



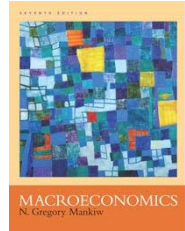
Business Conditions Analysis

ECON 736

Professor Yamin Ahmad

Lecture 3:

- Introduction to Aggregate Demand and Aggregate Supply



Key Concepts in this Lecture

- Aggregate Demand
- Long Run Supply
- Short Run Supply
- Equilibrium
- Effects of Shocks

Note: These lecture notes are incomplete without having attended lectures

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Time horizons in macroeconomics

- **Long run**
Prices are flexible, respond to changes in supply or demand.
- **Short run**
Many prices are “sticky” at some predetermined level.

The economy behaves much differently when prices are sticky.

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Classical Macro Theory

- Output is determined by the supply side:
 - supplies of capital, labor
 - technology.
- Changes in demand for goods & services (**C, I, G**) only affect prices, not quantities.
- Assumes complete price flexibility.
- Applies to the long run.

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When prices are sticky...

...output and employment also depend on demand, which is affected by

- fiscal policy (*G* and *T*)
- monetary policy (*M*)
- other factors, like exogenous changes in *C* or *I*.



The Model of Aggregate Demand and Supply

- the paradigm most mainstream economists and policymakers use to think about economic fluctuations and policies to stabilize the economy
- shows how the price level and aggregate output are determined
- shows how the economy's behavior is different in the short run and long run



Aggregate Demand

- The aggregate demand curve shows the relationship between the price level and the quantity of output demanded.
- For this chapter's intro to the AD/AS model, we use a simple theory of aggregate demand based on the quantity theory of money.
- We will develop the theory of aggregate demand in more detail later



The Quantity Equation as Aggregate Demand

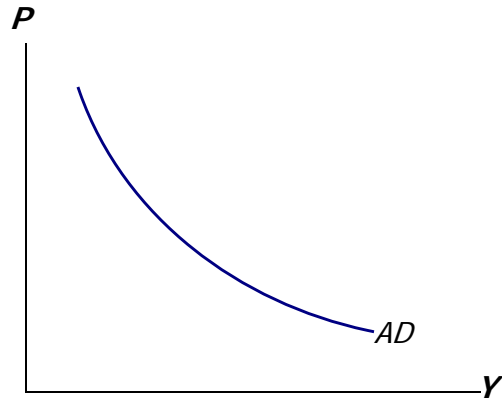
- Consider the following equation of exchange: **The Quantity Equation**

$$M V = P Y$$
- For given values of *M* and *V*, this equation implies an inverse relationship between *P* and *Y*
- In general, the AD curve will be derived from the IS/LM Model



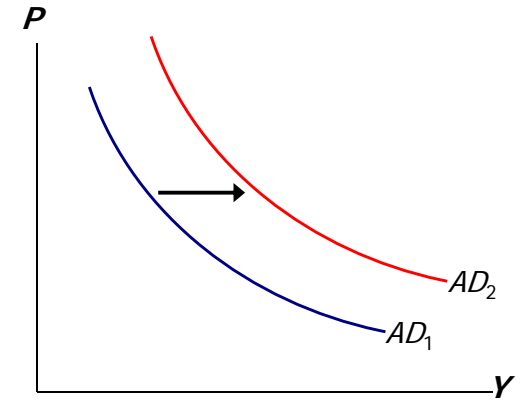
The downward-sloping AD curve

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

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

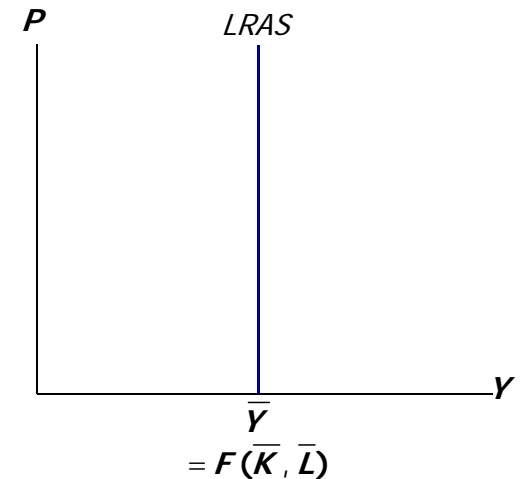
\bar{Y} is the **full-employment** or **natural** level of output, the level of output at which the economy's resources are fully employed.

