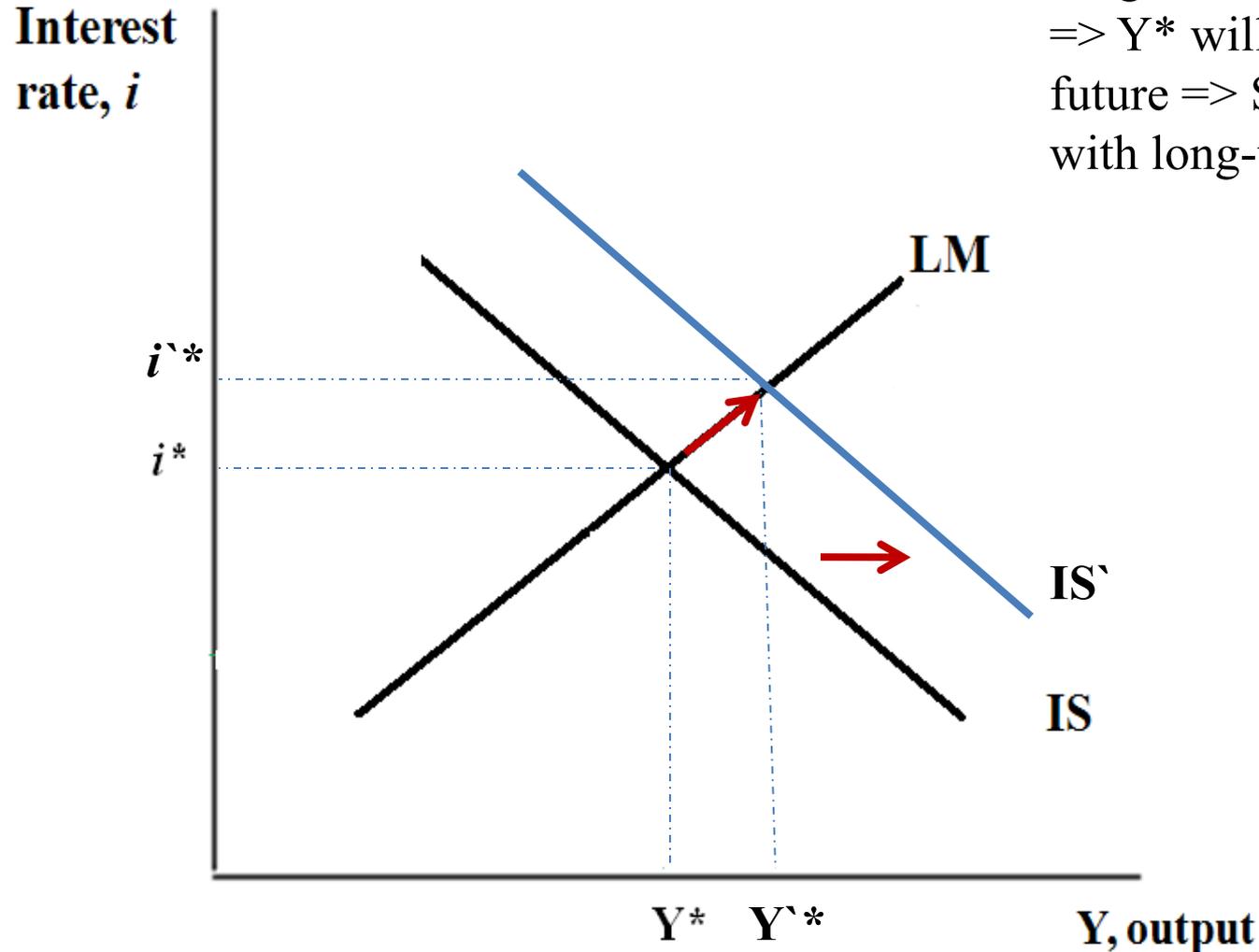
Response 1: Hold the money supply constant

