

Chapter 10: Aggregate Demand I: Building the *IS-LM* Model*

MACROECONOMICS

Seventh Edition

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Slides based on Ron Cronovich's slides, adjusted for course in Macroeconomics at the Wang Yanan Institute for Studies in Economics at Xiamen University.

Learning Objectives

This chapter introduces you to understanding:

- the goods market and the IS curve
- the money market and the LM curve
- the short-run equilibrium



10.1) Goods Market and IS Curve

→ The Keynesian Cross

- Simple closed economy model in which income is determined by expenditure.
- Notation:
 $PE = C + I + G$ = planned expenditure (PE)
 Y = real GDP = actual expenditure=output
- Think of PE as amount of goods households, firms and gvmt. **wish** to buy.
- Think of Y as goods which are **actually** produced.
- If $PE < Y$, firms cannot sell all they produced and put the difference into inventory ('inventory investment').

10.1) Goods Market and IS Curve

→ Elements of the Keynesian Cross

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

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

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

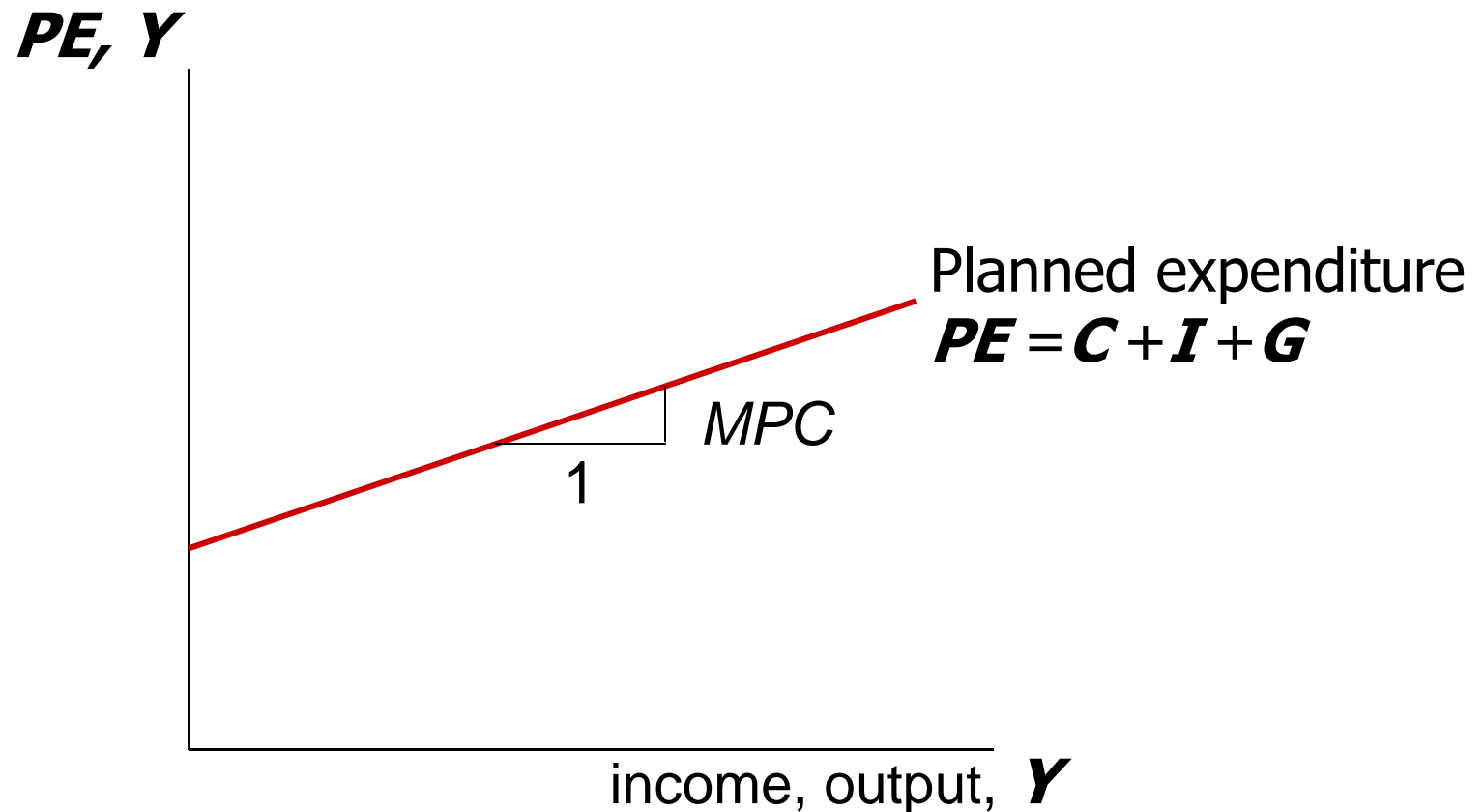
Planned expenditure: $PE = C(Y - \bar{T}) + \bar{I} + \bar{G}$

