Macroeconomics under Financial Crisis

Lecture 3

The AS-AD and IS-LM models

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Study material: ALL, Chapters 12;
MB Chapters 10, 11, 12.1

Topics of today's lecture

- the IS curve, and the LM curve
- the theory of liquidity preference
- how the IS-LM model determines income and the interest rate in the short run when P is fixed

Aggregate demand

- The aggregate demand curve shows the relationship between the price level and the quantity of output demanded.
- For this intro to the *AD/AS* model, we use a simple theory of aggregate demand based on the quantity theory of money.

The Quantity Equation as Aggregate Demand

- The quantity equation

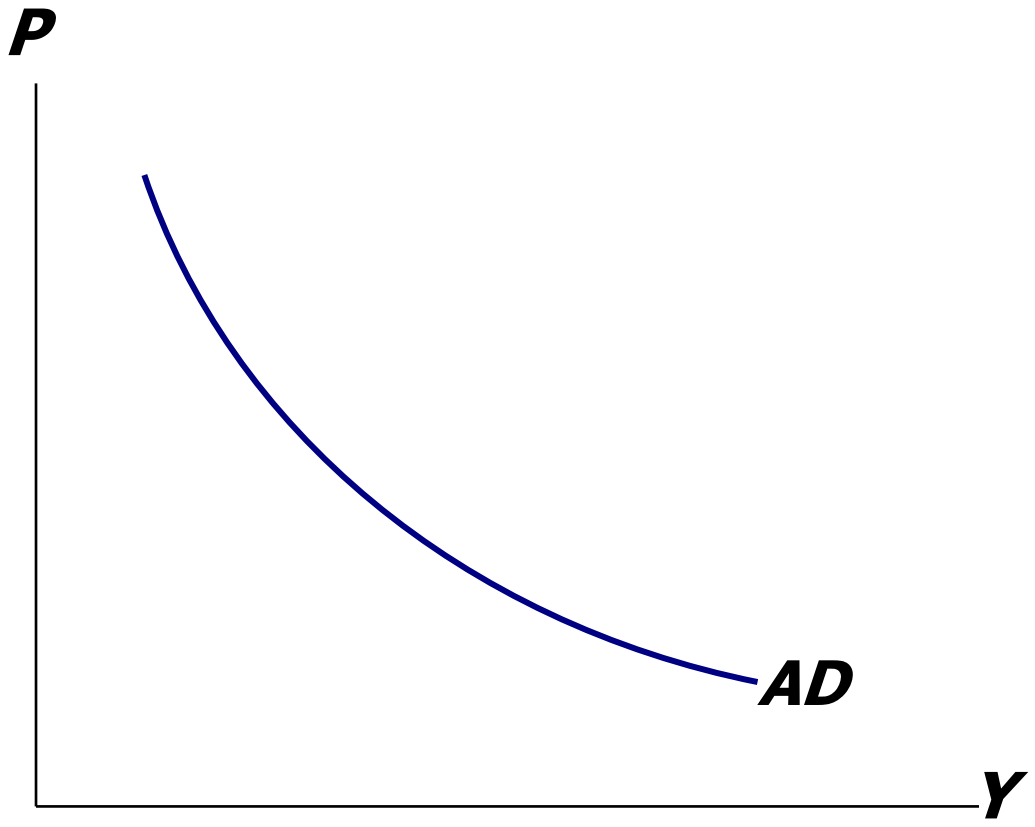
$$MV = PY$$

- For given values of M and V, this equation implies an inverse relationship between P and Y…

The downward-sloping *AD* curve

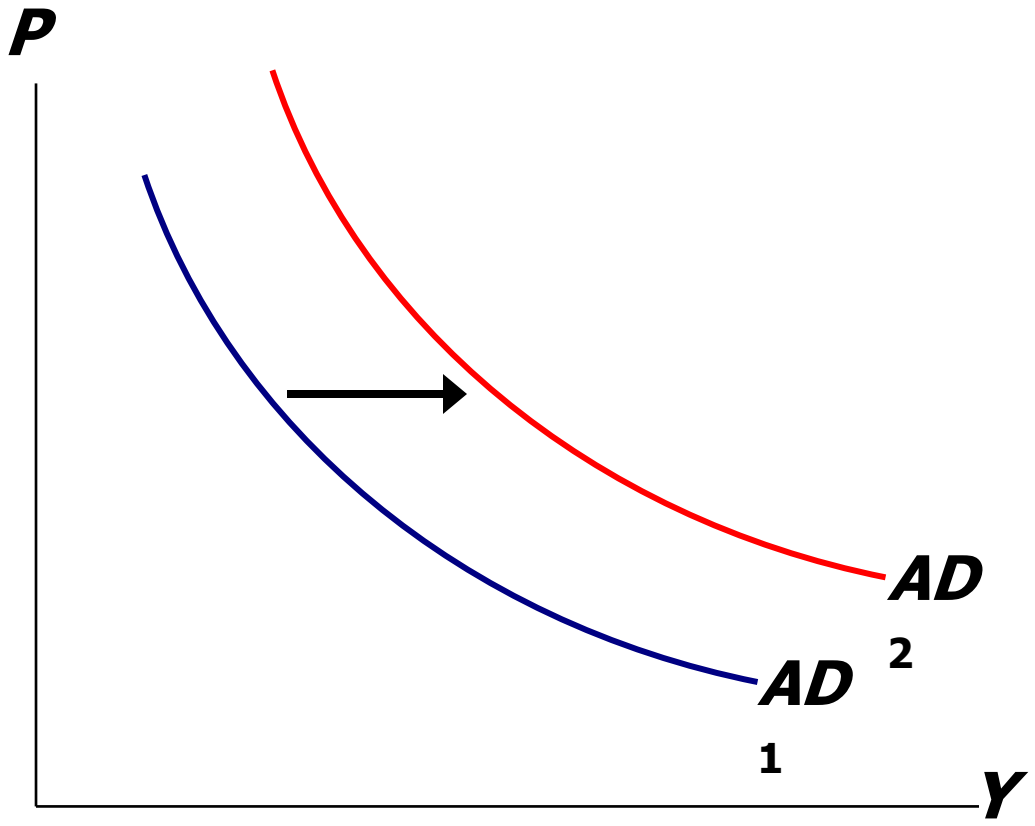
An increase in the price level causes a fall in real money balances (***M/P***),

causing a decrease in the demand for goods & services.



Shifting the *AD* curve

An increase in the money supply shifts the *AD* curve to the right.



Aggregate supply in the long run

- In the long run, output is determined by factor supplies and technology

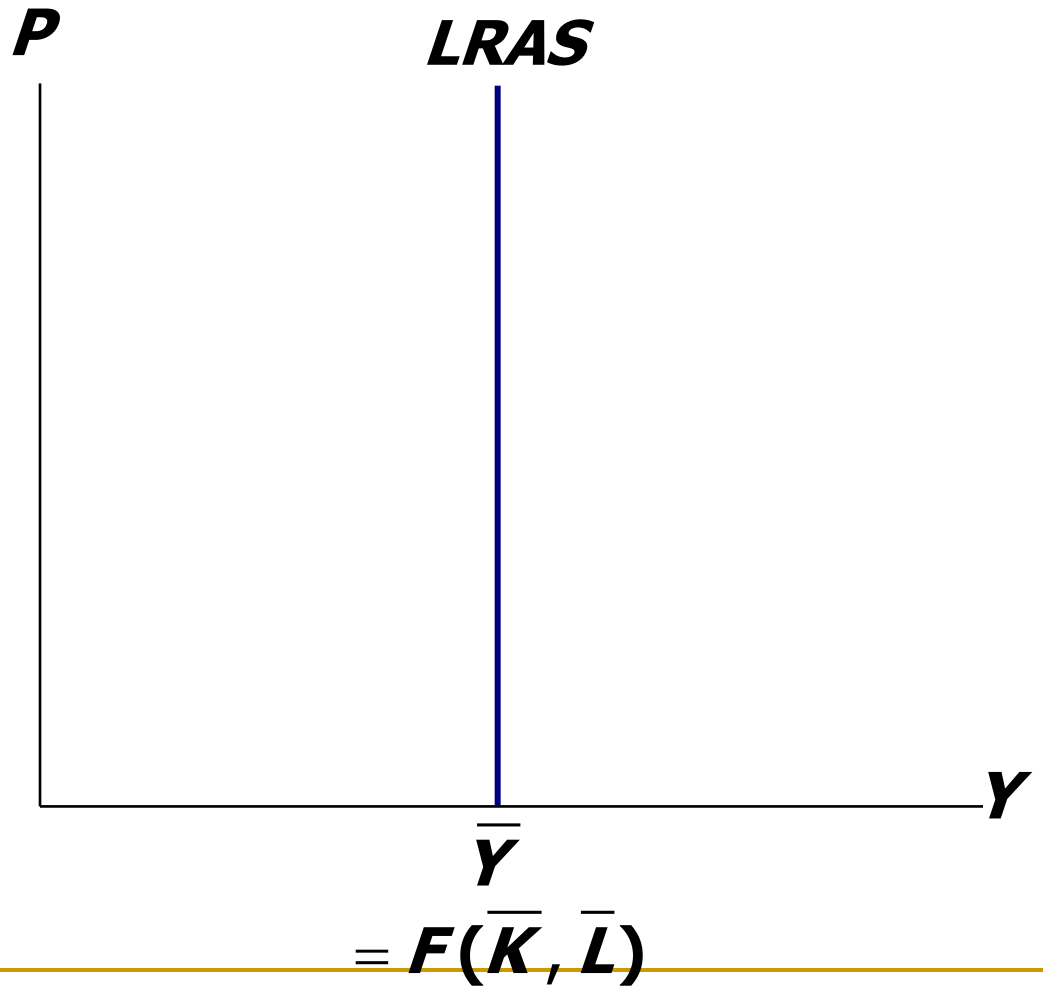
$$\overline{Y} = F(\overline{K}, \overline{L})$$

$\overline{Y}$ is the full-employment or natural level of output, at which the economy's resources are fully employed.