Response 2: Hold the interest rate constant

Response 3: Hold the output constant

IS-LM Model: Policy Mix

Scenario 1: Increase in G and *constant* money supply

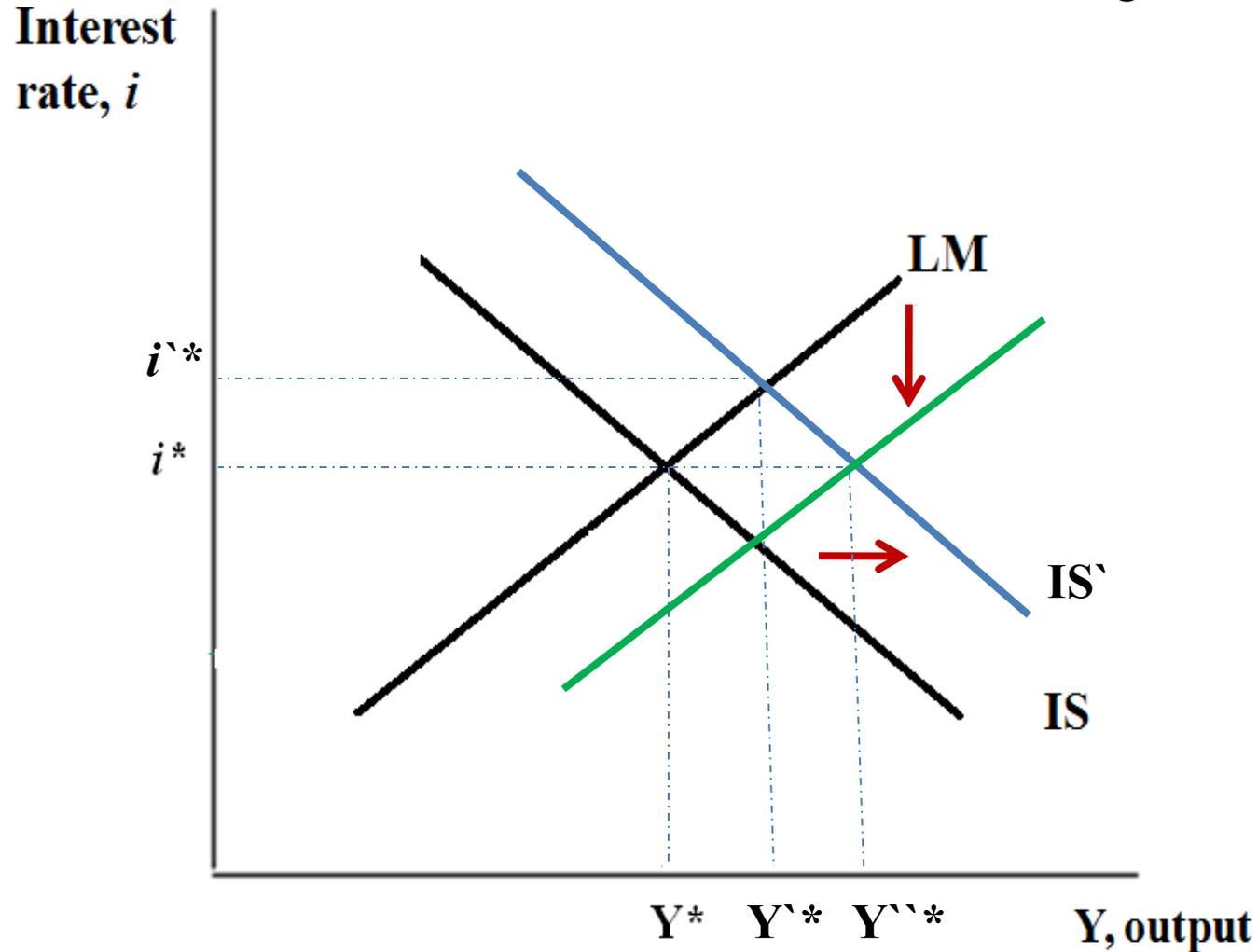


Larger Y^* and larger i^*
 $\Rightarrow Y^*$ will drop in the future \Rightarrow Short-term gain with long-term loss

IS-LM Model: Policy Mix (Cont.)