Equilibrium condition: $Y = PE$

Actual expenditure = planned expenditure

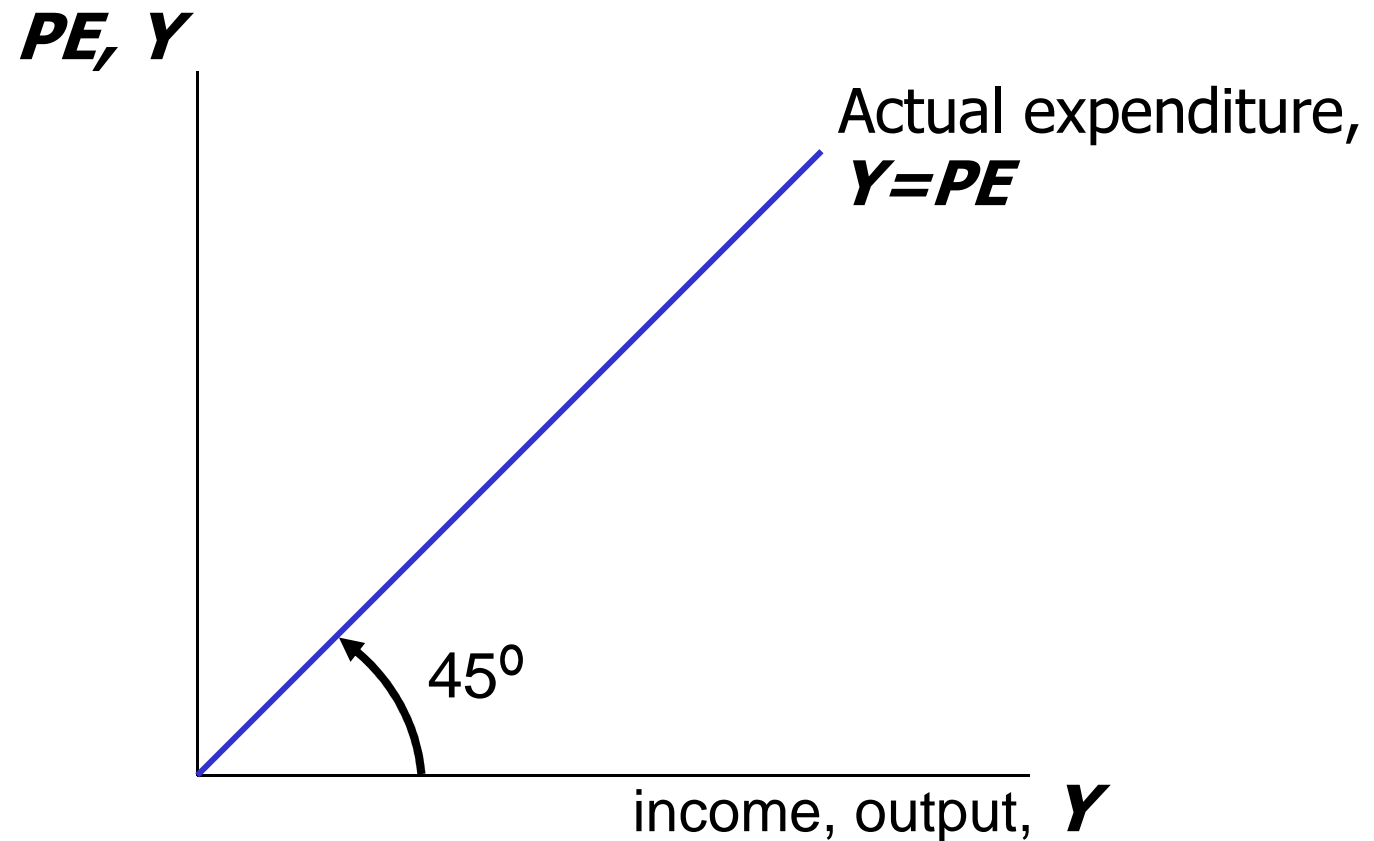
10.1) Goods Market and IS Curve

→ Graphing Planned Expenditure



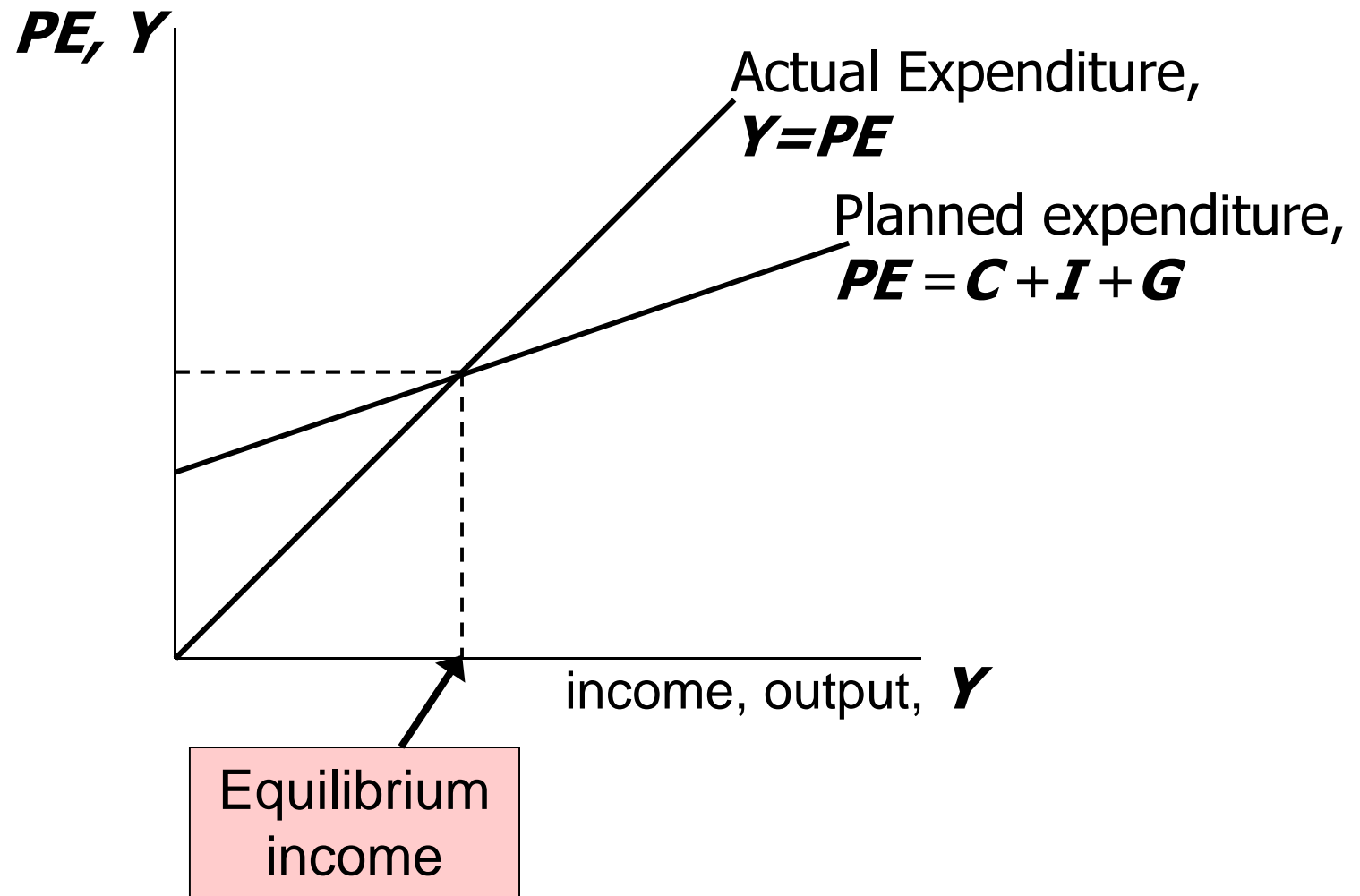
10.1) Goods Market and IS Curve

→ Graphing the Equilibrium Condition



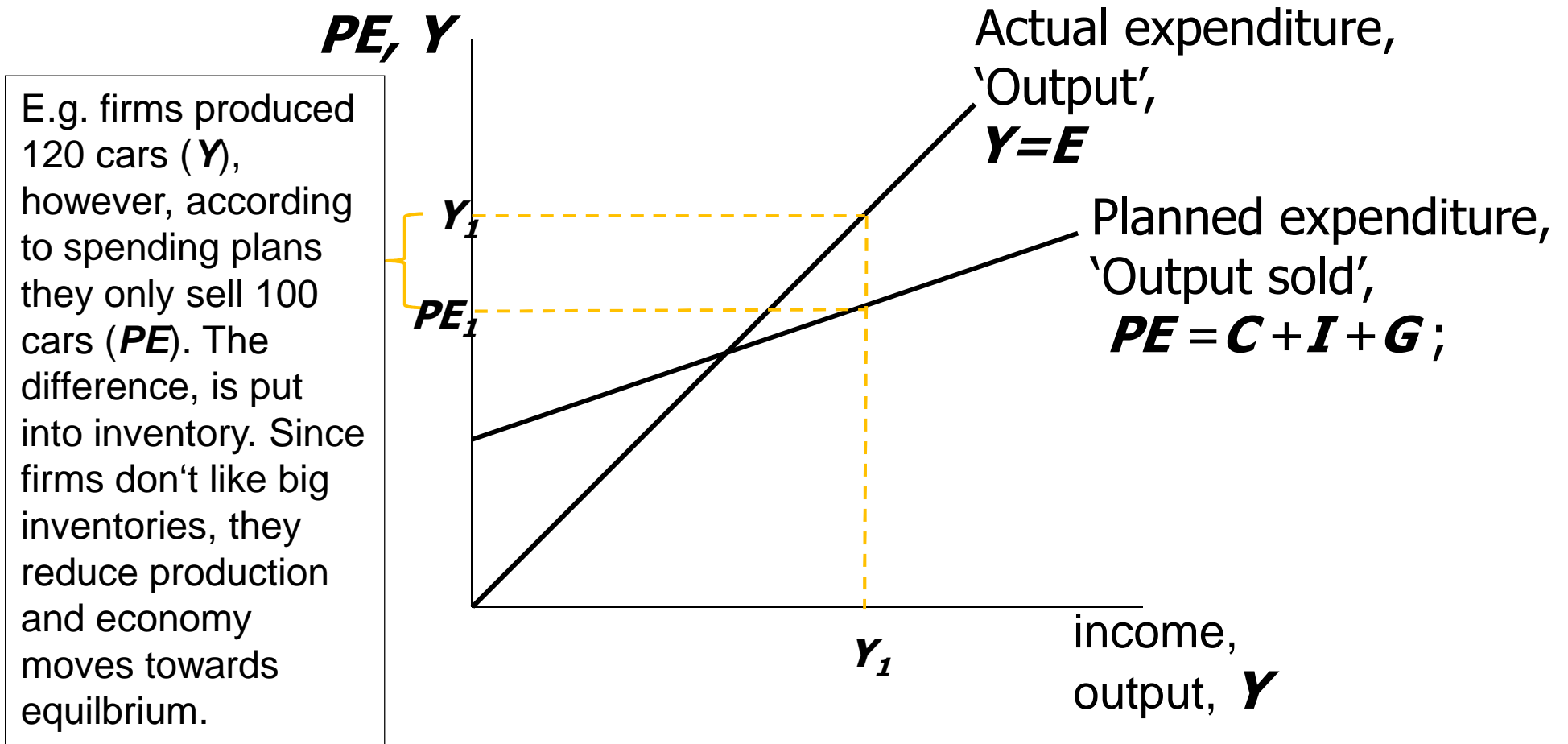
10.1) Goods Market and IS Curve

→ The Equilibrium Value of Income



10.1) Goods Market and IS Curve

→ The Equilibrium Value of Income (ctd.)

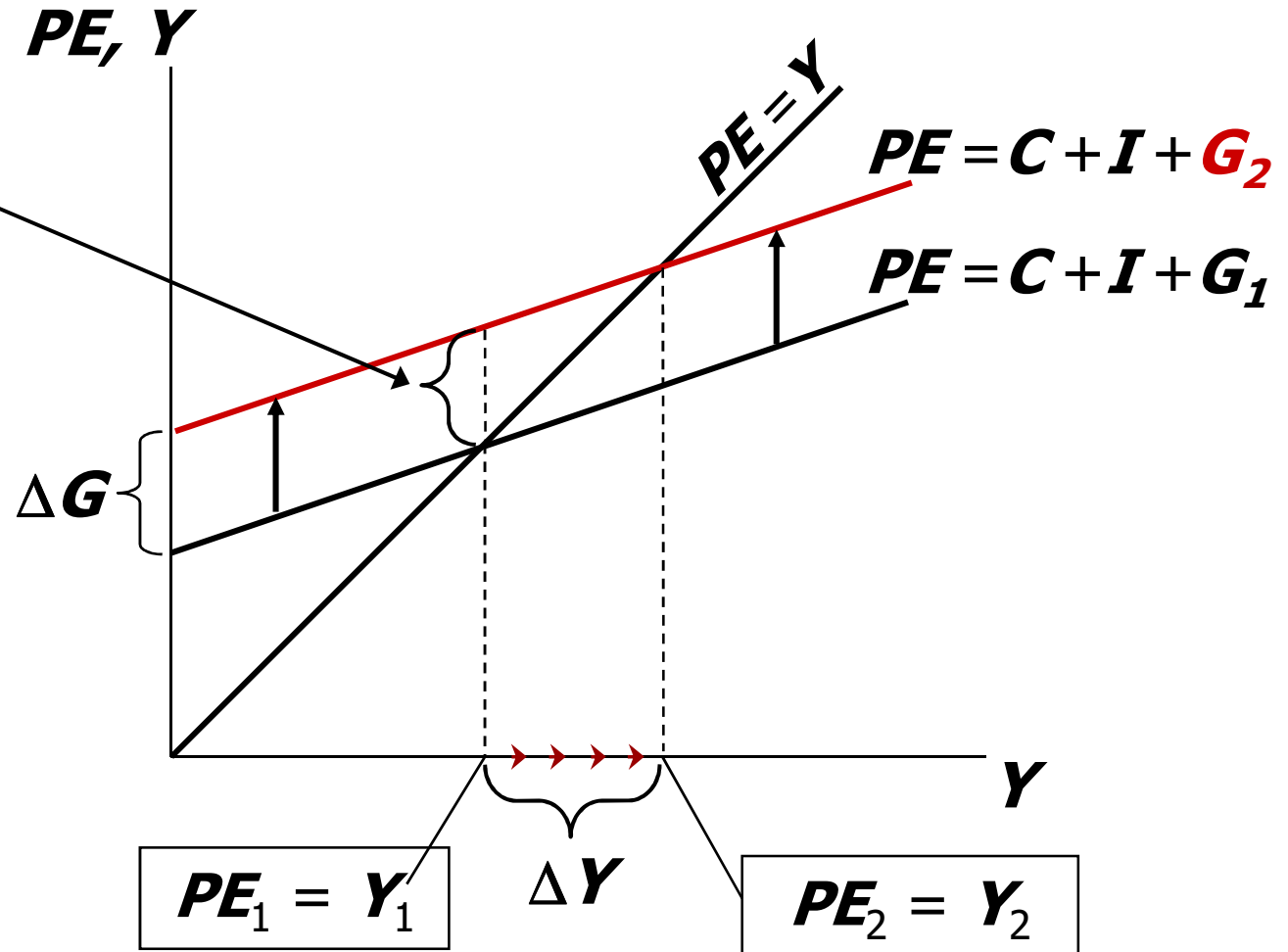


10.1) Goods Market and IS Curve

→ An Increase in Government Purchases

At Y_1 , there is now an unplanned drop in inventory...