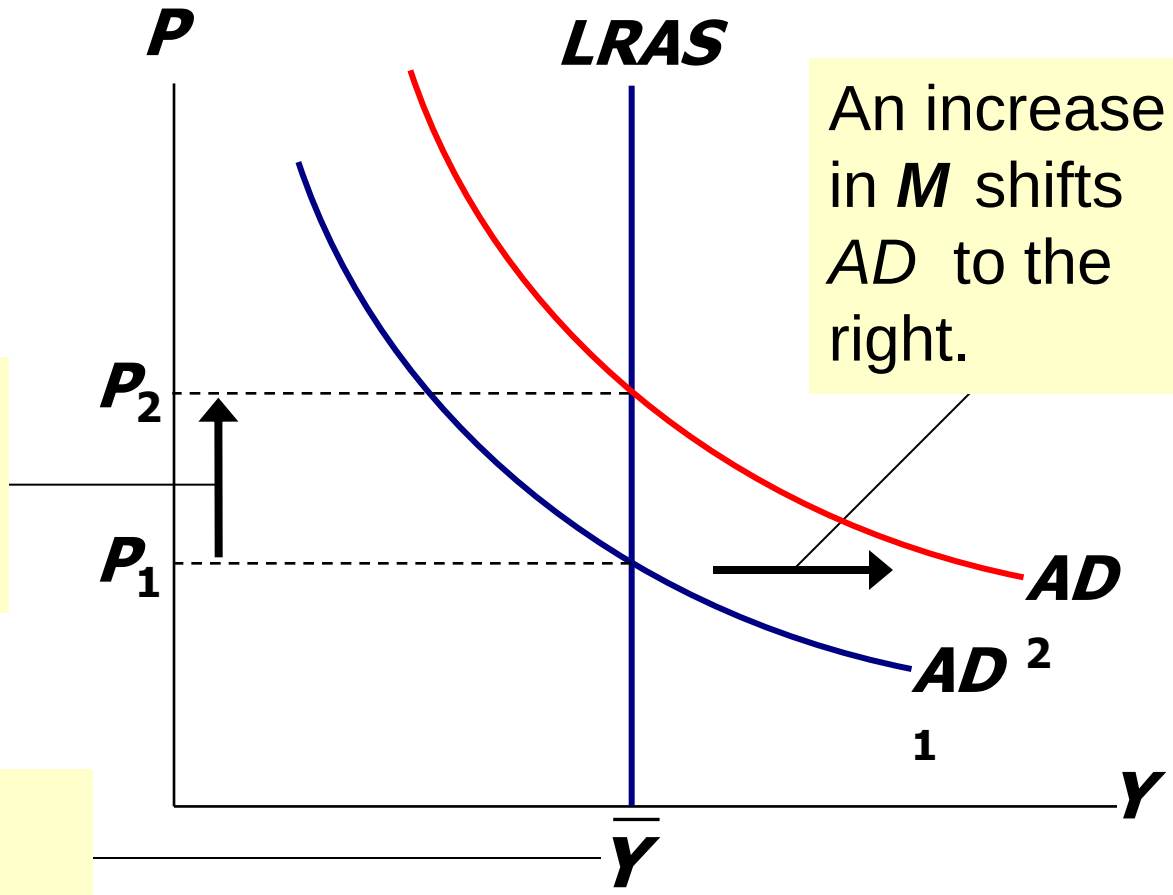
"Full employment" means that unemployment equals its natural rate (not zero).

The long-run aggregate supply curve

$\bar{Y}$ does not depend on P, so *LRAS* is vertical.



Long-run effects of an increase in *M*



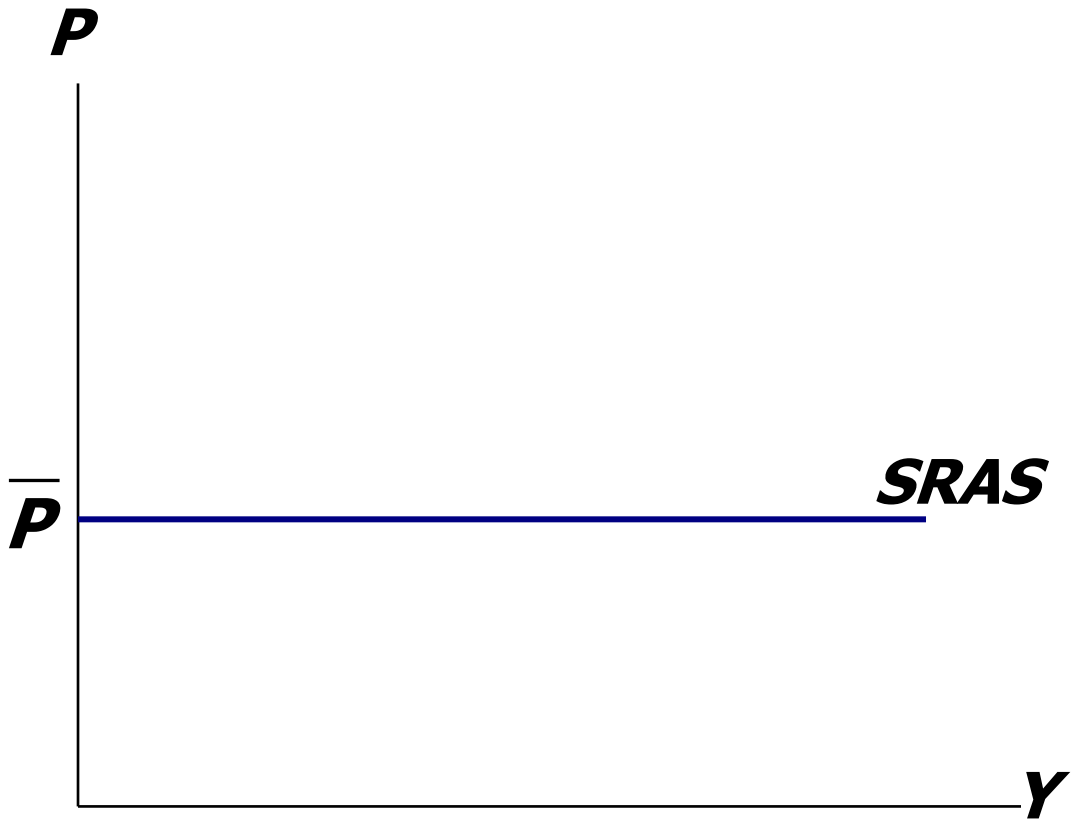
Aggregate supply in the short run

- Many prices are sticky in the short run.
- For now we assume
  - all prices are stuck at a predetermined level in the short run.
  - firms are willing to sell as much at that price level as their customers are willing to buy.
- Therefore, the short-run aggregate supply (*SRAS*) curve is horizontal:

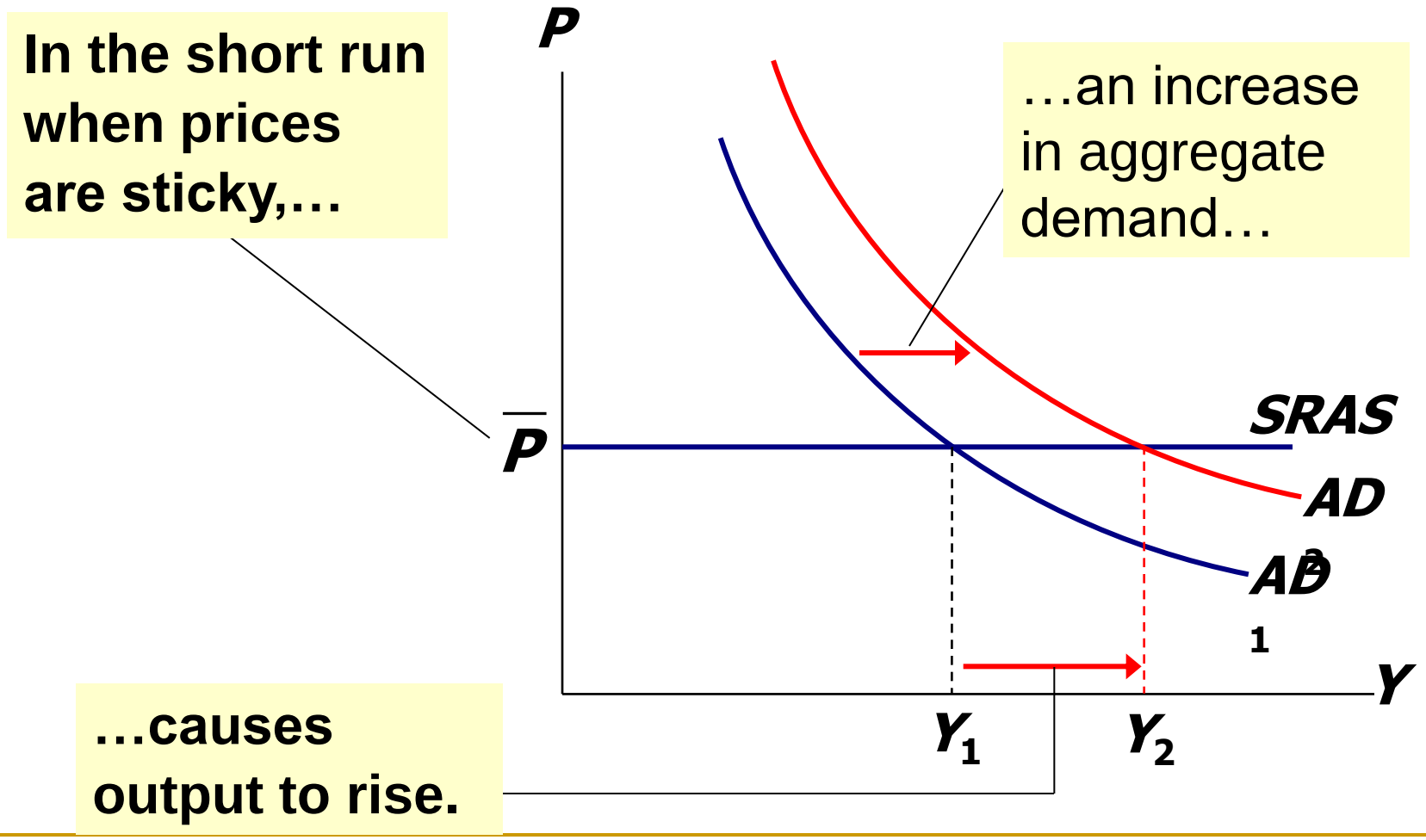
The short-run aggregate supply curve

The *SRAS* curve is horizontal:

The price level is fixed at a predetermined level, and firms sell as much as buyers demand.



Short-run effects of an increase in *M*



From the short run to the long run

Over time, prices gradually become "unstuck."
When they do, will they rise or fall?

In the short-run equilibrium, if	**then over time, *P* will…**
$Y > \bar{Y}$	***rise***
$Y < \bar{Y}$	***fall***
$Y = \bar{Y}$	***remain constant***

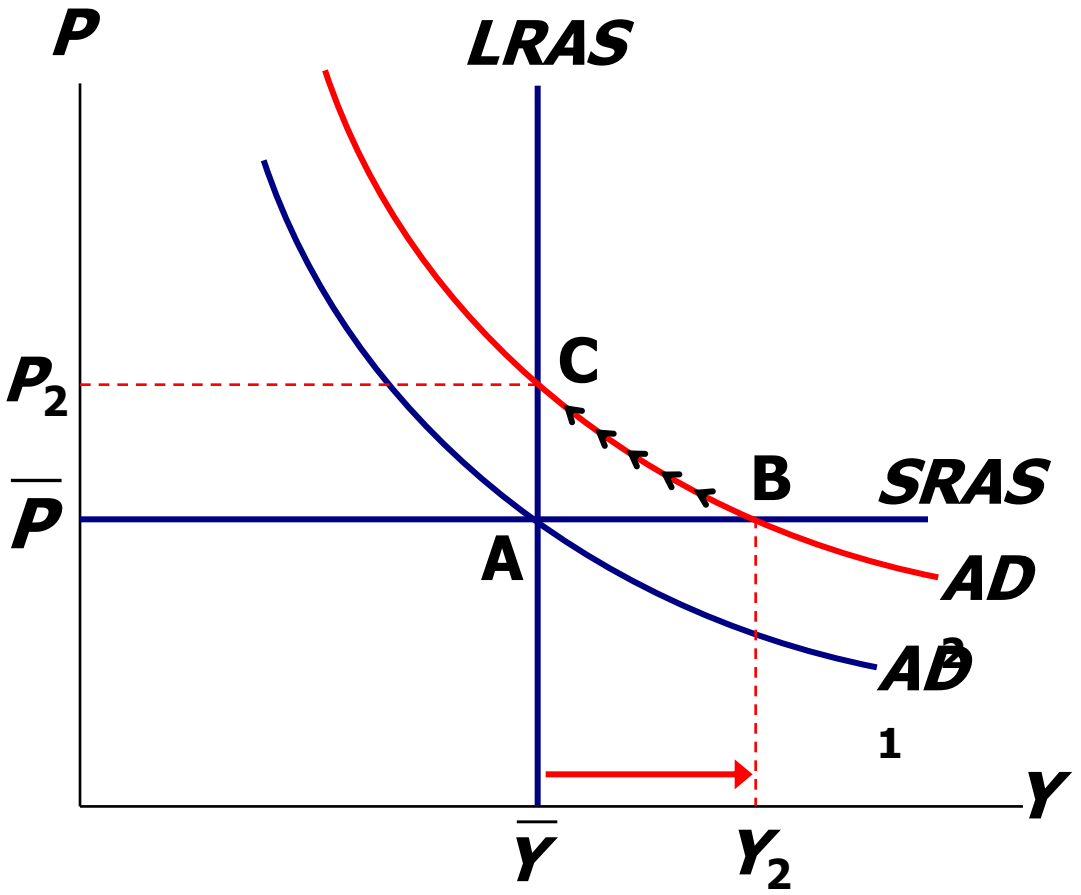
The adjustment of prices is what moves the economy to its long-run equilibrium.