Scenario 2: Increase in G and *constant* interest rate

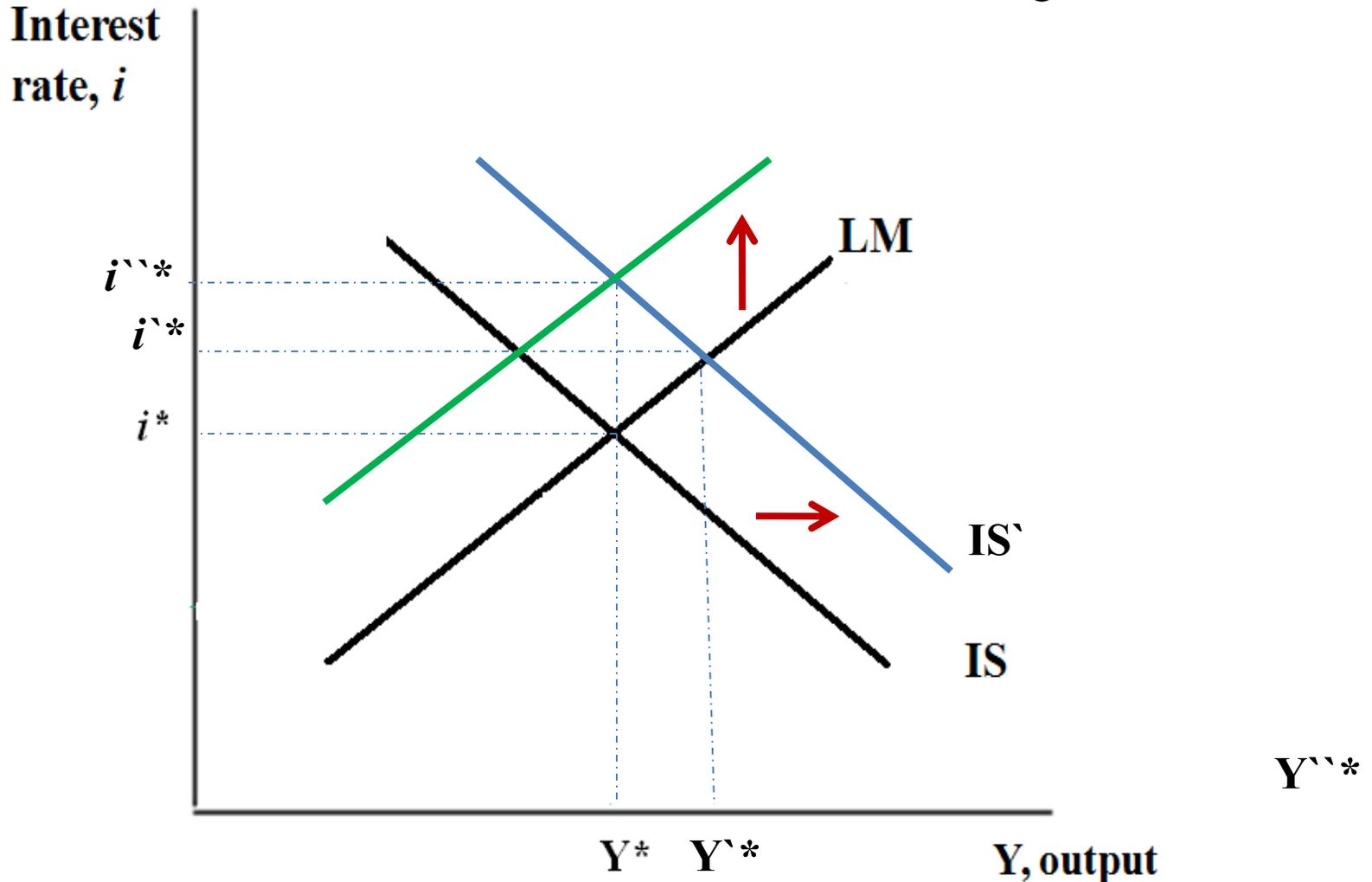
Larger Y^* and same i^*



IS-LM Model: Policy Mix (Cont.)

Scenario 3: Increase in G and *constant* output

Larger Y^* and same i^*



IS-LM Model: Policy Mix (Cont.)

- The U.S. fiscal policy multipliers

Estimates of fiscal policy multipliers

from the DRI macroeconomic model

<i>Assumption about monetary policy</i>	<i>Estimated value of $\Delta Y/\Delta G$</i>	<i>Estimated value of $\Delta Y/\Delta T$</i>
Fed holds money supply constant	0.60	-0.26
Fed holds nominal interest rate constant	1.93	-1.19

Next class: Midterm exam



Reading Assignment: Make sure you read all handouts!

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