

## Chapter 10: Aggregate Demand I

CHAPTER 10 Aggregate Demand I

0

### Context

- Chapter 9 introduced 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

CHAPTER 10 Aggregate Demand I

1

### Context

- This chapter 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).
- This chapter (and chapter 11) focus on the closed-economy case. Chapter 12 presents the open-economy case.

CHAPTER 10 Aggregate Demand I

2

### 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

CHAPTER 10 Aggregate Demand I

3

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

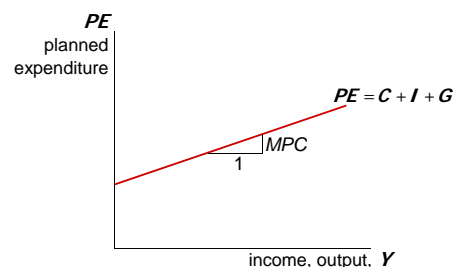
equilibrium condition:

actual expenditure = planned expenditure  
 $Y = PE$

CHAPTER 10 Aggregate Demand I

4

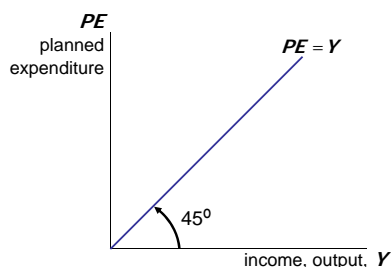
### Graphing planned expenditure



CHAPTER 10 Aggregate Demand I

5

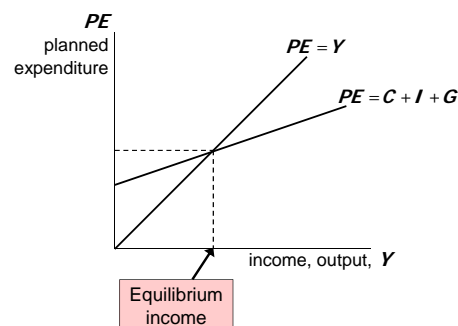
### Graphing the equilibrium condition



CHAPTER 10 Aggregate Demand I

6

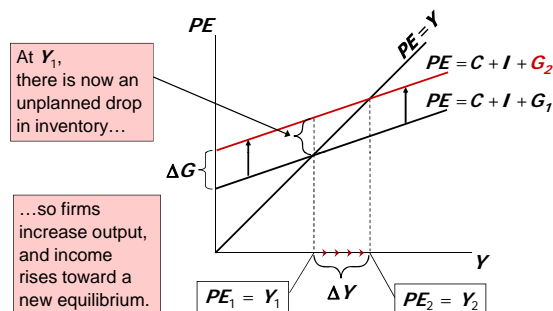
### The equilibrium value of income



CHAPTER 10 Aggregate Demand I

7

### An increase in government purchases



CHAPTER 10 Aggregate Demand I

8

### Solving for $\Delta Y$

$$\begin{aligned}
 Y &= C + I + G && \text{equilibrium condition} \\
 \Delta Y &= \Delta C + \Delta I + \Delta G && \text{in changes} \\
 &= \Delta C + \Delta G && \text{because } I \text{ exogenous} \\
 &= \text{MPC} \times \Delta Y + \Delta G && \text{because } \Delta C = \text{MPC} \Delta Y
 \end{aligned}$$

Collect terms with  $\Delta Y$  on the left side of the equals sign:

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

Solve for  $\Delta Y$ :

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

CHAPTER 10 Aggregate Demand I

9

### The government purchases multiplier

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

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

Example: If  $\text{MPC} = 0.8$ , then

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

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

CHAPTER 10 Aggregate Demand I

10

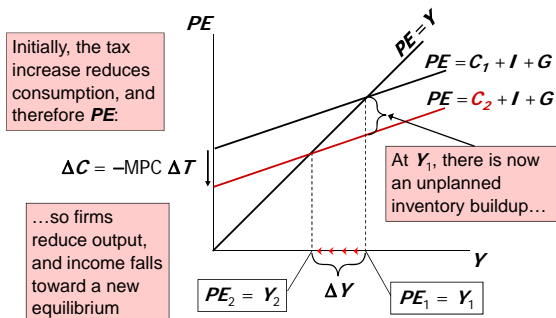
### Why the multiplier is greater than 1

- 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  $\Delta G$ .