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



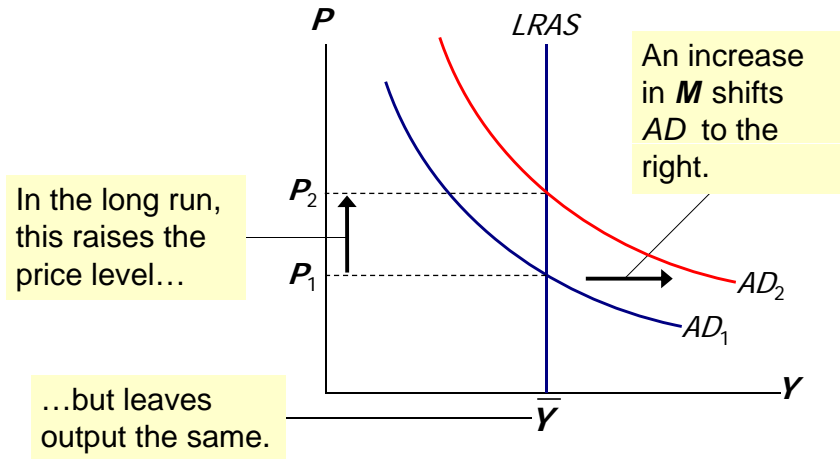
The long-run aggregate supply curve

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





Long-run effects of an increase in M



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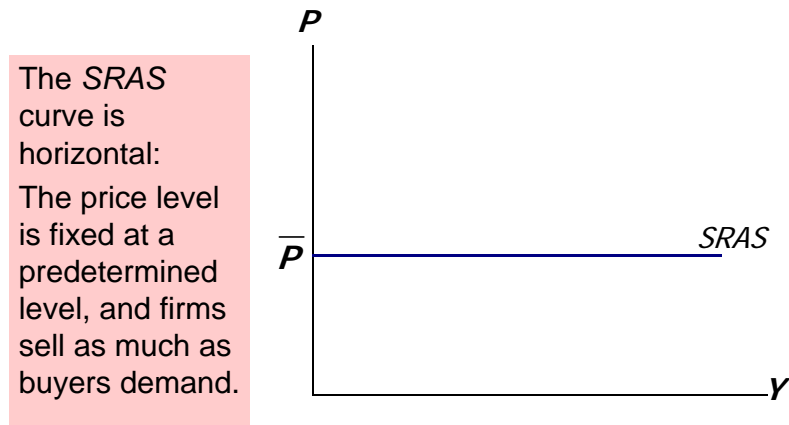
Aggregate Supply in the short run

- Many prices are sticky in the short run.
- For now we will 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:

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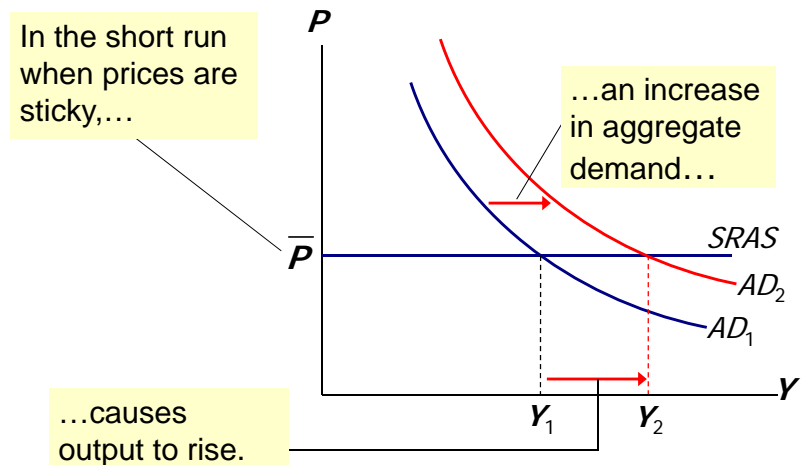
The short-run aggregate supply curve



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Short-run effects of an increase in M



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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.