...so firms increase output, and income rises toward a new equilibrium.



10.1) Goods Market and IS Curve

→ Solving for ΔY

$$Y = C + I + G \quad \text{equilibrium condition}$$

$$\Delta Y = \Delta C + \Delta I + \Delta G \quad \text{in changes}$$

$$= \Delta C + \Delta G \quad \text{because } I \text{ exogenous}$$

$$= \text{MPC} \times \Delta Y + \Delta G \quad \text{Because } \Delta C = \text{MPC}(\Delta Y - \Delta T) \text{ with } \Delta T = 0$$

Collect terms with ΔY
on the left side of the
equals sign:

$$(1 - \text{MPC}) \times \Delta Y = \Delta G$$

Solve for ΔY :

$$\Delta Y = \left(\frac{1}{1 - \text{MPC}} \right) \times \Delta G$$

10.1) Goods Market and IS Curve

→ The Government Purchases Multiplier

Definition: the increase in income resulting from a \$1 increase in **G**.

In this model, the govt purchases multiplier equals $\frac{\Delta Y}{\Delta G} = \frac{1}{1 - MPC}$

Example: If $MPC = 0.8$, then

$$\frac{\Delta Y}{\Delta G} = \frac{1}{1 - 0.8} = 5$$

An increase in **G** causes income to increase 5 times as much!

10.1) Goods Market and IS Curve

→ Why the Multiplier is Greater than 1

- Initially, the increase in **G** causes an equal increase in **Y**: $\Delta Y = \Delta G$.
- But $\uparrow Y \Rightarrow \uparrow C$
 - \Rightarrow further $\uparrow Y$
 - \Rightarrow further $\uparrow C$
 - \Rightarrow further $\uparrow Y$
- So the final impact on income is much bigger than the initial ΔG .

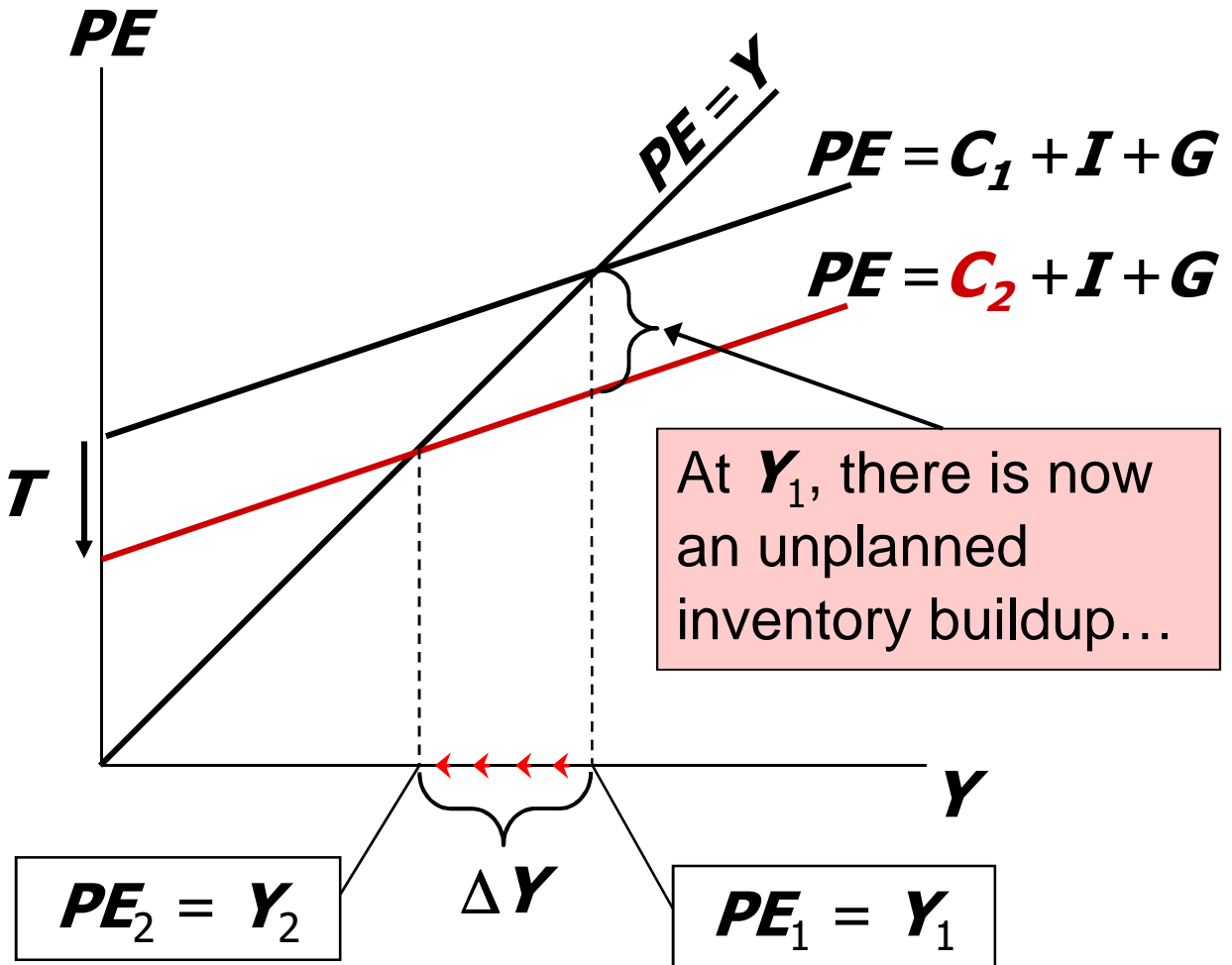
10.1) Goods Market and IS Curve

→ An Increase in Taxes

Initially, the tax increase reduces consumption, and therefore PE :

$$\Delta C = -MPC \Delta T$$

...so firms reduce output, and income falls toward a new equilibrium



10.1) Goods Market and IS Curve

→ Solving for ΔY

$$\begin{aligned}\Delta Y &= \Delta C + \Delta I + \Delta G && \text{eq'm condition in} \\ & && \text{changes} \\ &= \Delta C && \mathbf{I} \text{ and } \mathbf{G} \text{ exogenous} \\ &= \text{MPC} \times (\Delta Y - \Delta T)\end{aligned}$$

$$\text{Solving for } \Delta Y: (1 - \text{MPC}) \times \Delta Y = -\text{MPC} \times \Delta T$$

Final result:

$$\Delta Y = \left(\frac{-\text{MPC}}{1 - \text{MPC}} \right) \times \Delta T$$

10.1) Goods Market and IS Curve

→ The Tax Multiplier

Def: the change in income resulting from a \$1 increase in T :

$$\frac{\Delta Y}{\Delta T} = \frac{-MPC}{1 - MPC}$$

If $MPC = 0.8$, then the tax multiplier equals

$$\frac{\Delta Y}{\Delta T} = \frac{-0.8}{1 - 0.8} = \frac{-0.8}{0.2} = -4$$

10.1) Goods Market and IS Curve

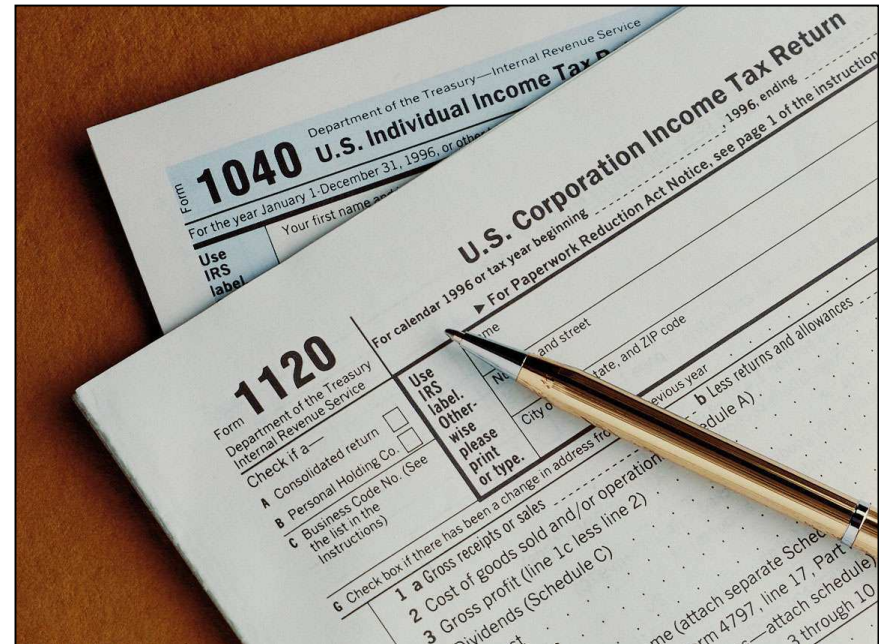
→ The Tax Multiplier

...is *negative*:

A tax increase reduces **C**, which reduces income.

...is *greater than one*
(*in absolute value*):

A change in taxes has a multiplier effect on income.



