Context

- 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 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.

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: $I = \bar{I}$

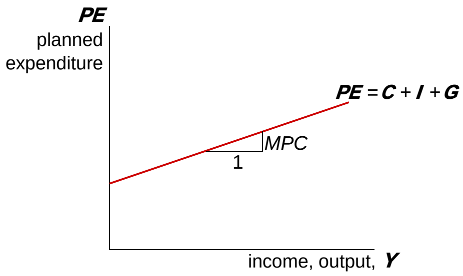
planned expenditure: $PE = C(Y - \bar{T}) + \bar{I} + \bar{G}$

equilibrium condition:

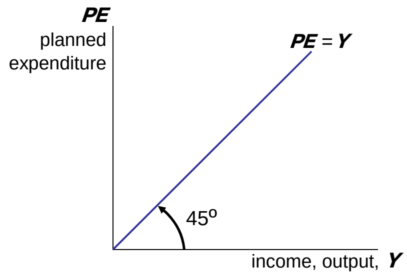
actual expenditure = planned expenditure

$Y = PE$

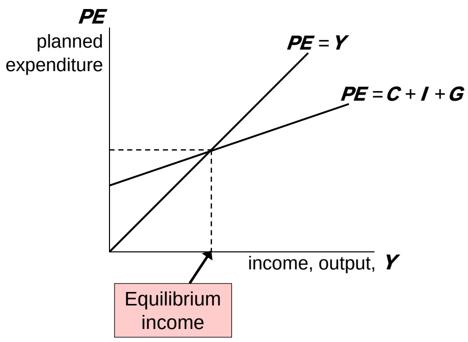
Graphing planned expenditure



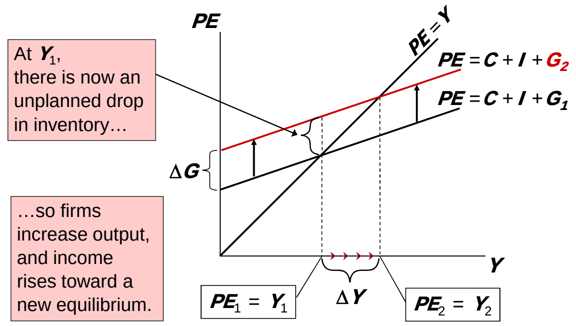
Graphing the equilibrium condition



The equilibrium value of income



An increase in government purchases



Solving for ΔY

$Y = C + I + G$ equilibrium condition

$\Delta Y = \Delta C + \Delta I + \Delta G$ in changes

$= \Delta C + \Delta G$ because I exogenous

$= \text{MPC} \times \Delta Y + \Delta G$ because $\Delta C = \text{MPC}\,\Delta Y$

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

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

Solve for ΔY:

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

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 *MPC* = 0.8, then

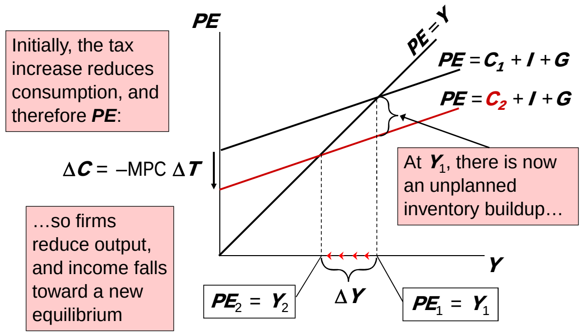
$$\frac{\Delta Y}{\Delta G} = \frac{1}{1-0.8} = 5$$

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

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.

An increase in taxes



Solving for ΔY

$\Delta Y = \Delta C + \Delta I + \Delta G$ — eq'm condition in changes

$= \Delta C$ — I and G exogenous

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

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

Final result:

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

The tax multiplier

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

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

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

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

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***.

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:

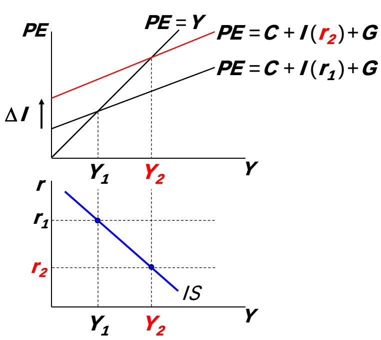
$$Y = C(Y - \overline{T}) + I(r) + \overline{G}$$

Deriving the *IS* curve

$\downarrow r \Rightarrow \uparrow I$

$\Rightarrow \uparrow PE$

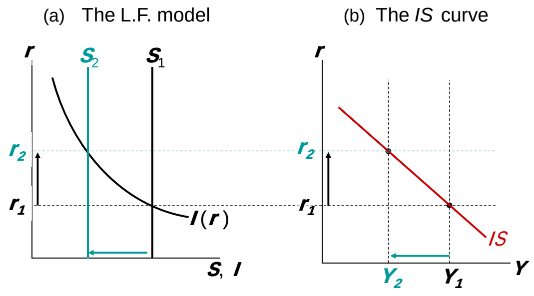
$\Rightarrow \uparrow Y$



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.