The SR & LR effects of $\Delta M > 0$

A = initial equilibrium

B = new short-run eq'm after Fed increases *M*

C = long-run equilibrium



How shocking!!!

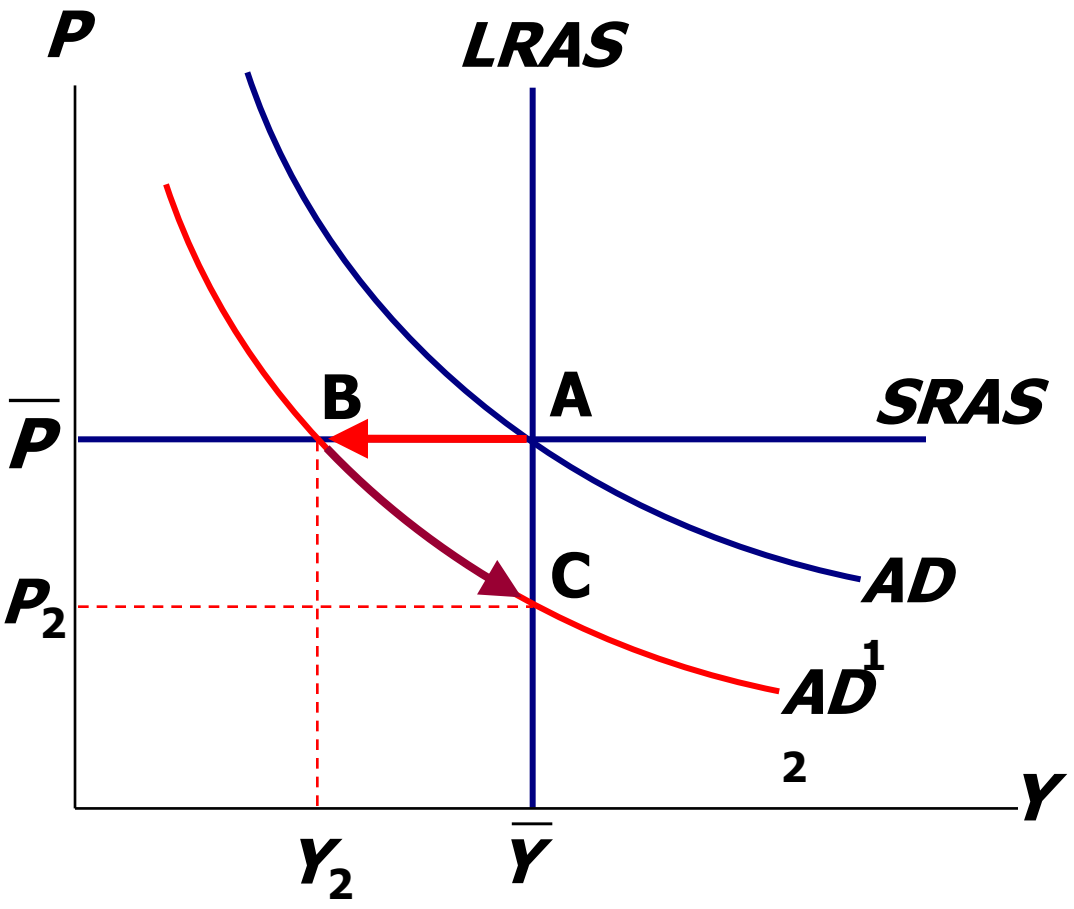
- **shocks**: exogenous changes in agg. supply or demand
- Shocks temporarily push the economy away from full employment.
- Example: exogenous decrease in velocity

  If the money supply is held constant, a decrease in ***V*** means people will be using their money in fewer transactions, causing a decrease in demand for goods and services.

The effects of a negative demand shock

AD shifts left, depressing output and employment in the short run.

Over time, prices fall and the economy moves down its demand curve toward full-employment.



Supply shocks

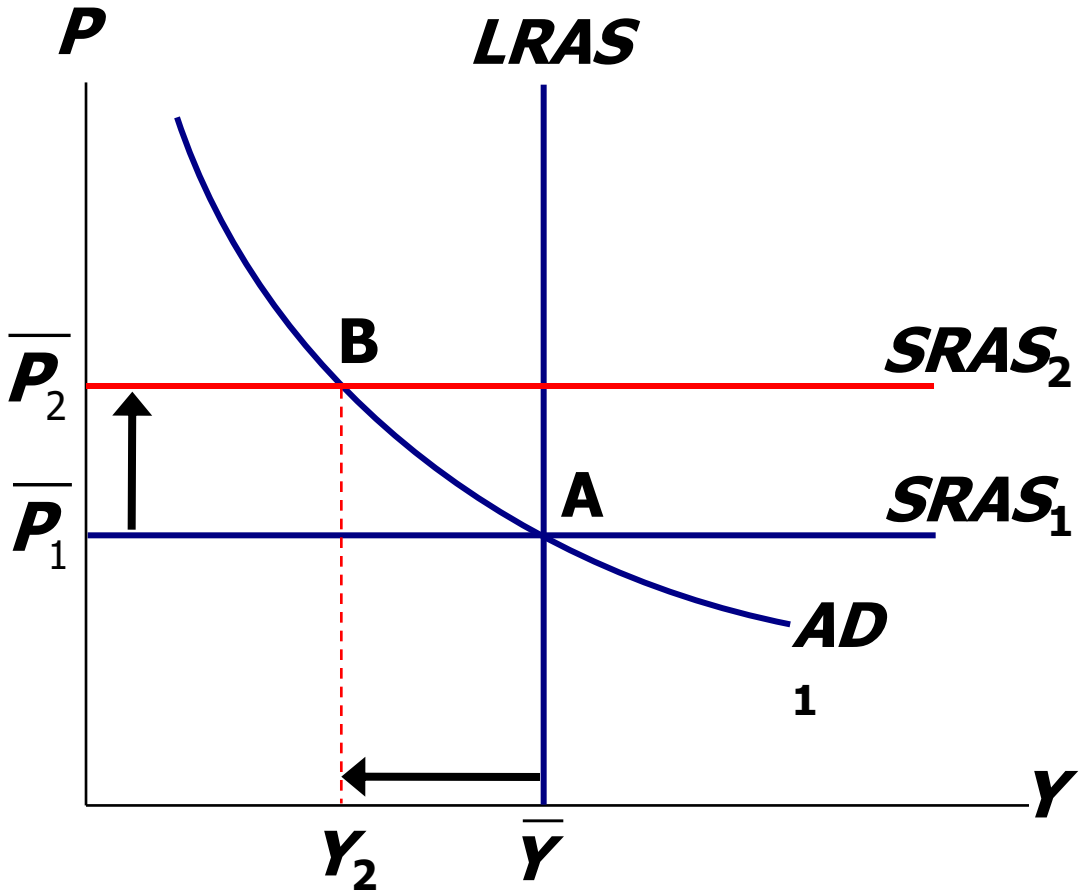
- A **supply shock** alters production costs, affects the prices that firms charge. (also called **price shocks**)
- Examples of *adverse* supply shocks:
  - Bad weather reduces crop yields, pushing up food prices.
  - Workers unionize, negotiate wage increases.
  - New environmental regulations require firms to reduce emissions. Firms charge higher prices to help cover the costs of compliance.
- *Favorable* supply shocks lower costs and prices.

Stabilization policy

- def: policy actions aimed at reducing the severity of short-run economic fluctuations.
- Example: Using monetary policy to combat the effects of adverse supply shocks…

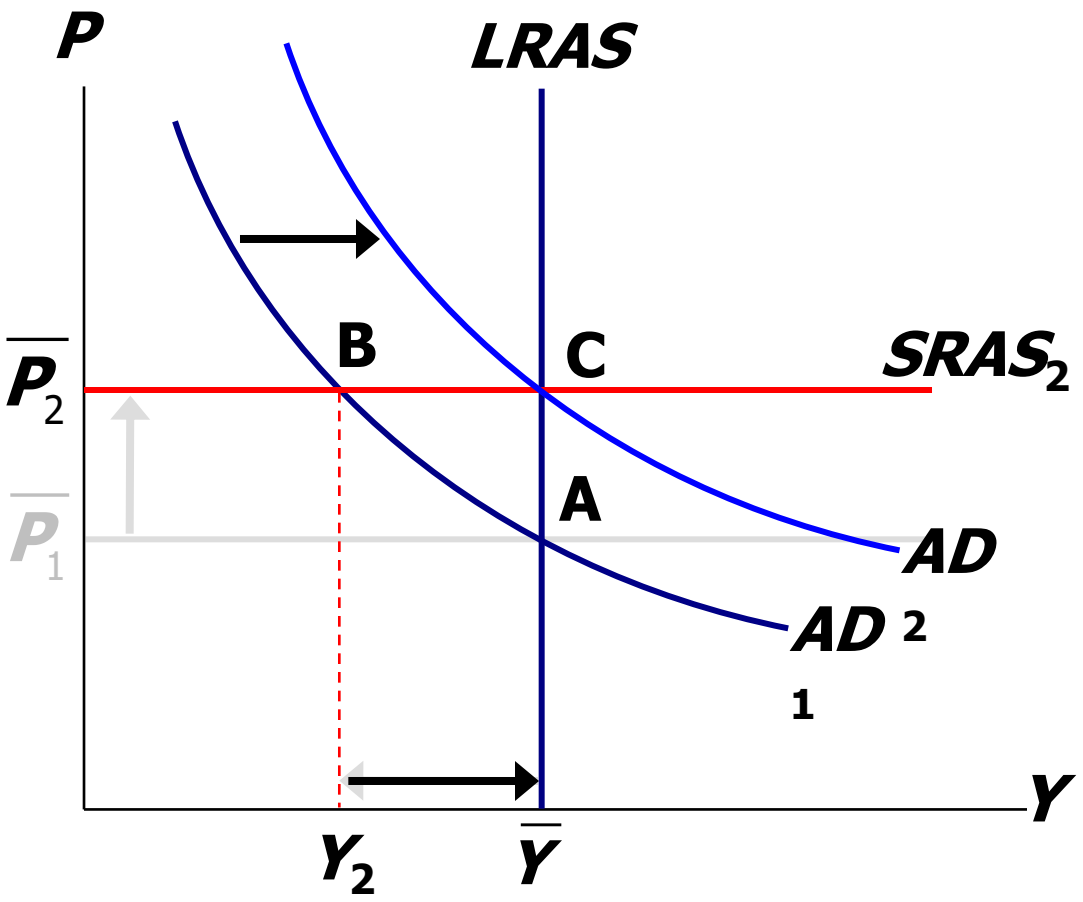
Stabilizing output with monetary policy

The adverse supply shock moves the economy to point B.