...is *smaller than the govt spending multiplier*:

Consumers save the fraction $(1 - MPC)$ of a tax cut, so the initial boost in spending from a tax cut is smaller than from an equal increase in **G**.

10.1) Goods Market and IS Curve

→ 该你们了

Use a graph of the Keynesian cross to show the effects of a decrease in planned investment on the equilibrium level of income/output.

10.1) Goods Market and IS Curve

→ Definition of 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:

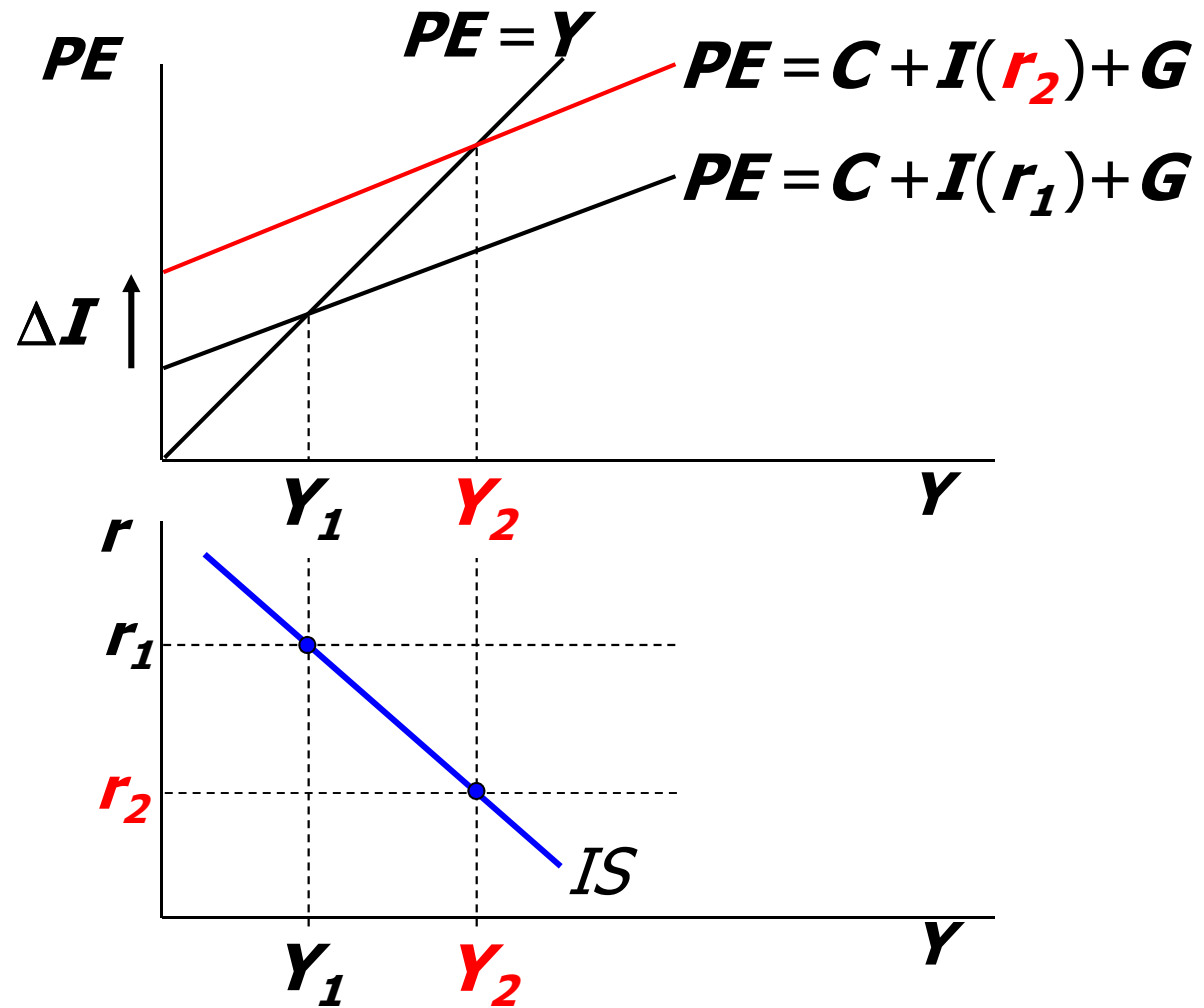
$$Y = C(Y - \bar{T}) + I(r) + \bar{G}$$

where I , as in chapter 3, is a function of the interest rate.

10.1) Goods Market and IS Curve

→ Deriving the *IS* Curve

$\downarrow r \Rightarrow \uparrow I$
 $\Rightarrow \uparrow PE$
 $\Rightarrow \uparrow Y$



10.1) Goods Market and IS Curve

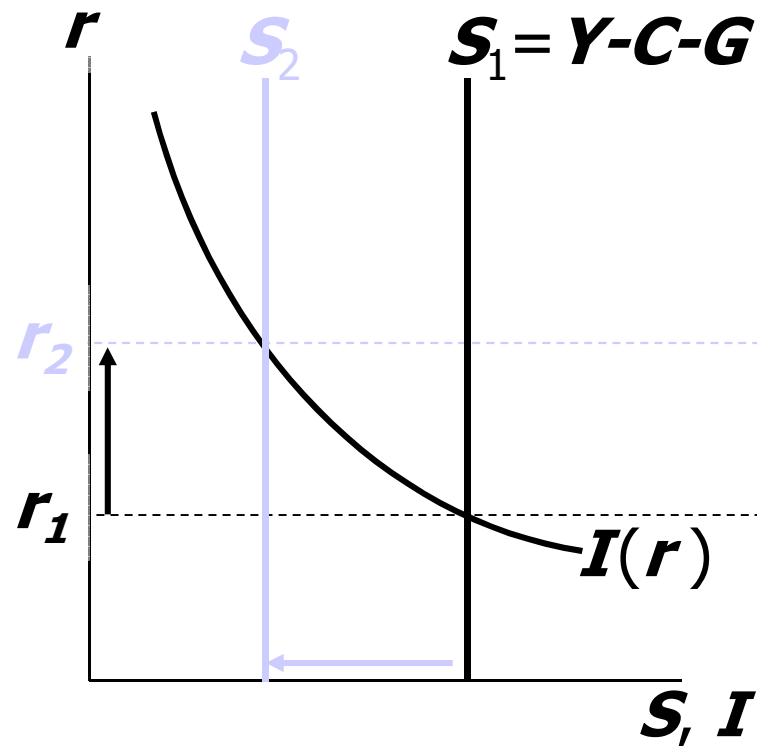
→ Why the *IS* Curve is Negatively Sloped

- 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.

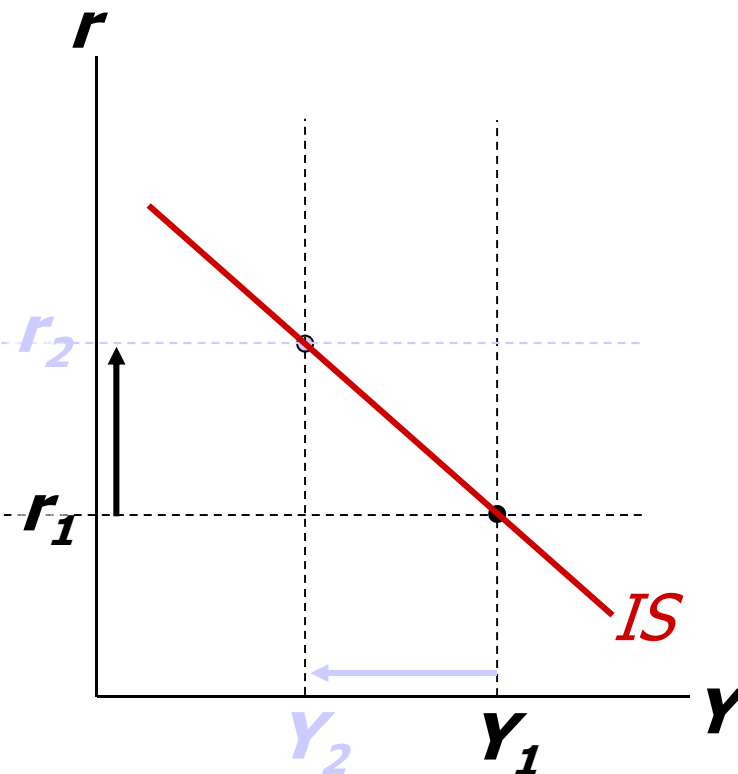
10.1) Goods Market and IS Curve

→ IS Curve & Loanable Funds Model

(a) The L.F. model



(b) The IS curve



10.1) Goods Market and IS Curve

→ 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...