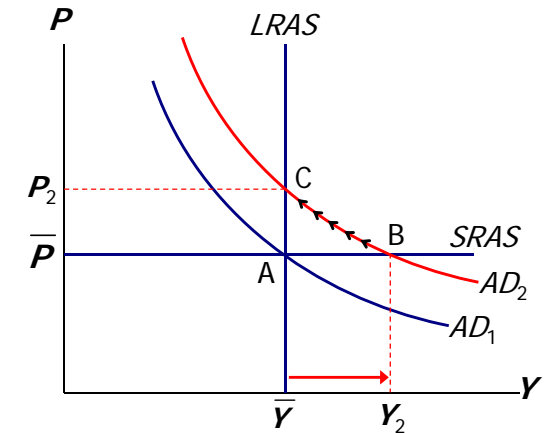


The SR & LR effects of $\Delta M > 0$

A = initial equilibrium

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

C = long-run equilibrium



Shock!!!

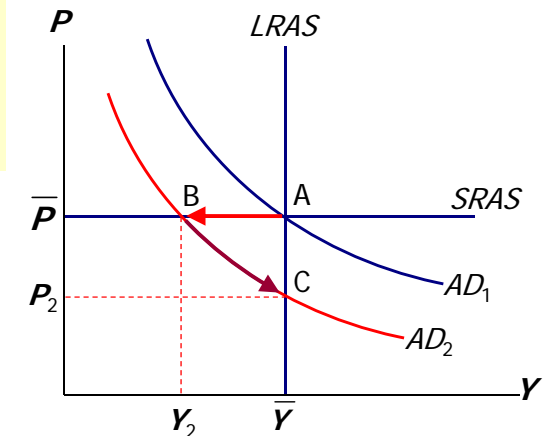
- **Shocks:** exogenous changes in agg. supply or demand
- Shocks temporarily push the economy away from full employment.
- Example: *exogenous decrease in velocity*
If the money supply is held constant, a decrease in V means people will be using their money in fewer transactions, causing a decrease 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.

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CASE STUDY: The 1970s oil shocks

- Early 1970s: OPEC coordinates a reduction in the supply of oil.
- Oil prices rose
 - 11% in 1973
 - 68% in 1974
 - 16% in 1975
- Such sharp oil price increases are supply shocks because they significantly impact production costs and prices.

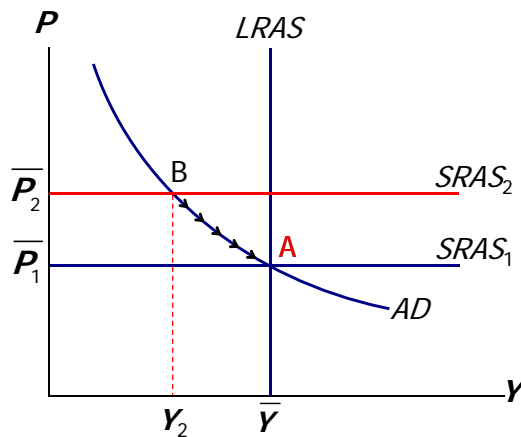
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CASE STUDY: The 1970s oil shocks

The oil price shock shifts *SRAS* up, causing output and employment to fall.

In absence of further price shocks, prices will fall over time and economy moves back toward full employment.