Stabilizing output with monetary policy

But the Fed accommodates the shock by raising agg. demand.



results:
P **is permanently higher, but *Y* remains at its full-employment level.**

IS-LM

- The model of aggregate demand and aggregate supply.
- Long run
  - prices flexible
  - output determined by factors of production & technology
  - unemployment equals its natural rate
- Short run
  - prices fixed
  - output determined by aggregate demand
  - unemployment negatively related to output

Context

- This section develops the *IS-LM* model, the basis of the aggregate demand curve.
- We focus on the short run and assume the price level is fixed (so, *SRAS* curve is horizontal).
- For simplicity, we focus on the closed-economy case.

The Keynesian Cross

- A simple closed economy model in which income is determined by expenditure.
  (due to J.M. Keynes)
- Notation:

  I = planned investment

  $PE = C + I + G$ = planned expenditure

  Y = real GDP = actual expenditure
- Difference between actual & planned expenditure = unplanned inventory investment

Elements of the Keynesian Cross

consumption function: $C = C(Y - T)$

govt policy variables: $G = \bar{G}, \quad T = \bar{T}$

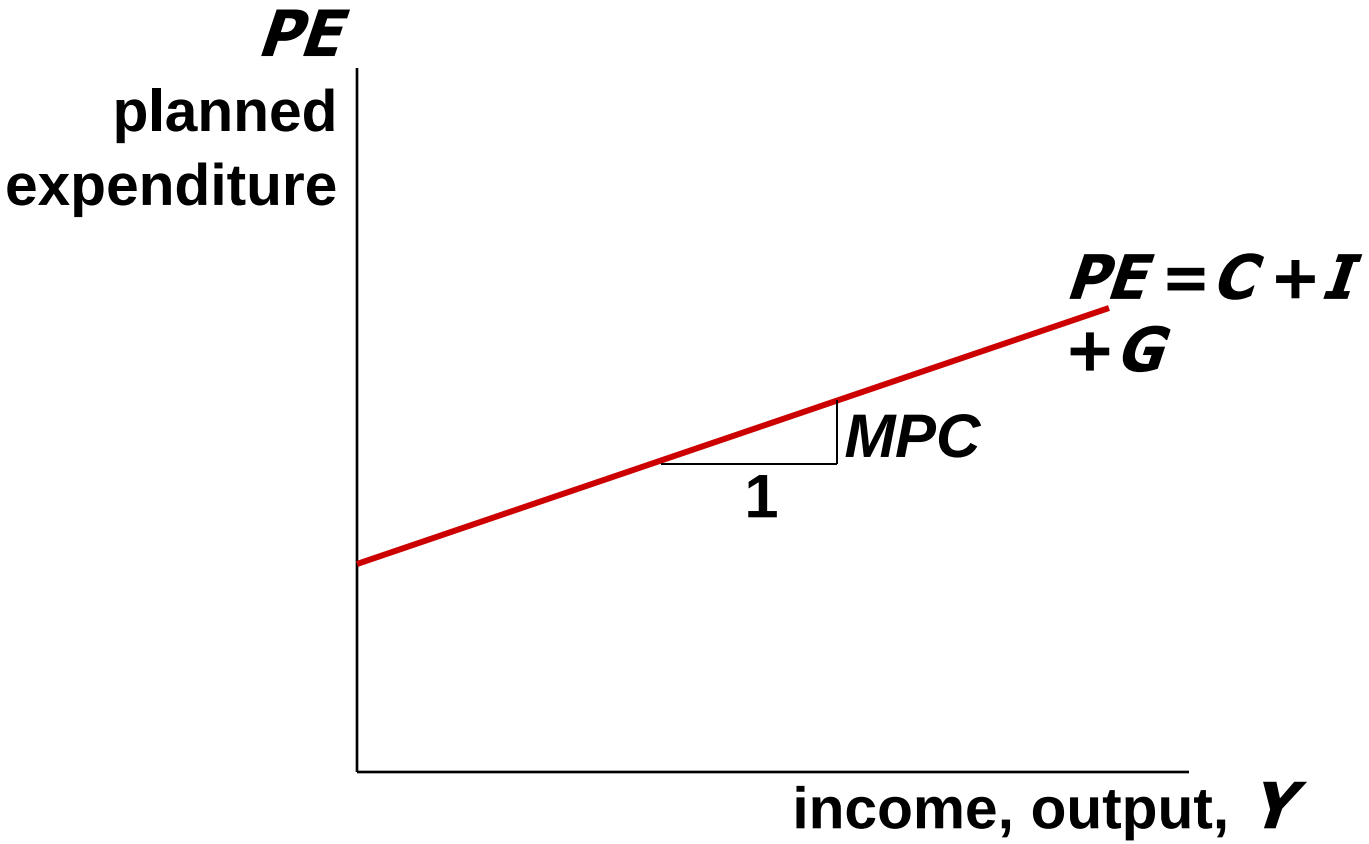
for now, planned investment is exogenous: $I = \bar{I}$

planned expenditure: $PE = C(Y - \bar{T}) + \bar{I} + \bar{G}$

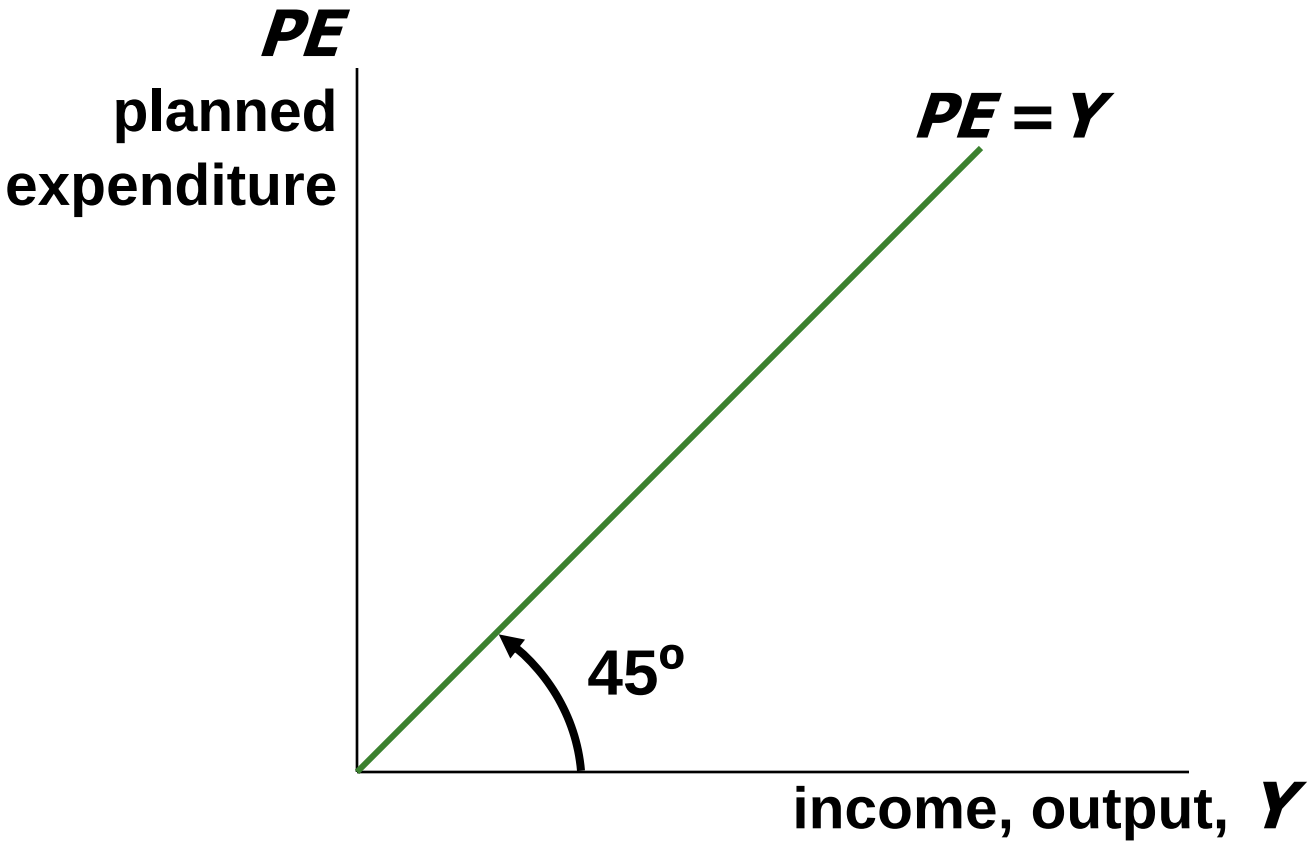
equilibrium condition:

actual expenditure = planned expenditure $Y = PE$

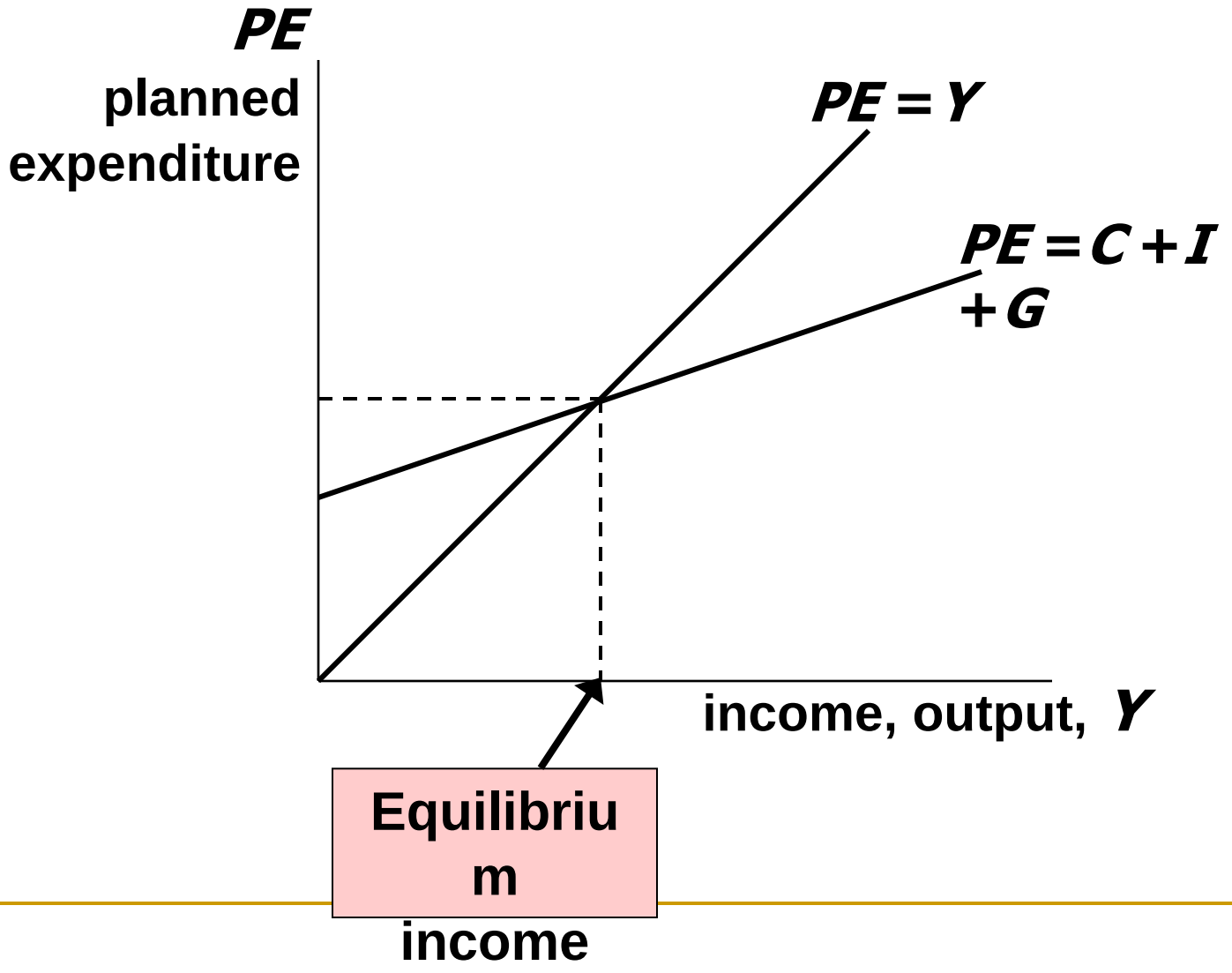
Graphing planned expenditure



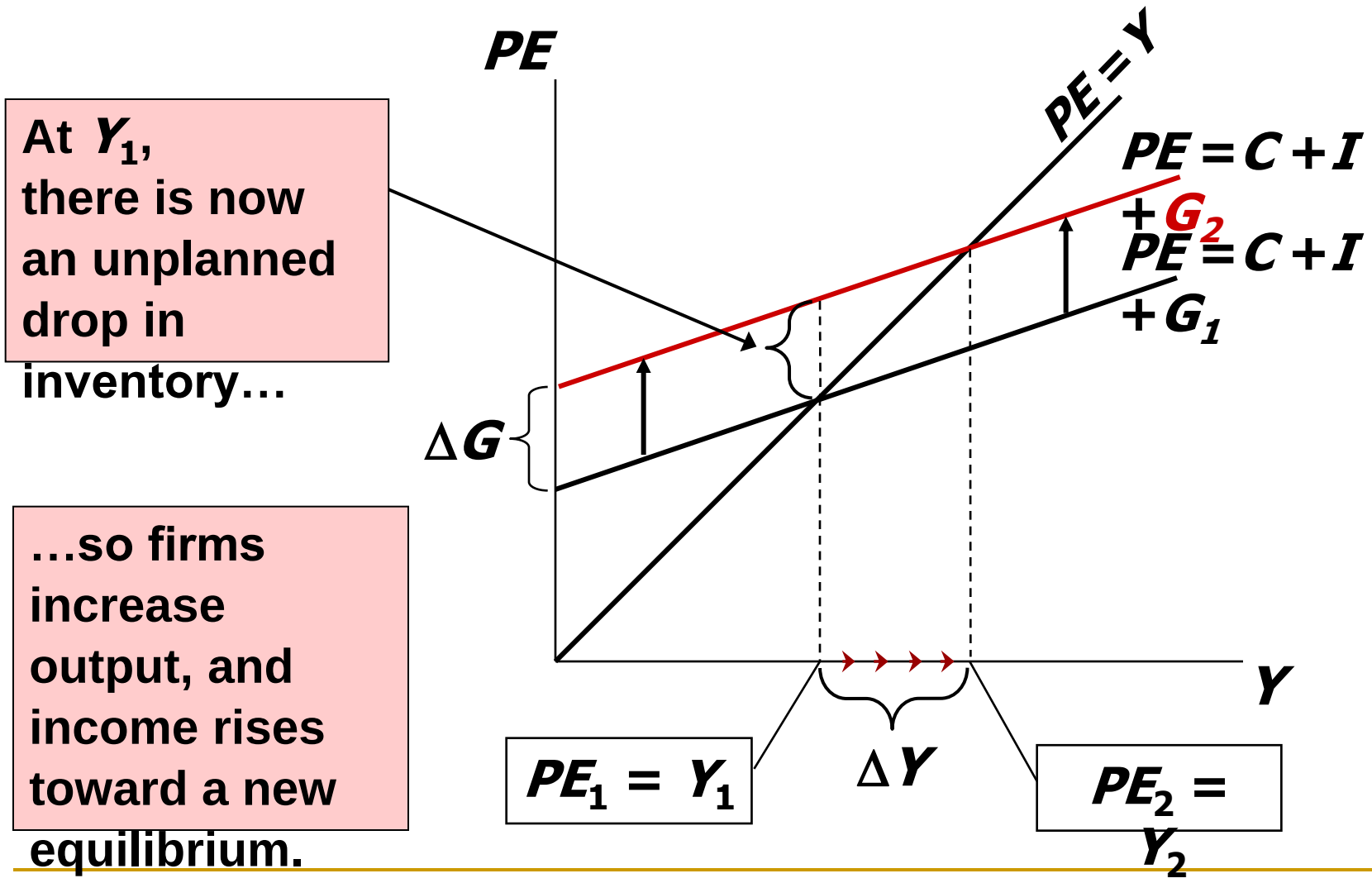
Graphing the equilibrium condition



The equilibrium value of income



An increase in government purchases



The *IS* curve

def: a graph of all combinations of ***r*** and ***Y*** that result in goods market equilibrium

i.e. actual expenditure (output)
= planned expenditure

The equation for the *IS* curve is:

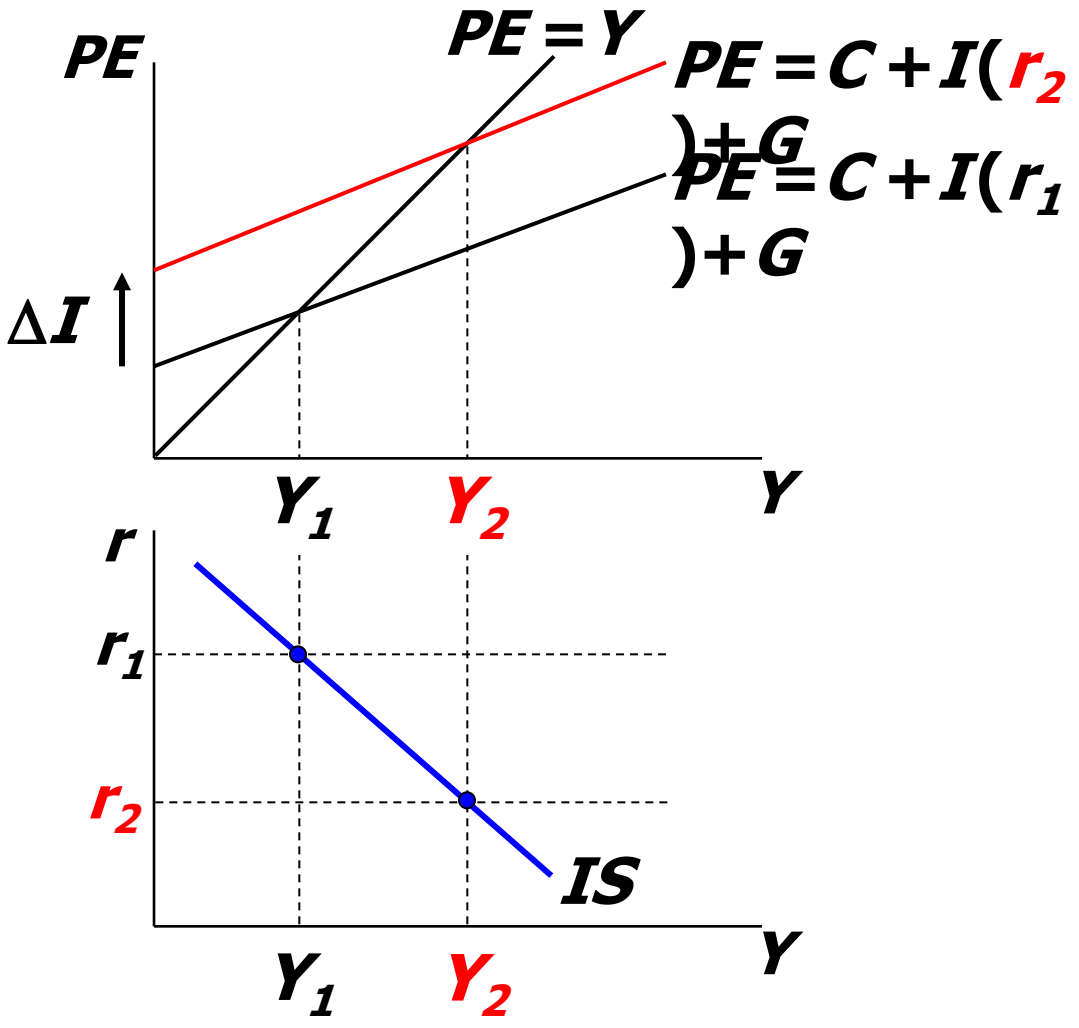
$$\boldsymbol{Y = C(Y - \overline{T}) + I(r) + \overline{G}}$$

Deriving the *IS* curve

$\downarrow r \Rightarrow \uparrow I$

$\Rightarrow \uparrow PE$

$\Rightarrow \uparrow Y$



Why the *IS* curve is negatively sloped

- A fall in the interest rate motivates firms to increase investment spending, which drives up total planned spending (***PE***).
- To restore equilibrium in the goods market, output (*a.k.a.* actual expenditure, ***Y***) must increase.