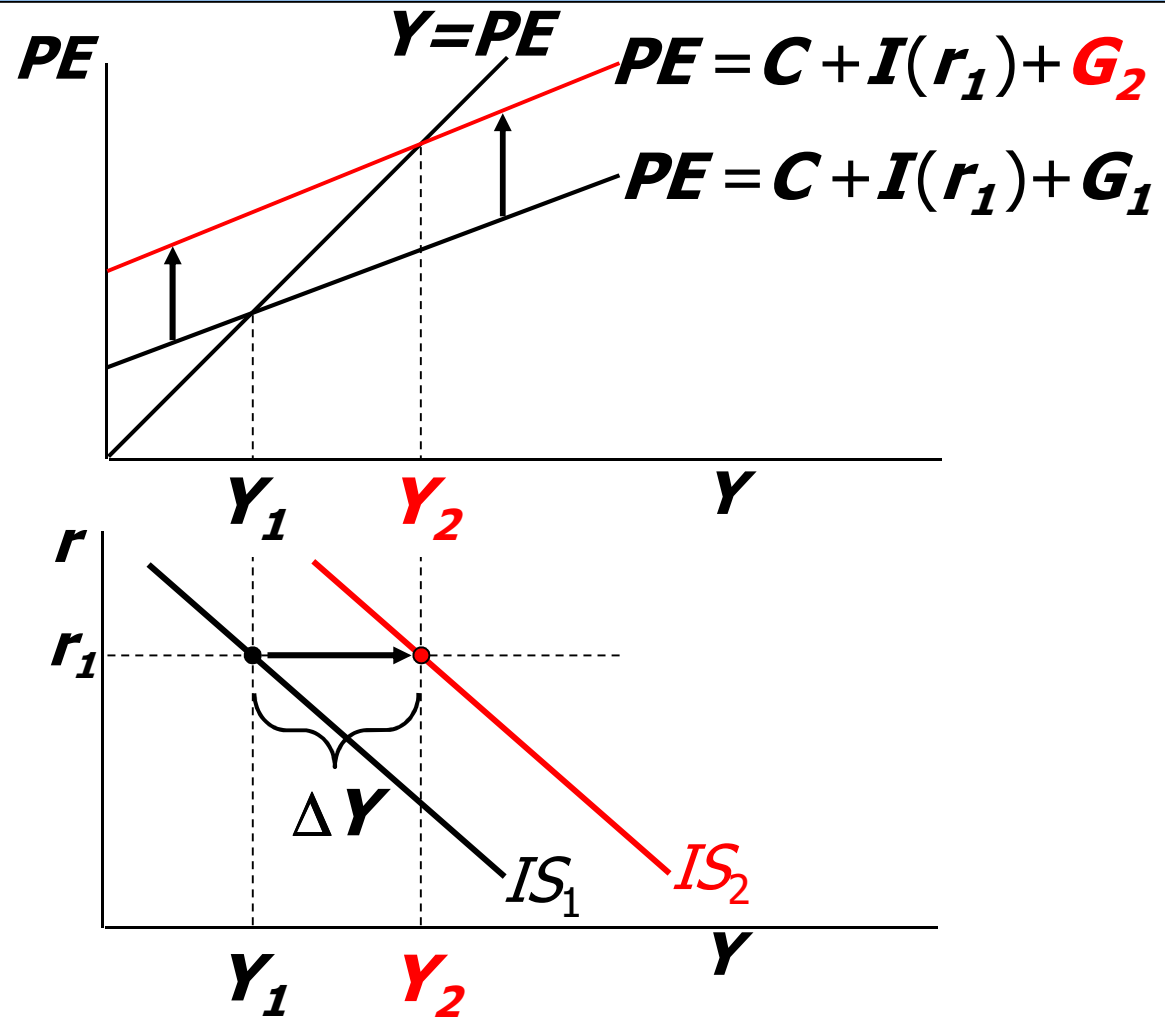
10.1) Goods Market and IS Curve

→ 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

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



10.1) Goods Market and IS Curve

→ 该你们了: *Shifting the IS Curve*

Use the diagram of the Keynesian cross to show how a decrease in taxes shifts the *IS* curve.

Learning Objectives

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- the goods market and the IS curve
- the money market and the LM curve
- the short-run equilibrium



10.2) Money Market and LM Curve

→ The Theory of Liquidity Preference

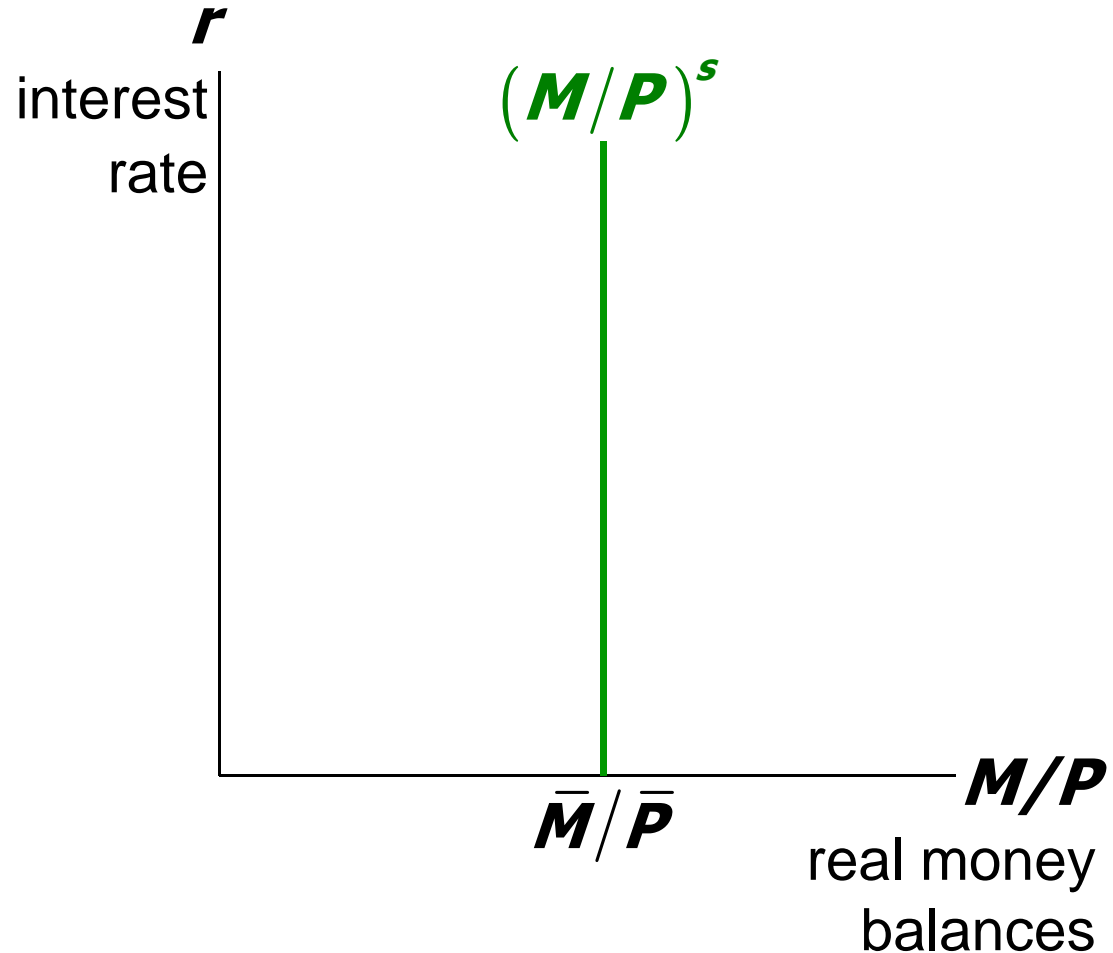
- LM curve plots the relation between the interest rate and the level of income on the market for money balances.
- To understand this relationship Keynes introduced the theory of liquidity preference.
- A simple theory in which the interest rate is determined by money supply and money demand.

10.2) Money Market and LM Curve

→ Money Supply

The supply of real money balances is fixed:

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

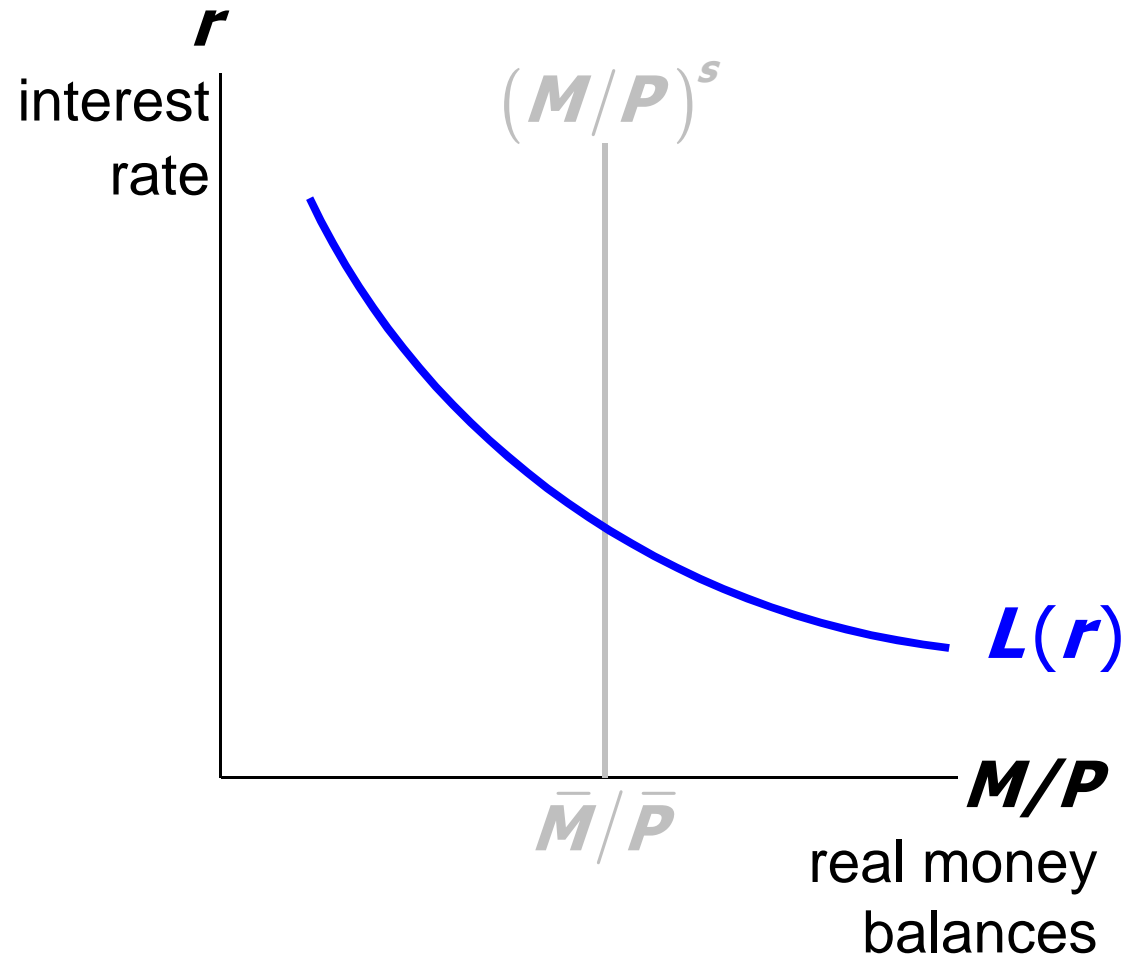


10.2) Money Market and LM Curve

→ Money Demand

Demand for
real money
balances:

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

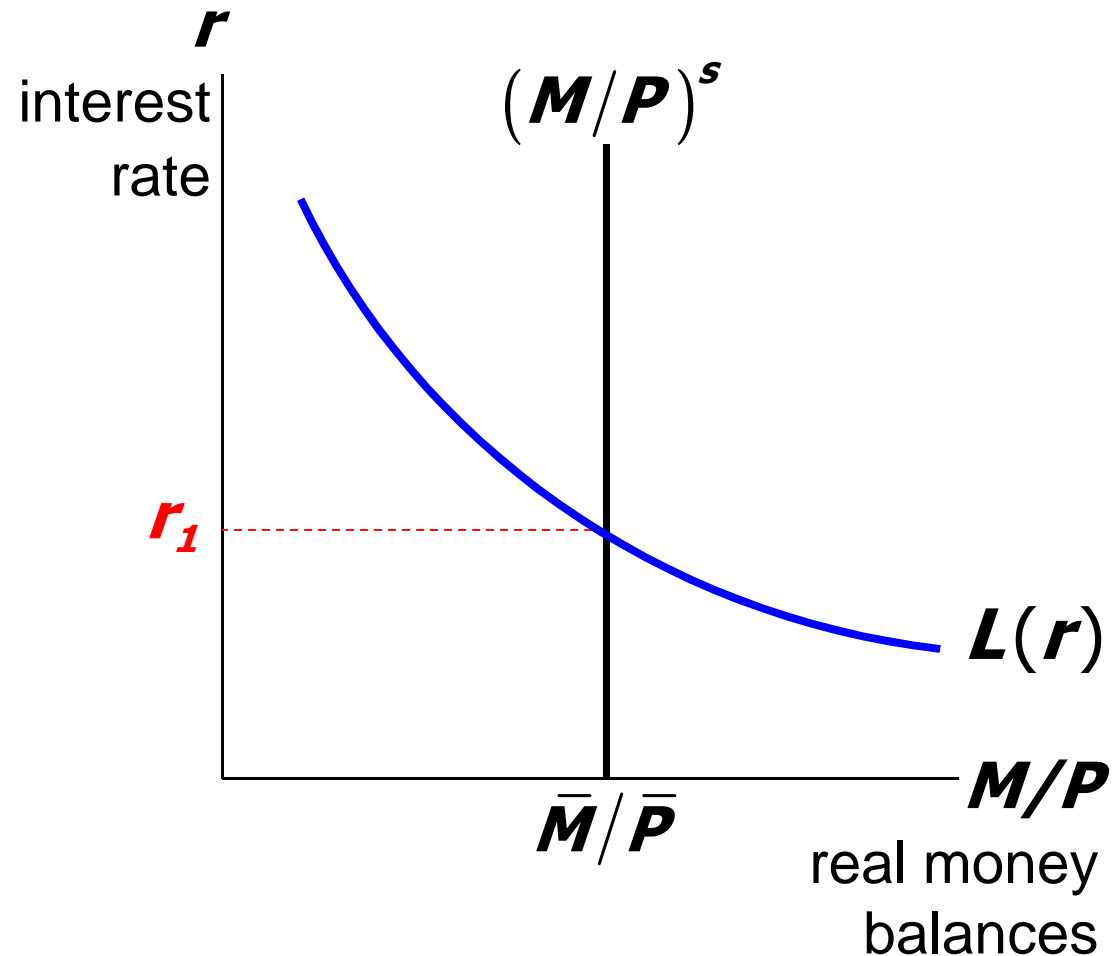


10.2) Money Market and LM Curve

→ Equilibrium

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

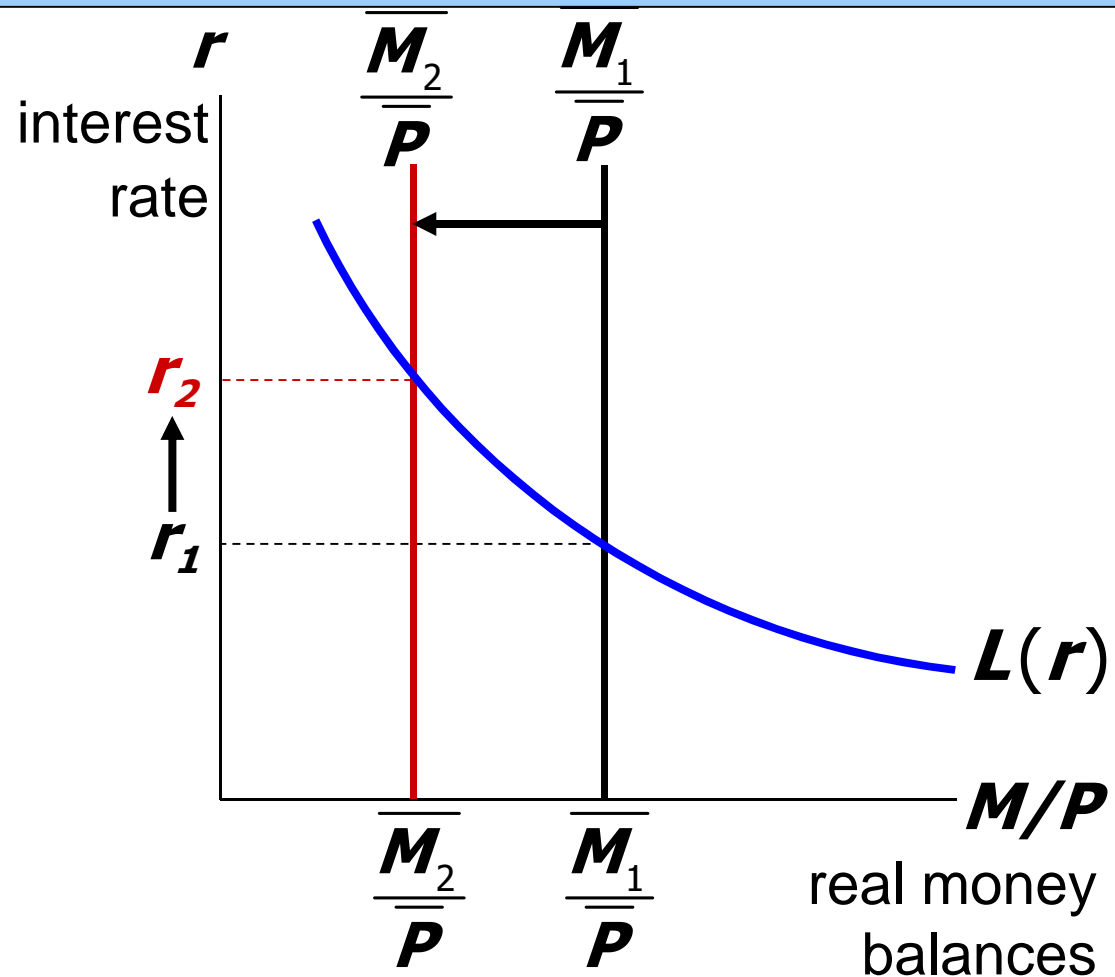
$$\bar{M}/\bar{P} = L(r)$$



10.2) Money Market and LM Curve

→ How the Fed Raises the Interest Rate

To increase r ,
Fed reduces M



10.2) Money Market and LM Curve

→ Monetary Tightening & Interest Rates

- Late 1970s: $\pi > 10\%$
- Oct 1979: Fed Chairman Paul Volcker announces that monetary policy would aim to reduce inflation
- Aug 1979-April 1980:
Fed reduces ***M/P*** 8.0%
- Jan 1983: $\pi = 3.7\%$

How do you think this policy change would affect nominal interest rates?

10.2) Money Market and LM Curve

→ Monetary Tightening & Rates, *cont.*

The effects of a monetary tightening on nominal interest rates		
	short run	long run
model	Liquidity preference <i>(Keynesian)</i>	Quantity theory, Fisher effect <i>(Classical)</i>
prices	sticky	flexible
prediction	$\Delta i > 0$	$\Delta i < 0$
actual outcome	8/1979: $i = 10.4\%$ 4/1980: $i = 15.8\%$	8/1979: $i = 10.4\%$ 1/1983: $i = 8.2\%$