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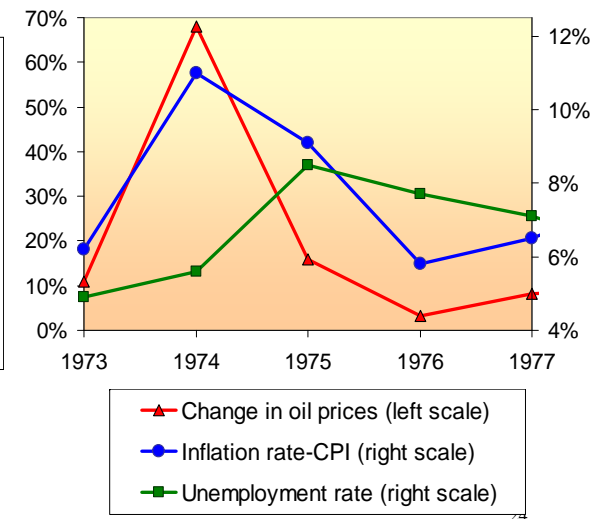


CASE STUDY: The 1970s oil shocks

Predicted effects of the oil shock:

- inflation ↑
- output ↓
- unemployment ↑

...and then a gradual recovery.

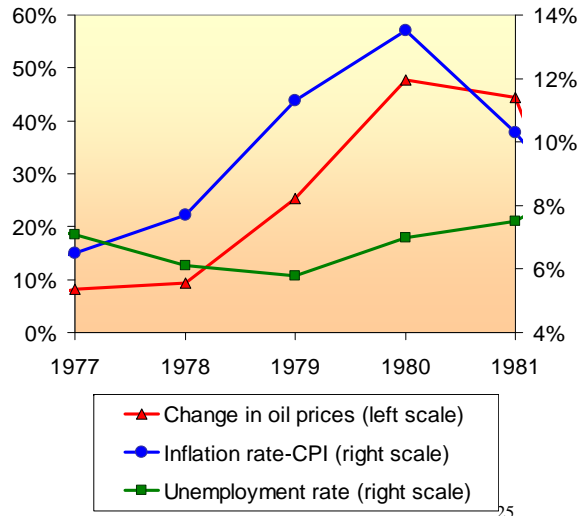


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CASE STUDY: The 1970s oil shocks

Late 1970s:
As economy was recovering, oil prices shot up again, causing another huge supply shock!!!

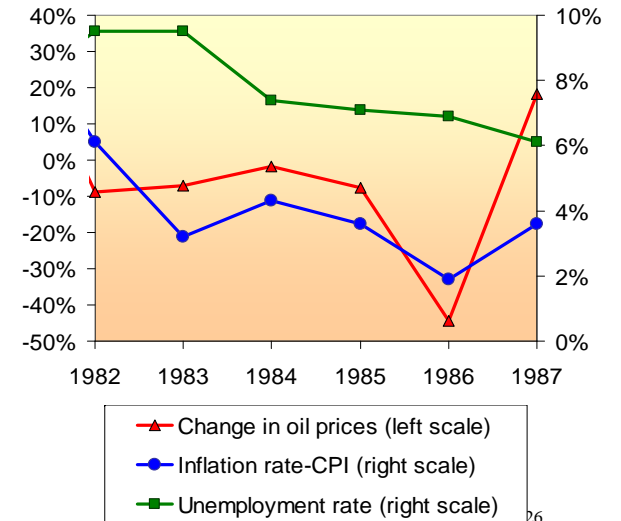


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CASE STUDY: The 1980s oil shocks

1980s:
A favorable supply shock-- a significant fall in oil prices. As the model predicts, inflation and unemployment fell:



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Stabilization policy

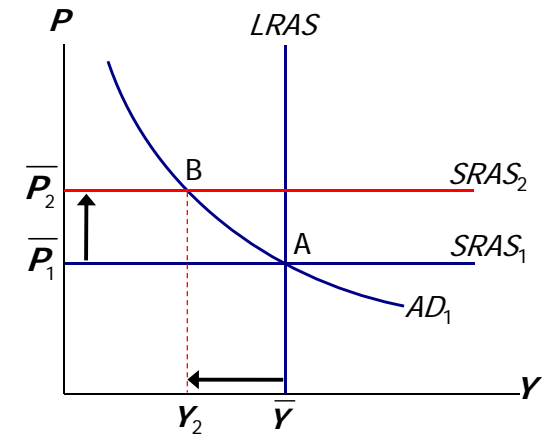
- **Def:** policy actions aimed at reducing the severity of short-run economic fluctuations.
- **Example:** Using monetary policy to combat the effects of adverse supply shocks:

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Stabilizing Output with Monetary Policy

The adverse supply shock moves the economy to point B.