Fiscal Policy and the *IS* curve

- We can use the *IS*-*LM* model to see how fiscal policy (***G*** and ***T***) affects aggregate demand and output.
- Let's start by using the Keynesian cross to see how fiscal policy shifts the *IS* curve…

Shifting the *IS* curve: ΔG

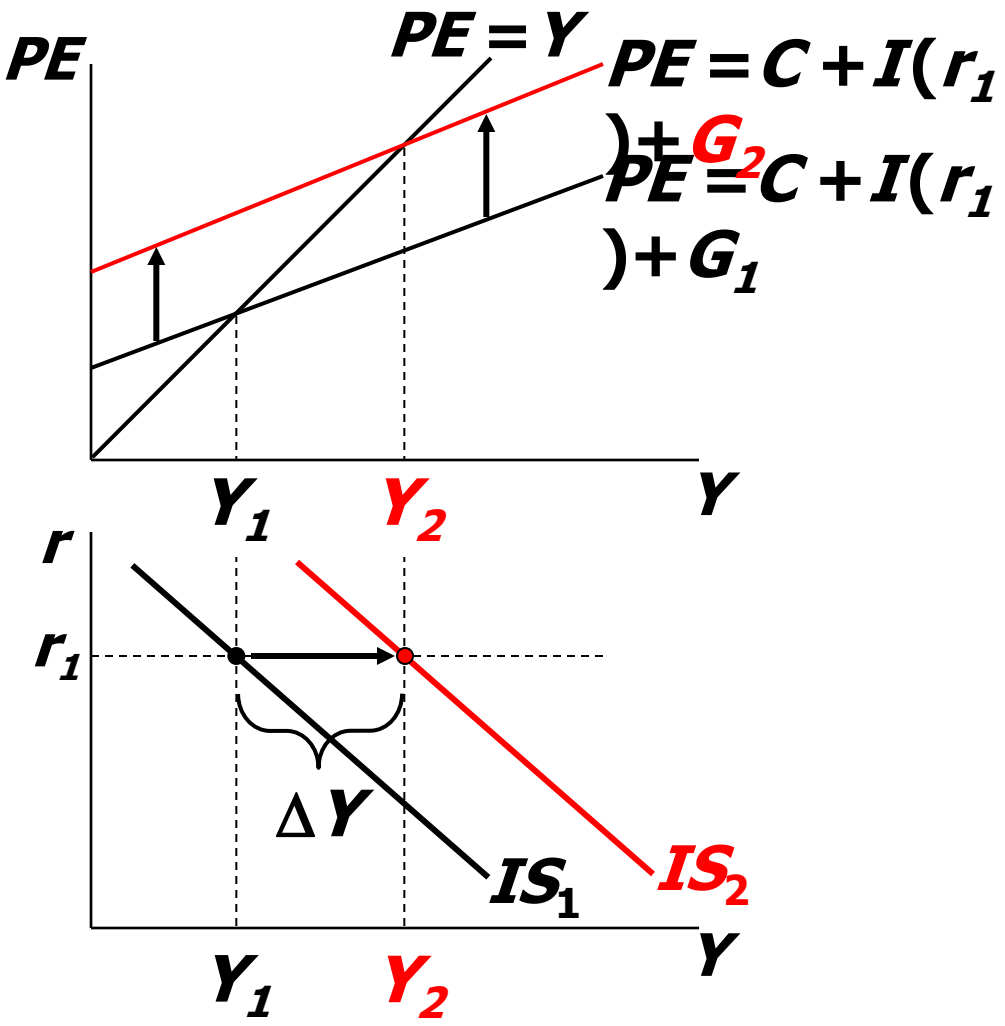
At any value of r,

$\uparrow G \Rightarrow \uparrow PE \Rightarrow \uparrow Y$

…so the *IS* curve shifts to the right.

The horizontal distance of the *IS* shift equals

$$\Delta Y = \frac{1}{1-\text{MPC}} \Delta G$$



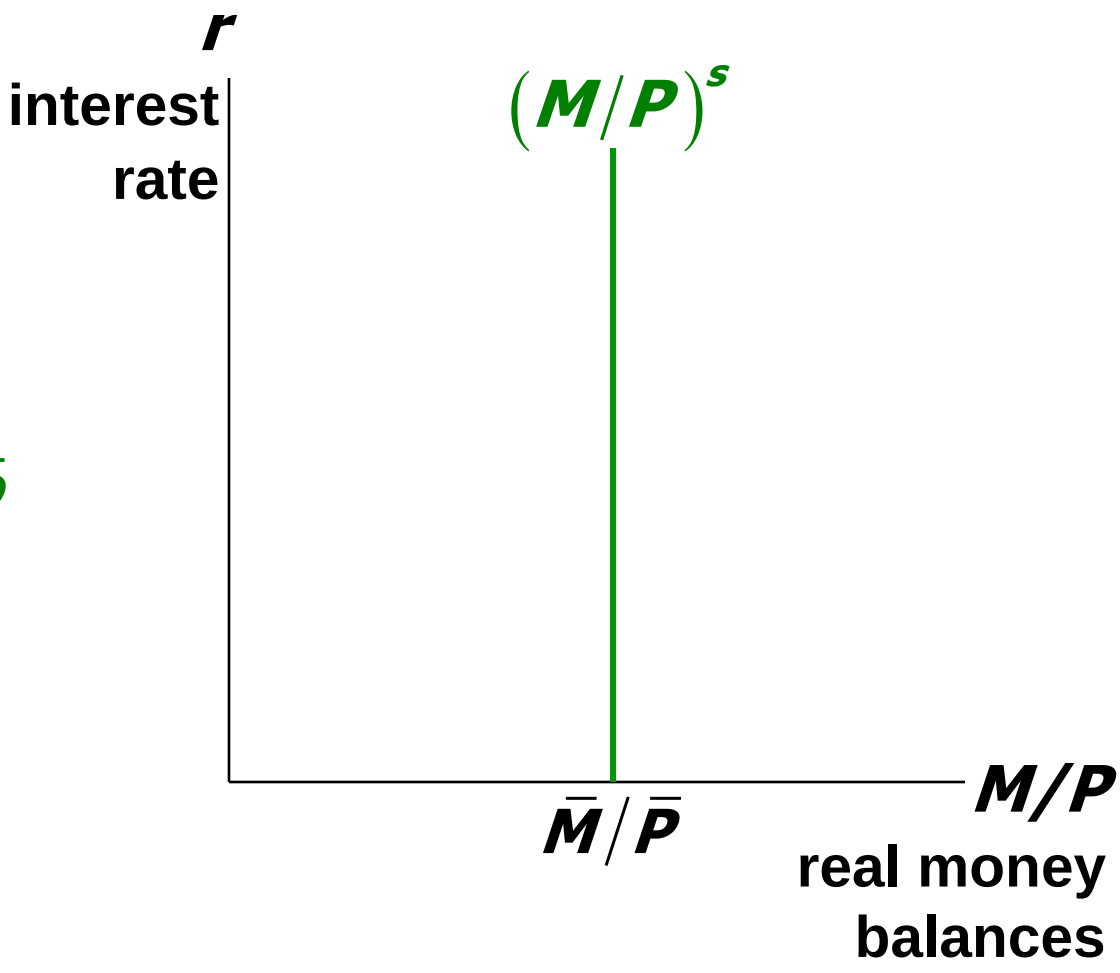
The Theory of Liquidity Preference

- Due to John Maynard Keynes.
- A simple theory in which the interest rate is determined by money supply and money demand.

Money supply

The supply of real money balances is fixed:

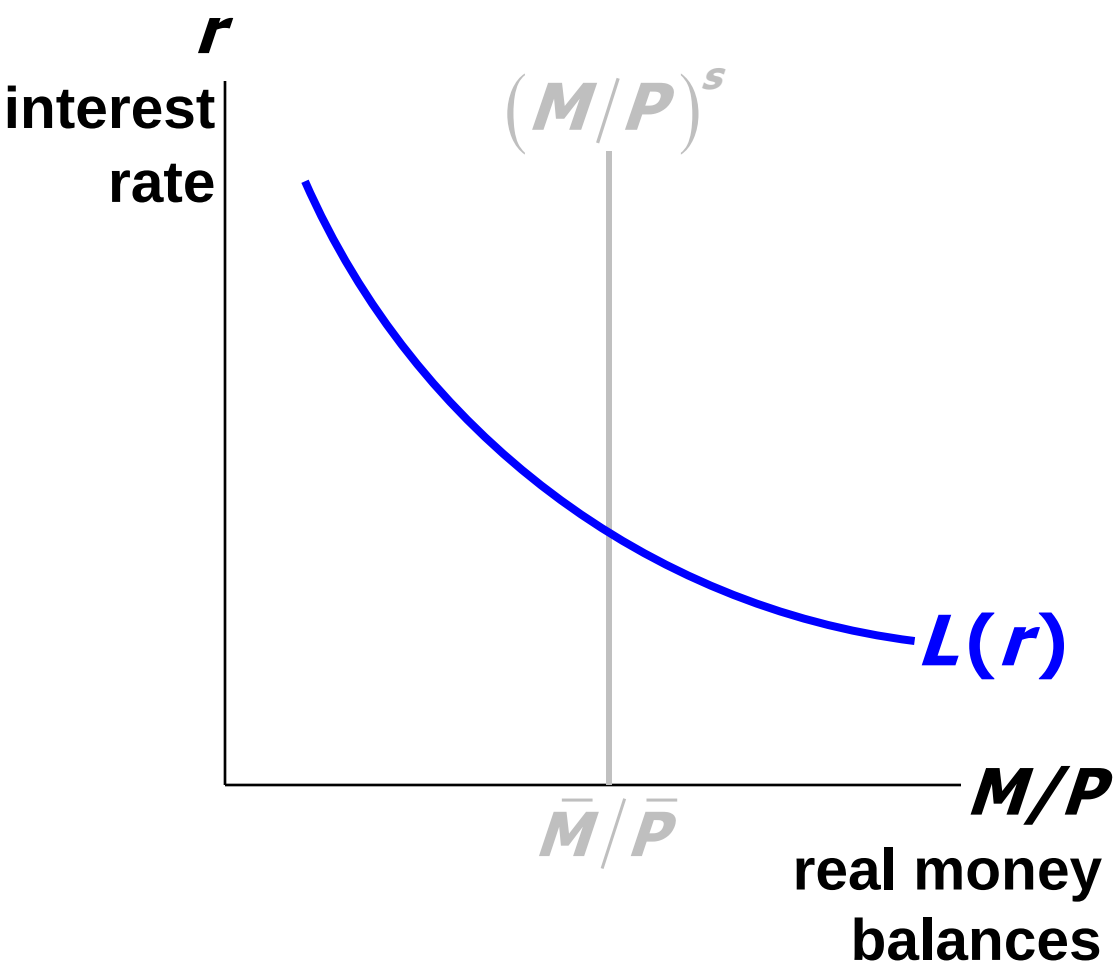
$$\left(M/P\right)^{s} = \bar{M}/\bar{P}$$



Money demand

Demand for real money balances:

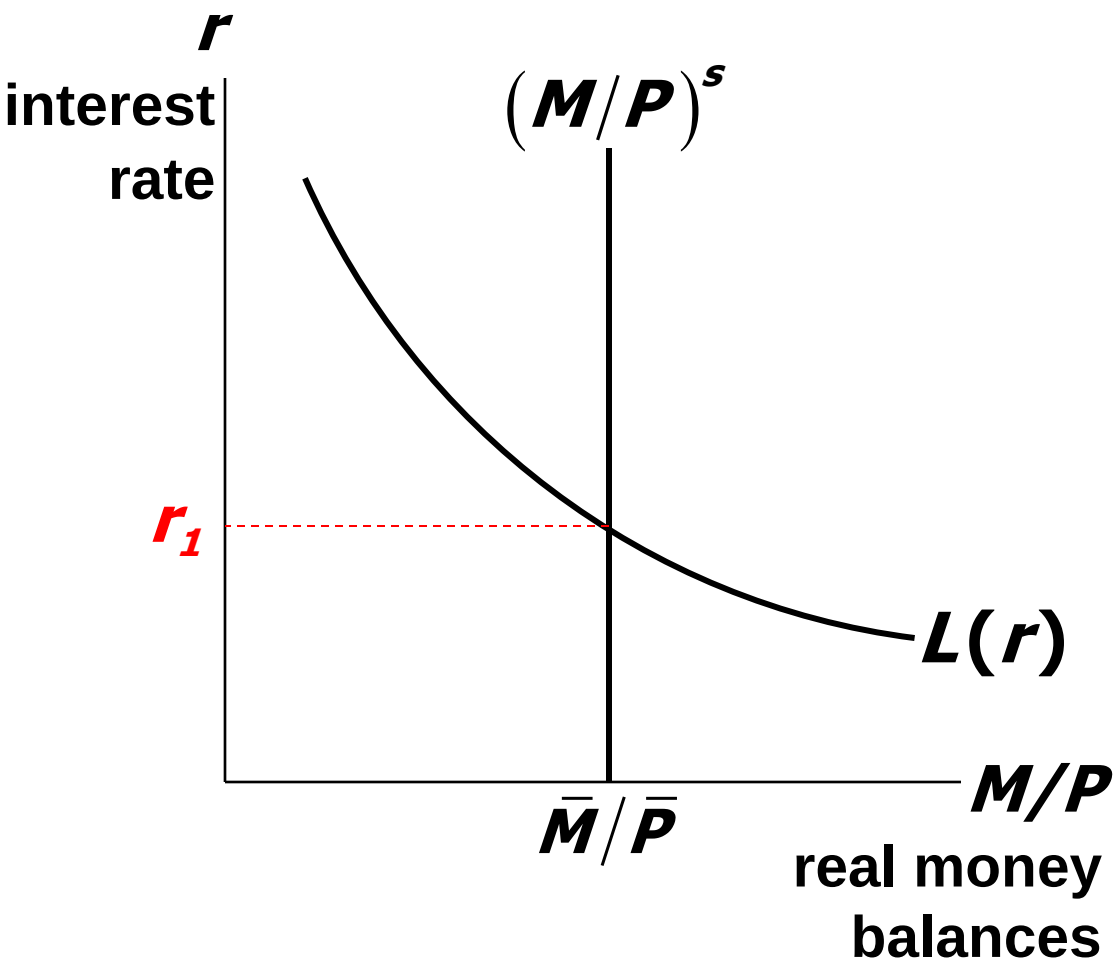
$$\left(M/P\right)^{d} = L(r)$$



Equilibrium

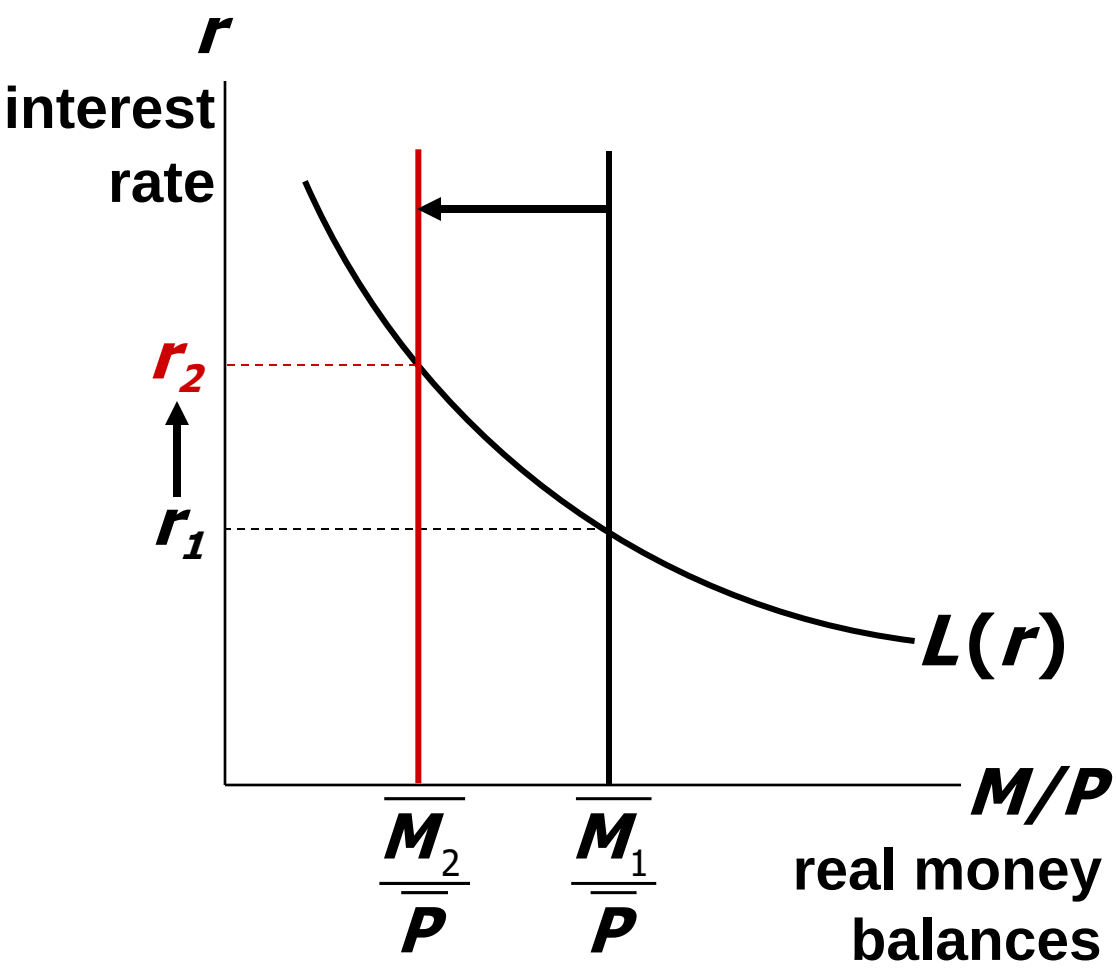
The interest rate adjusts to equate the supply and demand for money:

$$\overline{M}/\overline{P} = L(r)$$



How the central bank raises the interest rate

To increase *r*,
Fed reduces *M*



The *LM* curve

Now let's put ***Y*** back into the money demand function:

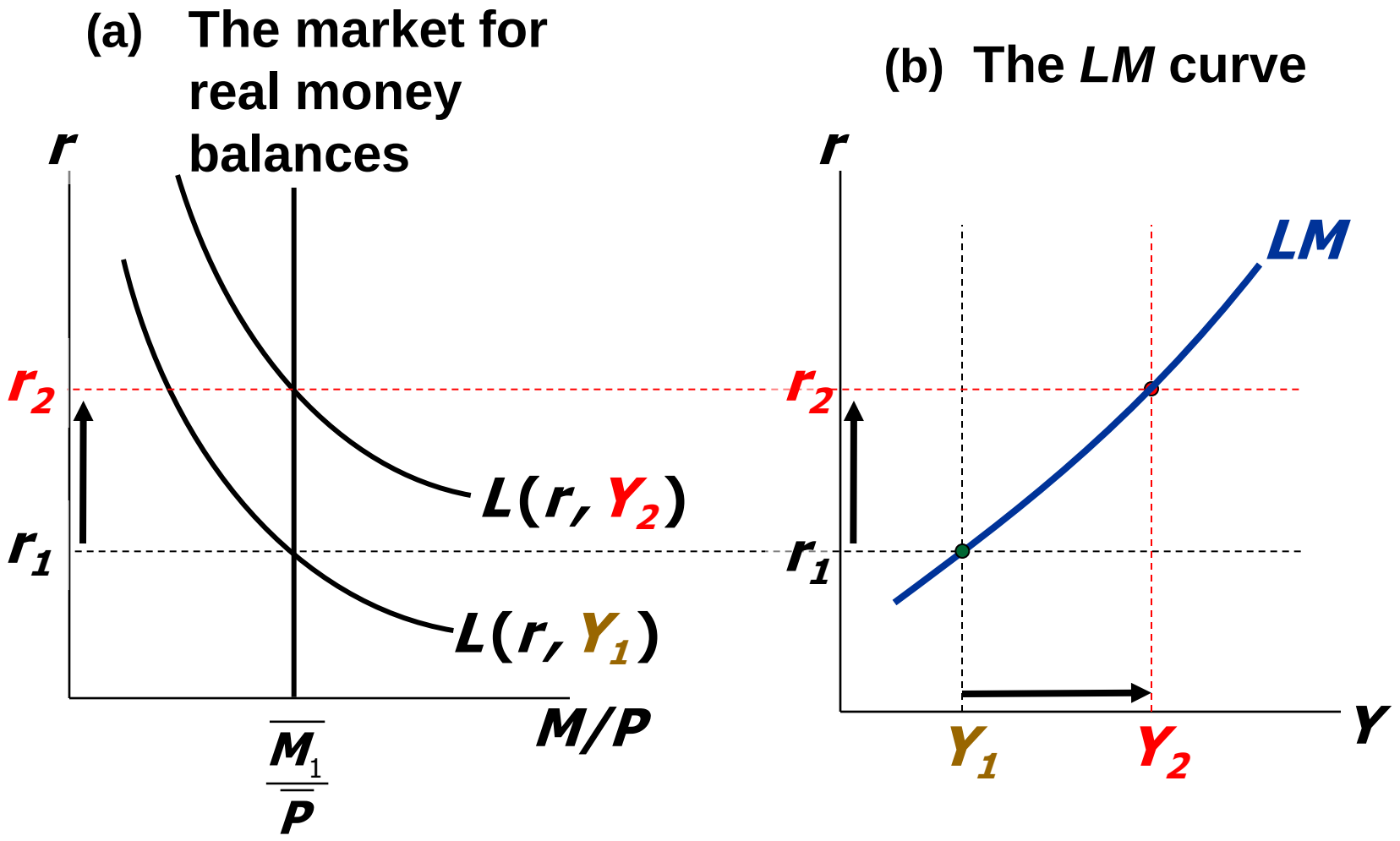
$$(M/P)^d = L(r, Y)$$

The *LM* curve is a graph of all combinations of *r* and *Y* that equate the supply and demand for real money balances.

The equation for the *LM* curve is:

$$\bar{M}/\bar{P} = L(r, Y)$$

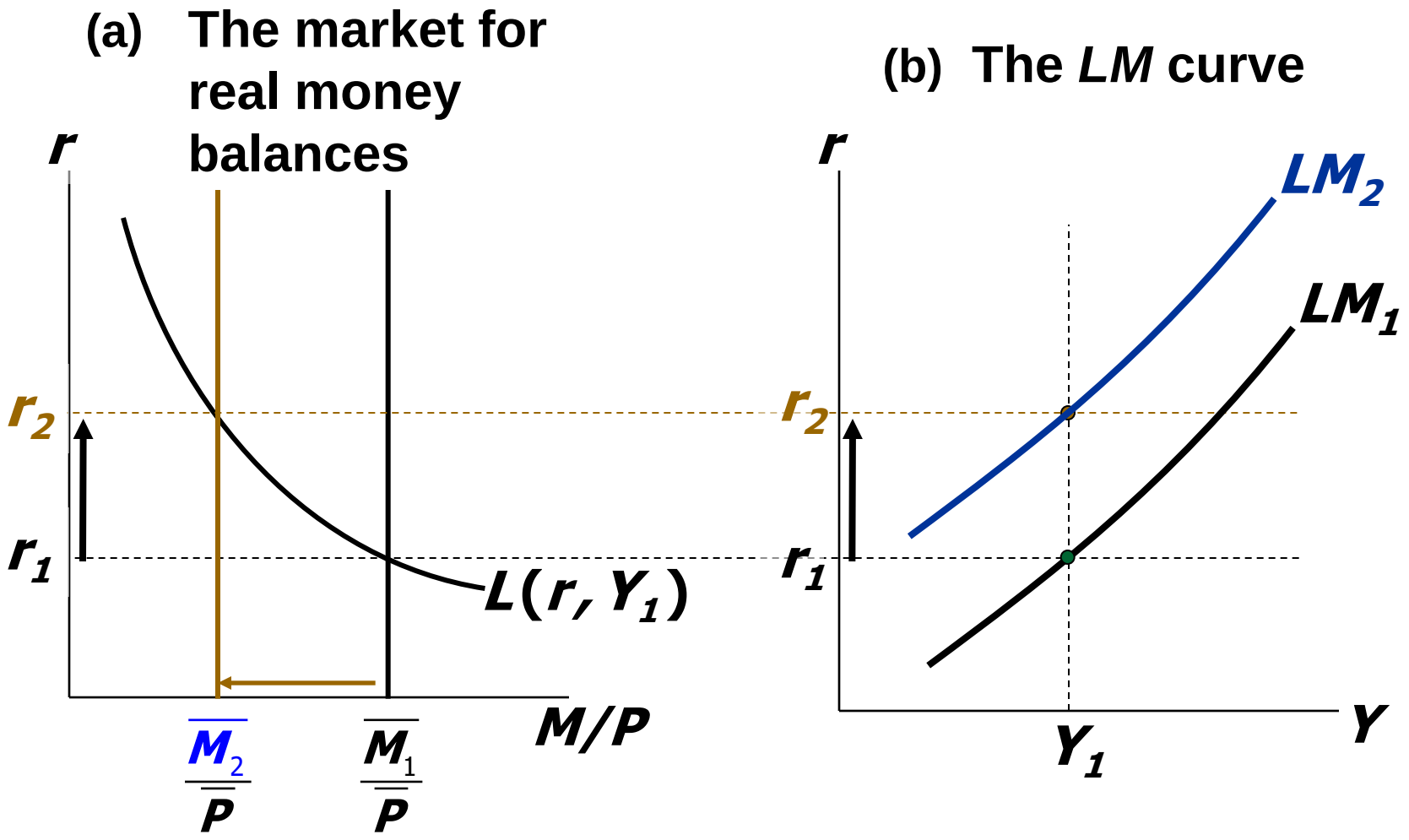
Deriving the *LM* curve



Why the *LM* curve is upward sloping

- An increase in income raises money demand.
- Since the supply of real balances is fixed, there is now excess demand in the money market at the initial interest rate.
- The interest rate must rise to restore equilibrium in the money market.

How $\Delta M<0$ shifts the LM curve

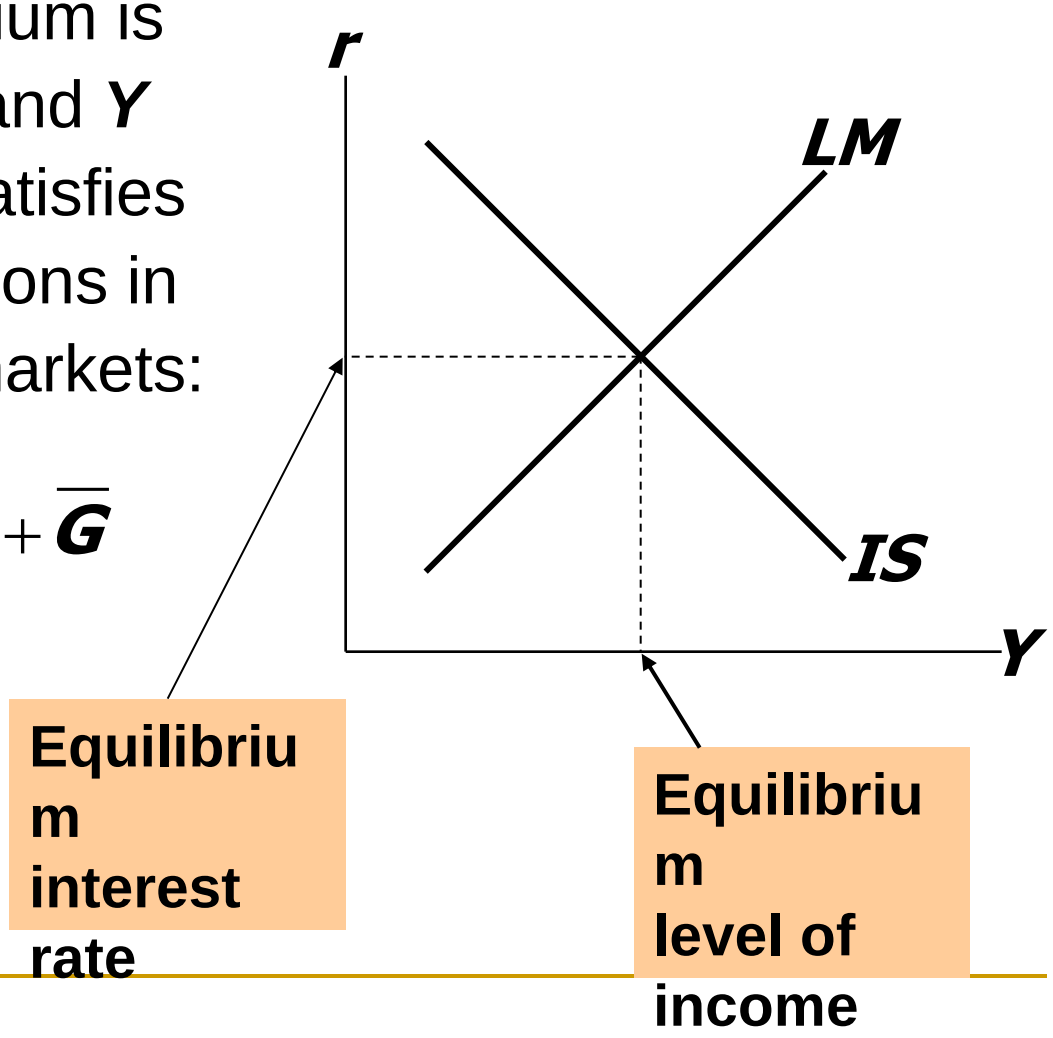


The short-run equilibrium

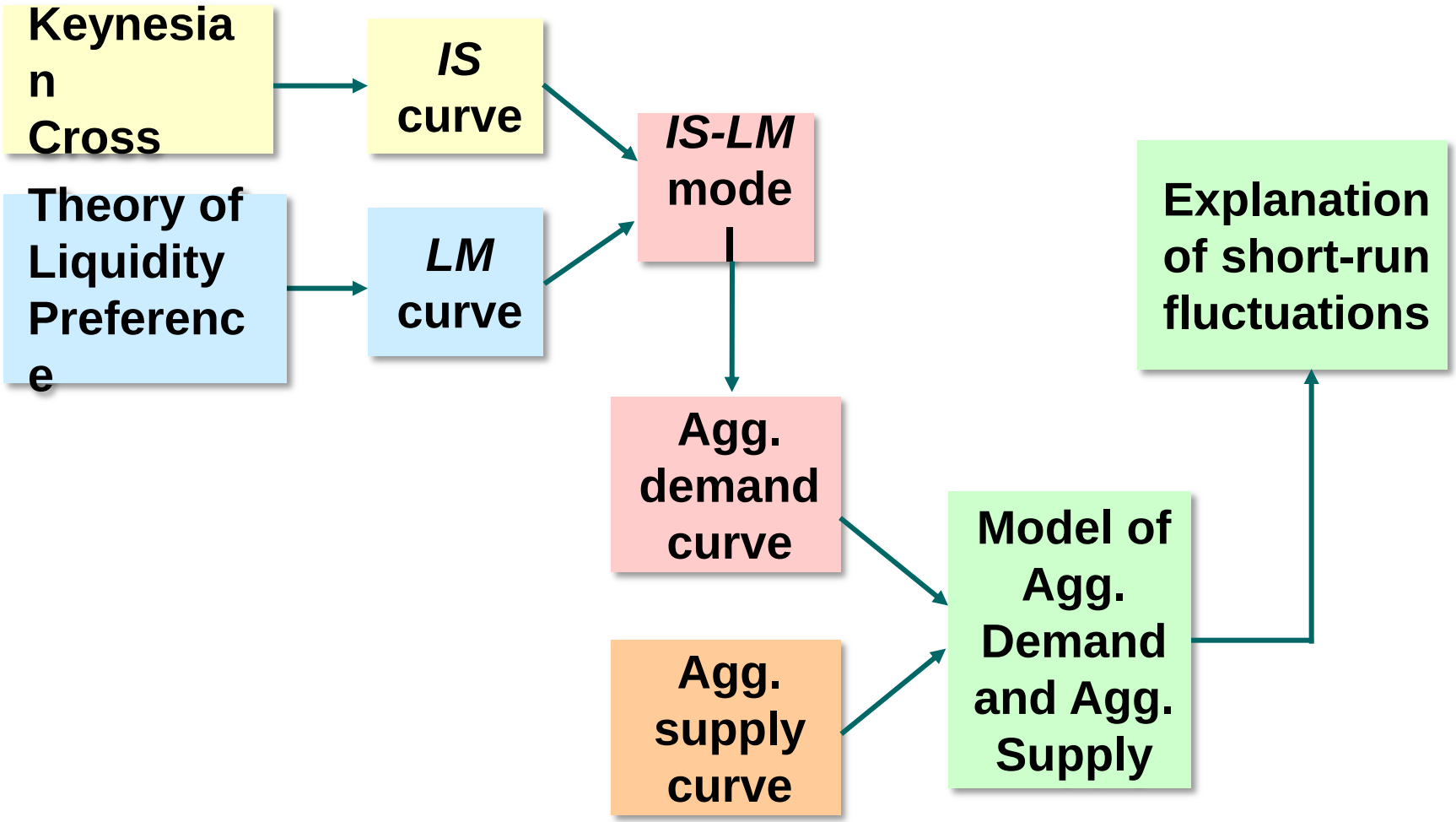
The short-run equilibrium is the combination of r and Y that simultaneously satisfies the equilibrium conditions in the goods & money markets:

$$Y = C(Y - \bar{T}) + I(r) + \bar{G}$$

$$\bar{M}/\bar{P} = L(r, Y)$$



The Big Picture



SUMMARY

1. Long run: prices are flexible, output and employment are always at their natural rates, and the classical theory applies.

   Short run: prices are sticky, shocks can push output and employment away from their natural rates.

2. Aggregate demand and supply: a framework to analyze economic fluctuations

SUMMARY

3. The aggregate demand curve slopes downward.
4. The long-run aggregate supply curve is vertical, because output depends on technology and factor supplies, but not prices.
5. The short-run aggregate supply curve is horizontal, because prices are sticky at predetermined levels.

SUMMARY

6. Shocks to aggregate demand and supply cause fluctuations in GDP and employment in the short run.
7. The central bank can attempt to stabilize the economy
with monetary policy.

SUMMARY

1. Keynesian cross
   - basic model of income determination
   - takes fiscal policy & investment as exogenous
   - fiscal policy has a multiplier effect on income
2. *IS* curve
   - comes from Keynesian cross when planned investment depends negatively on interest rate
   - shows all combinations of ***r*** and ***Y*** that equate planned expenditure with actual expenditure on goods & services

SUMMARY

3. Theory of Liquidity Preference
   - basic model of interest rate determination
   - takes money supply & price level as exogenous
   - an increase in the money supply lowers the interest rate
4. *LM* curve
   - comes from liquidity preference theory when money demand depends positively on income
   - shows all combinations of ***r*** and ***Y*** that equate demand for real money balances with supply

SUMMARY

5. *IS-LM* model
   - Intersection of *IS* and *LM* curves shows the unique point (***Y***, ***r***) that satisfies equilibrium in both the goods and money markets.