10.2) Money Market and LM Curve

→ Definition of the *LM* Curve

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

$$\left(\frac{M}{P}\right)^d = L(r, Y)$$

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

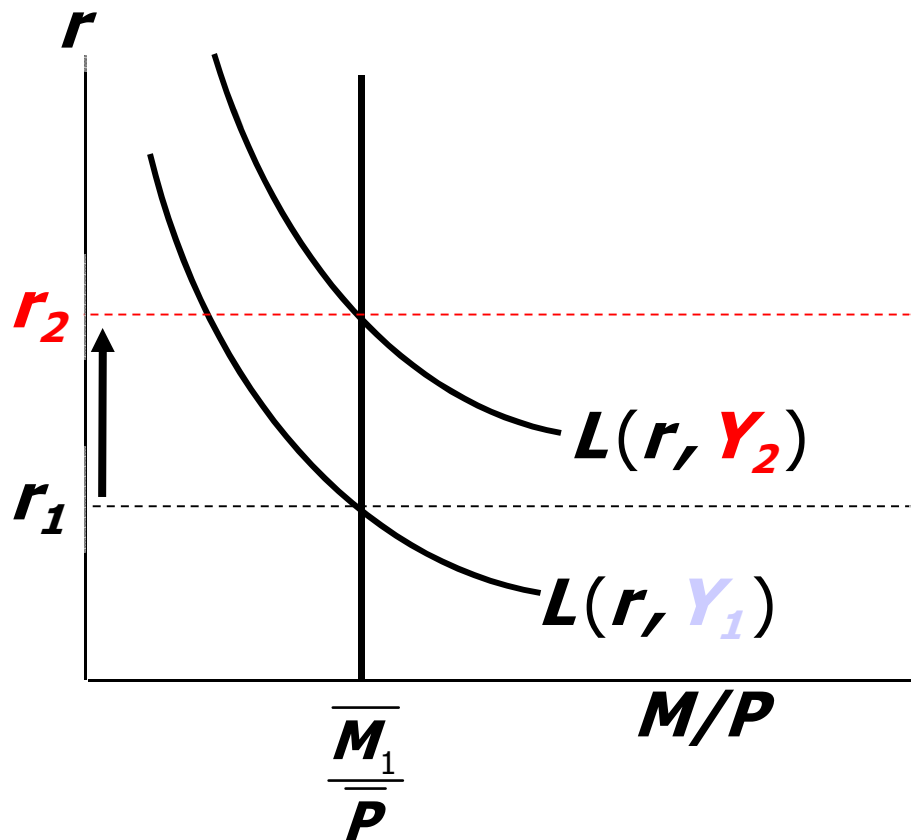
The equation for the *LM* curve is:

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

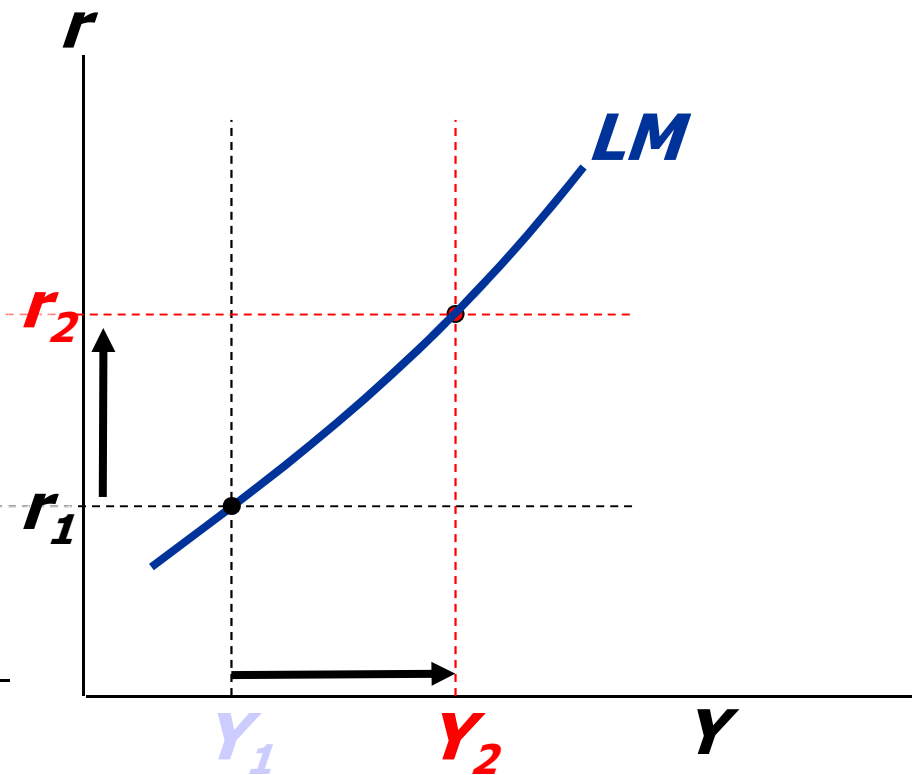
10.2) Money Market and LM Curve

→ Deriving the *LM* Curve

(a) The market for real money balances



(b) The *LM* curve



10.2) Money Market and LM Curve

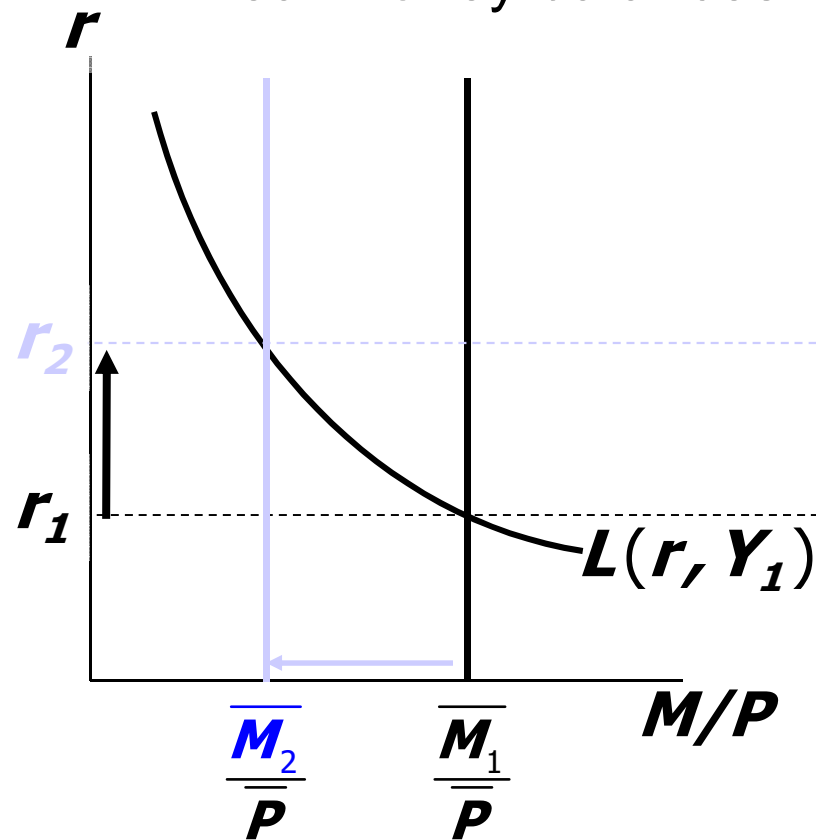
→ Why the *LM* Curve is Upward Sloping

- 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.

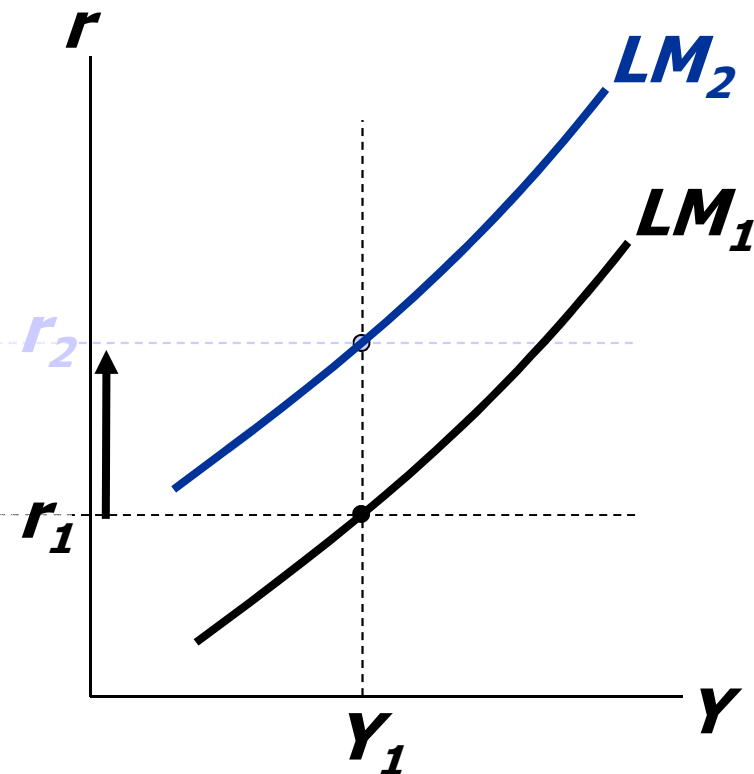
10.2) Money Market and LM Curve

→ How ΔM Shifts the LM Curve

(a) The market for real money balances



(b) The LM curve



10.2) Money Market and LM Curve

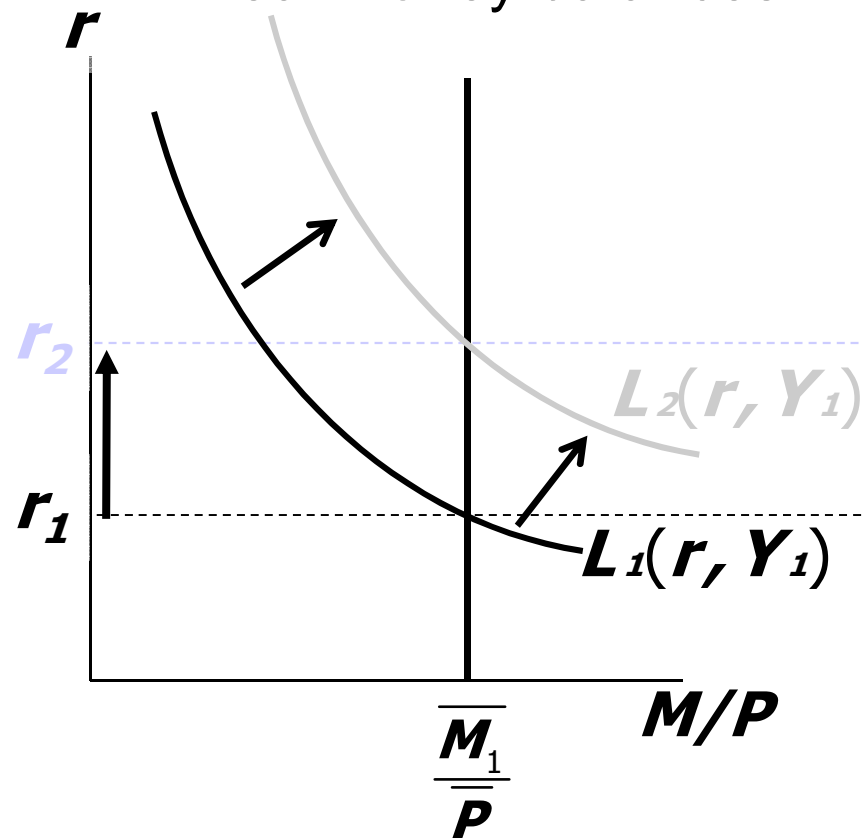
→ 该你们了: *Shifting the LM Curve*

Suppose a wave of credit card fraud causes consumers to use cash more frequently in transactions. Use the liquidity preference model to show how these events shift the LM curve.