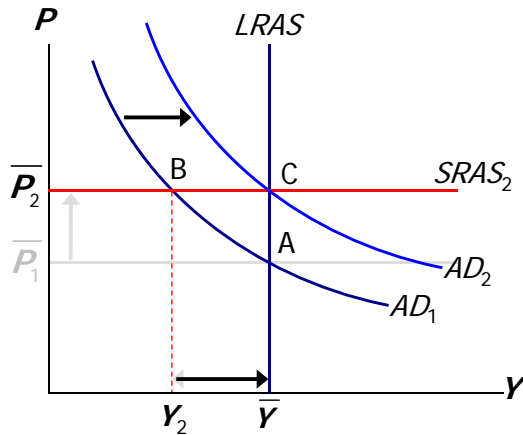
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Stabilizing Output with Monetary Policy

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

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



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Alternative Approaches

	Market Clearing	Source of shocks	Role for Policy?
Keynesian	No	AD(IS)	Yes
New Classical	Yes	AD(LM)	No
Real Business Cycles (discussed in Econ 402)	Yes	AS	No

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Summary of Part I

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

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Summary of Part I

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.

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Summary of Part I

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

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Concepts in Part II: Components of AD

- Aggregate Expenditures/Keynesian Model:
 - The Consumption Function
 - The Keynesian Cross
 - Autonomous Expenditures
 - Multipliers
- Equilibrium in the Goods Market/Loanable Funds Market
- The IS Relation

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The Composition of GDP

$$Y = C + I + G + NX$$

Recall that:

- **Consumption (C)** refers to the goods and services purchased by consumers.
- **Investment (I)**, sometimes called **fixed investment**, is the purchase of capital goods. It is the sum of **nonresidential investment** and **residential investment**.

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The Composition of GDP

- **Government Spending (G)** refers to the purchases of goods and services by the federal, state, and local governments. It does not include **government transfers**, nor interest payments on the government debt.
- **Imports (IM)** are the purchases of foreign goods and services by consumers, business firms, and the U.S. government.
- **Exports (X)** are the purchases of U.S. goods and services by foreigners.

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The Composition of GDP

- **Net exports ($X - IM$)** is the difference between exports and imports, also called the **trade balance**.

$$Exports = imports \Leftrightarrow \text{trade balance}$$

$$Exports > imports \Leftrightarrow \text{trade surplus}$$

$$Exports < imports \Leftrightarrow \text{trade deficit}$$

- **Inventory investment** is the difference between production and sales.

The Demand for Goods

- The total demand for goods is written as:

$$AE \equiv C + I + G + X - IM$$

- The symbol “ \equiv ” means that this equation is an **identity**, or definition.
- Under the assumption that the economy is closed, $X = IM = 0$, then:

$$AE \equiv C + I + G$$

The Demand for Goods

To determine AE , some simplifications must be made:

- Assume that all firms produce the same good, which can then be used by consumers for consumption, by firms for investment, or by the government.
- Assume that firms are willing to supply and demand in that market
- Assume that the economy is *closed*, that it does not trade with the rest of the world, then both exports and imports are zero.