The *IS* curve and the loanable funds model



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…

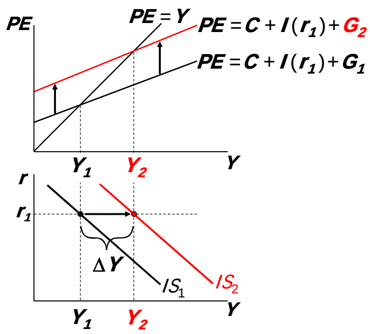
Shifting the *IS* curve: ΔG

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

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



NOW YOU TRY:

Shifting the IS curve: ΔT

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

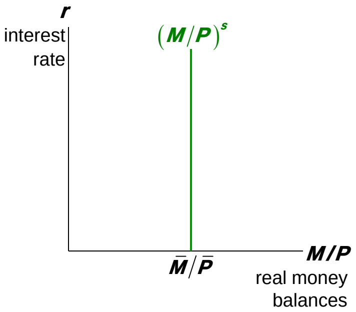
The Theory of Liquidity Preference

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

Money supply

The supply of real money balances is fixed:

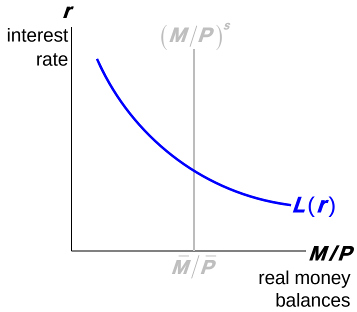
$$(M/P)^s = \bar{M}/\bar{P}$$



Money demand

Demand for real money balances:

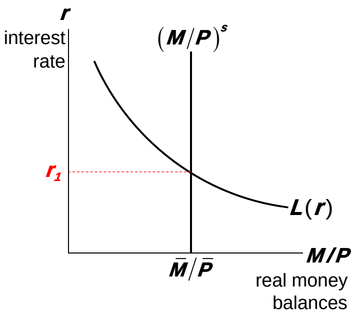
$$(M/P)^d = L(r)$$



Equilibrium

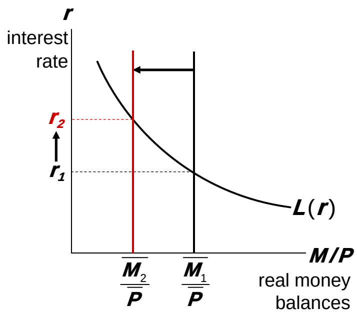
The interest rate adjusts to equate the supply and demand for money:

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



How the Fed raises the interest rate

To increase r, Fed reduces M



CASE STUDY:
Monetary Tightening & Interest Rates

- Late 1970s: π > 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: π = 3.7%

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

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:

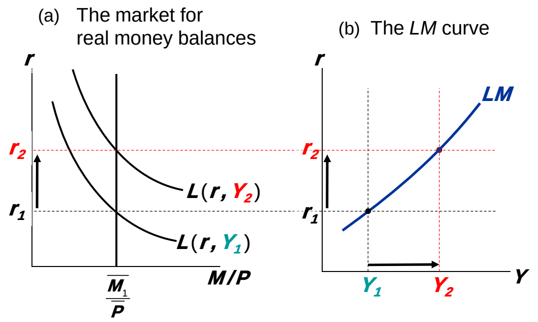
$$(M/P)^d = L(r,Y)$$

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:

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

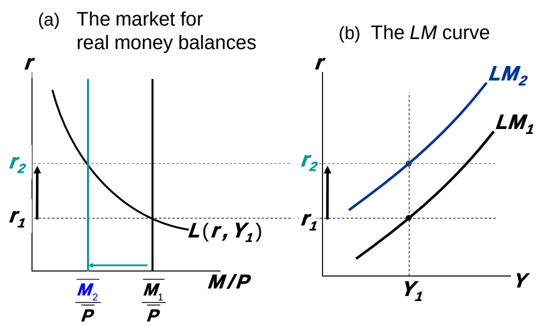
Deriving the *LM* curve



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 ΔM shifts the *LM* curve



NOW YOU TRY:

Shifting the LM curve

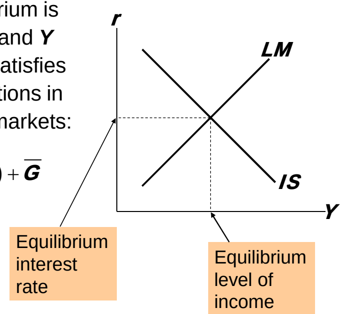
- Suppose a wave of credit card fraud causes consumers to use cash more frequently in transactions.
- Use the liquidity preference model to show how these events shift the LM curve.

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:

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

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



The Big Picture