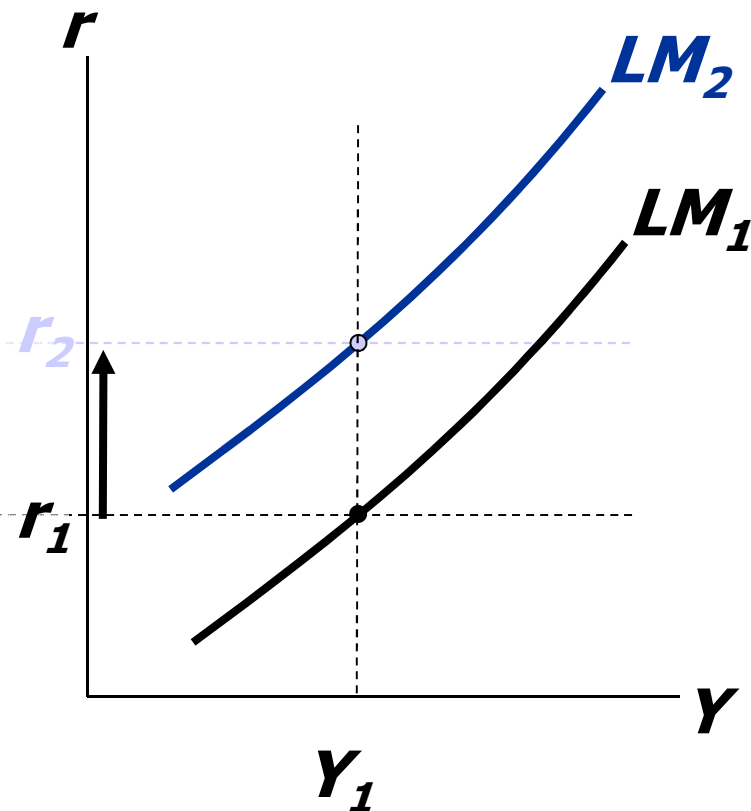
10.2) Money Market and LM Curve

→ How increase in $(M/P)^D$ Shifts LM Curve

(a) The market for real money balances



(b) The LM curve



Learning Objectives

This chapter introduces you to understanding:

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- the money market and the LM curve
- the short-run equilibrium



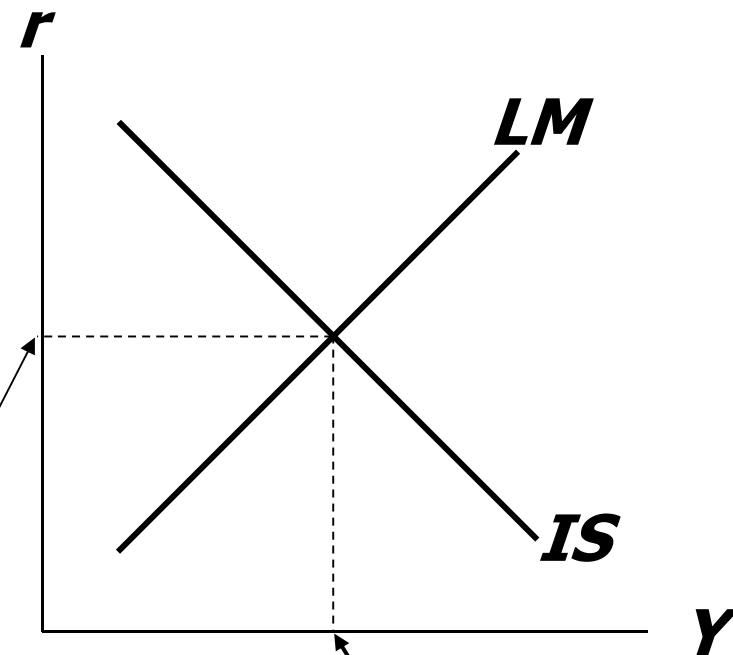
10.3) The Short-Run Equilibrium

→ Definitions and Equations

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

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

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

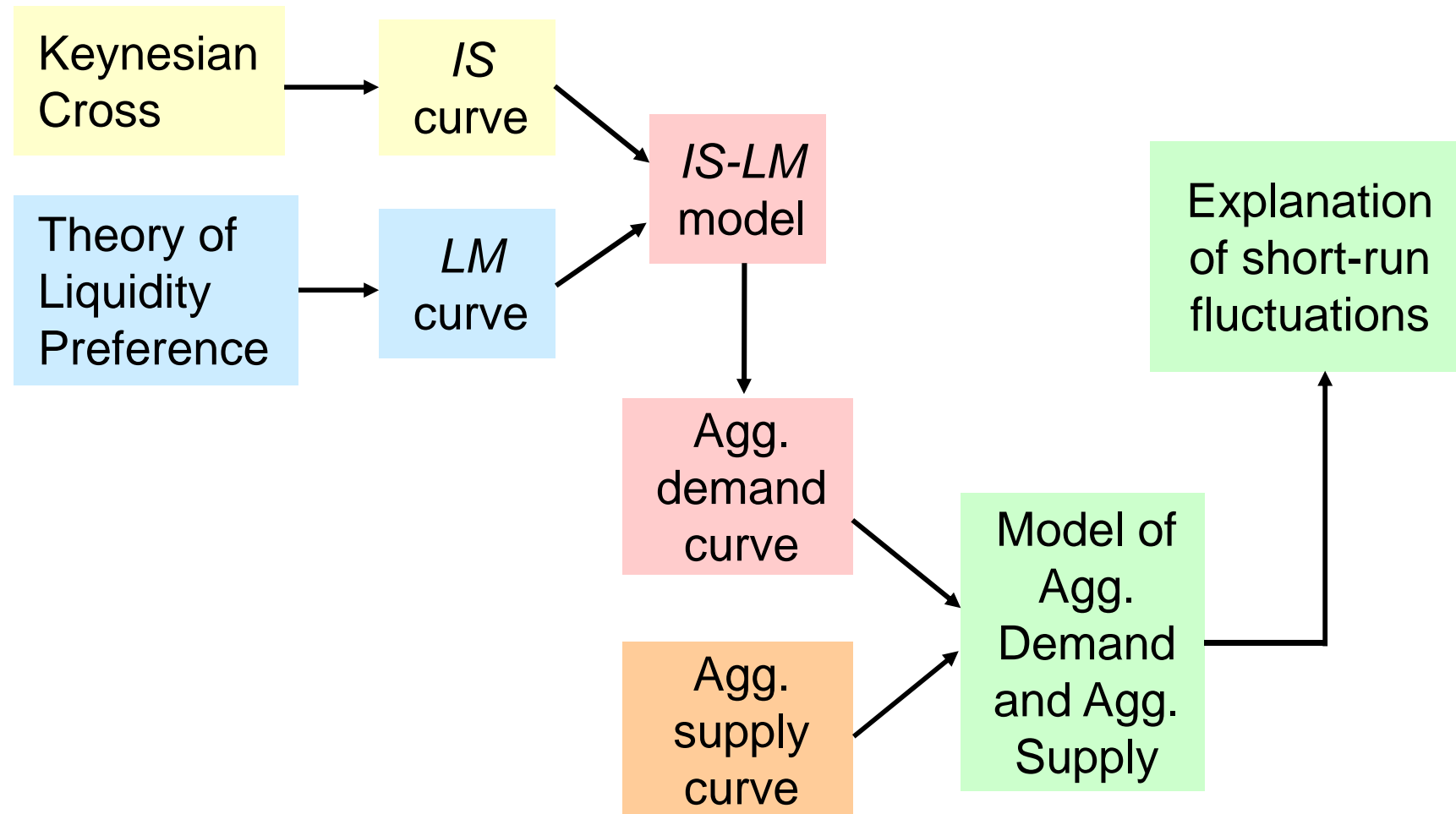


Equilibrium
interest
rate

Equilibrium
level of
income

10.3) The Short-Run Equilibrium

→ The Big Picture



Preview of Chapter 11

In Chapter 11, we will

- use the *IS-LM* model to analyze the impact of policies and shocks.
- learn how the aggregate demand curve comes from *IS-LM*.
- use the *IS-LM* and *AD-AS* models together to analyze the short-run and long-run effects of shocks.
- use our models to learn about the Great Depression.

Economic Text:

→ Behind the bald figures

- 1) What is a leading indicator?
- 2) Why are pet businesses, condom, and business sales said to be leading indicators of the economic situation?
- 3) Why do some people suggest to take the shortness of skirts ('hemlines') or countries leaders' hairlines to be indicators of the economic situation?
- 4) Even if the previous suggestions were good to predict where the economy is heading, why are they only of limited use as leading economic indicators?
- 5) Which mechanism could explain the relation between the number of google searches for 'gold price' and the U.S. consumer confidence? What is the big advantage of this indicator if the relation proves to be stable?

Chapter Summary

1. Keynesian cross

- basic model of income determination
- takes fiscal policy & investment as exogenous
- fiscal policy has a multiplier effect on income.

Chapter Summary

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

Chapter 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

Chapter Summary

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

Chapter 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.