CHAPTER 10 Aggregate Demand I

11

## An increase in taxes



CHAPTER 10 Aggregate Demand I

12

## Solving for $\Delta Y$

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

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

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

CHAPTER 10 Aggregate Demand I

13

## 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

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

CHAPTER 10 Aggregate Demand I

14

## 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  $G$ .



CHAPTER 10 Aggregate Demand I

15

## NOW YOU TRY:

### Practice with the Keynesian Cross

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

## 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

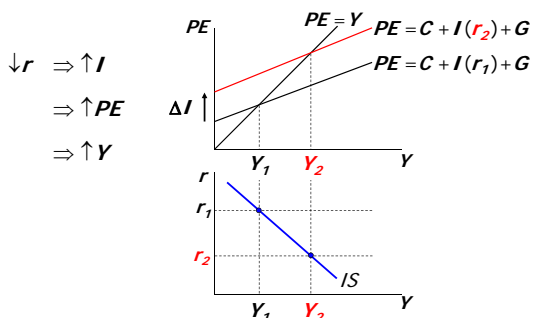
The equation for the  $IS$  curve is:

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

CHAPTER 10 Aggregate Demand I

17

### Deriving the *IS* curve



CHAPTER 10 Aggregate Demand I

18

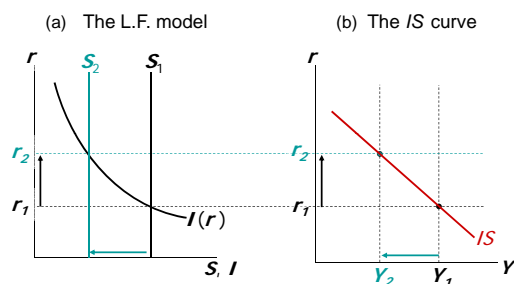
### Why the *IS* curve is negatively sloped

- 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.

CHAPTER 10 Aggregate Demand I

19

### The *IS* curve and the loanable funds model



CHAPTER 10 Aggregate Demand I

20

### 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...

CHAPTER 10 Aggregate Demand I

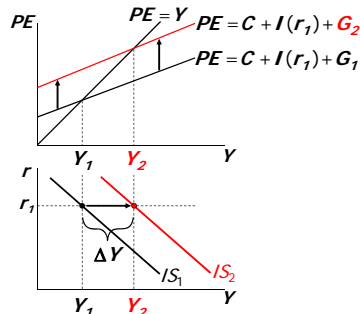
21

### Shifting the *IS* curve: $\Delta G$

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

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



CHAPTER 10 Aggregate Demand I

22

### NOW YOU TRY:

#### Shifting the *IS* curve: $\Delta T$

- Use the diagram of the Keynesian cross or loanable funds model to show how an increase in taxes shifts the *IS* curve.

### 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.

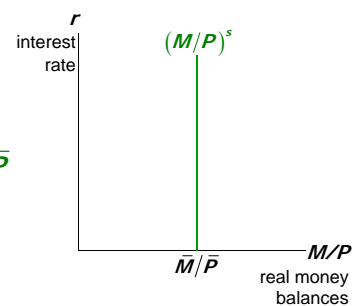
CHAPTER 10 Aggregate Demand I

24

### Money supply

The supply of real money balances is fixed:

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



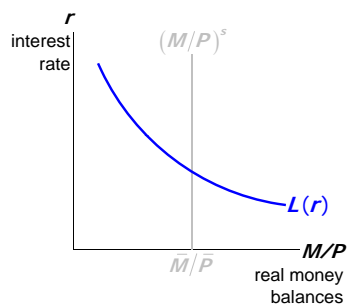
CHAPTER 10 Aggregate Demand I

25

### Money demand

Demand for real money balances:

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



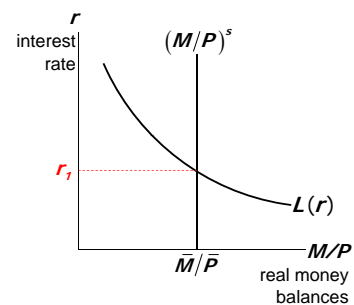
CHAPTER 10 Aggregate Demand I

26

### Equilibrium

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

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

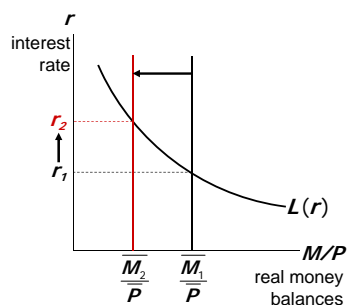


CHAPTER 10 Aggregate Demand I

27

### How the Fed raises the interest rate

To increase  $r$ ,  
Fed reduces  $M$



CHAPTER 10 Aggregate Demand I

28

### CASE STUDY:

#### 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?*

CHAPTER 10 Aggregate Demand I

29

### Monetary Tightening & Interest Rates, *cont.*

The effects of a monetary tightening on nominal interest rates		
	short run	long run
model	Liquidity preference (Keynesian)	Quantity theory, Fisher effect (Classical)
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: $i = 8.2\%$

### 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.

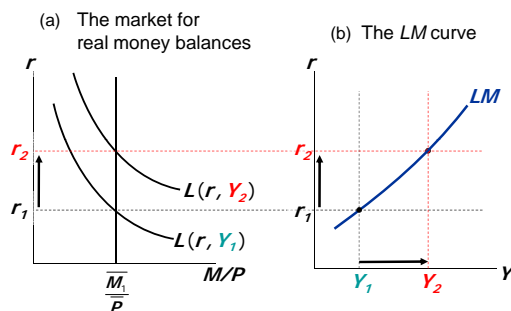
The equation for the *LM* curve is:

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

CHAPTER 10 Aggregate Demand I

31

### Deriving the *LM* curve



CHAPTER 10 Aggregate Demand I

32

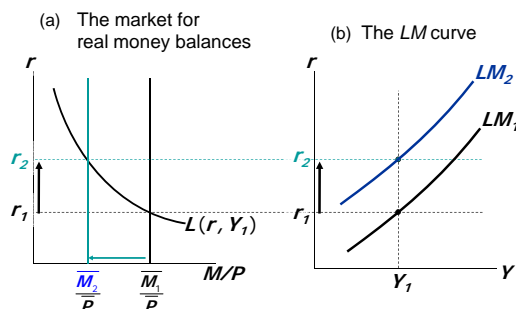
### Why the *LM* curve is upward sloping

- 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.

CHAPTER 10 Aggregate Demand I

33

### How $\Delta M$ shifts the *LM* curve



CHAPTER 10 Aggregate Demand I

34

### NOW YOU TRY:

#### Shifting the *LM* curve

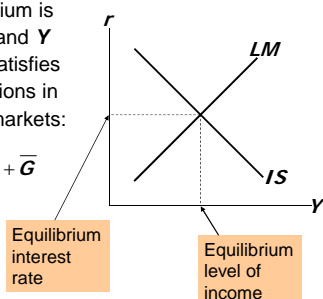
- Suppose a wave of credit card fraud causes consumers to use cash more frequently in transactions.
- Use the liquidity preference model to show how these events shift the *LM* curve.

### 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:

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

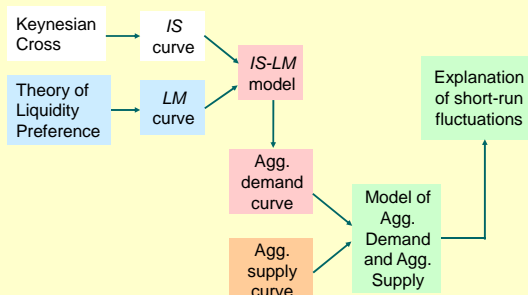
$$\bar{M}/\bar{P} = L(r, Y)$$



CHAPTER 10 Aggregate Demand I

36

### 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.

CHAPTER 10 Aggregate Demand I

38

### Chapter 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

### 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
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.