Consumption (C)

- **Disposable income, (Y_D)**, is the income that remains once consumers have paid taxes and received transfers from the government.

$$C = C(Y_D)_{(+)}$$

- The function $C(Y_D)$ is called the **consumption function**. It is a **behavioral equation**, that is, it captures the behavior of consumers.
- Disposable income is defined as: $Y_D \equiv Y - T$

Consumption (C)

- A more specific form of the consumption function is this **linear relation**:

$$C = c_0 + c_1 Y_D$$

This function has two **parameters**, c_0 and c_1 :

- c_1 is called the **(marginal) propensity to consume**, or the effect of an additional dollar of disposable income on consumption.
- c_0 is the intercept of the consumption function, and is known as **autonomous consumption**, i.e. the amount of consumption expenditures households wish to purchase, independent of income.

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Consumption (C)

Figure 1

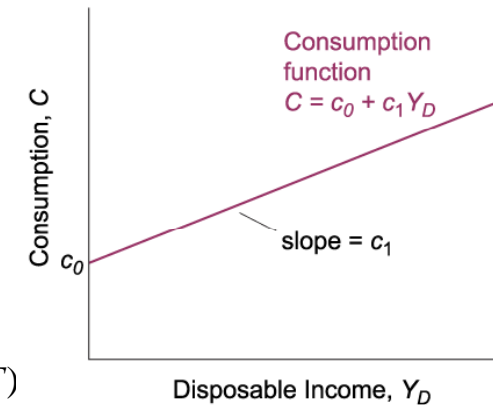
Consumption and Disposable Income

Consumption increases with disposable income, but less than one for one.

$$C = C(Y_D)$$

$$Y_D \equiv Y - T$$

$$C = c_0 + c_1(Y - T)$$



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Investment (I)

- Variables that depend on other variables within the model are called **endogenous**. Variables that are not explain within the model are called **exogenous**. Investment here is taken as given, or treated as an exogenous variable:

$$I = \bar{I}$$

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Government Spending (G)

Government spending, G , together with taxes, T , describes **fiscal policy** — the choice of taxes and spending by the government.

We shall assume that G and T are also exogenous for two reasons:

- Governments do not behave with the same regularity as consumers or firms.
- Macroeconomists must think about the implications of alternative spending and tax decisions of the government.

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The Determination of Equilibrium Output

Equilibrium in the goods market requires that production, Y , be equal to the demand for goods, AE :

$$Y = AE$$

Then:

$$Y = c_0 + c_1(Y - T) + \bar{I} + \bar{G}$$

The **equilibrium condition** is that, production, Y , be equal to demand. Demand, AE , in turn depends on income, Y , which itself is equal to production.



Using Algebra

The equilibrium equation can be manipulated to derive some important terms:

- **Autonomous spending** and the **multiplier**:
 - The term $[c_0 + \bar{I} + \bar{G} - c_1T]$ is that part of the demand for goods that does not depend on output, it is called **autonomous spending**. If the government ran a balanced budget, then $T=G$.
 - Because the propensity to consume (c_1) is between zero and one, $\frac{1}{1-c_1}$ is a number greater than one. For this reason, this number is called the **multiplier**.

$$Y = \frac{1}{1 - c_1} [c_0 + \bar{I} + \bar{G} - c_1T]$$



The Keynesian Cross

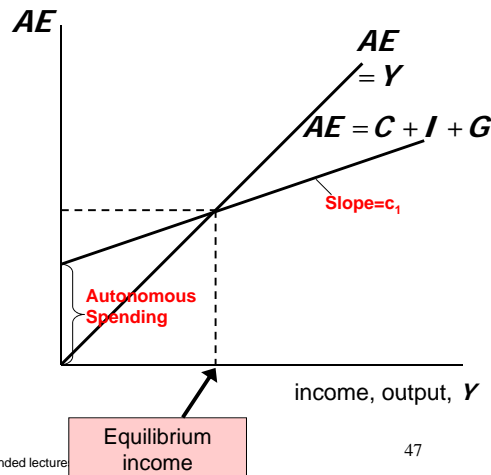
$$AE = (c_0 + \bar{I} + \bar{G} - c_1\bar{T}) + c_1Y$$

Figure 2

Equilibrium in the Goods Market

Equilibrium output is determined by the condition that production be equal to demand.

- First, plot demand as a function of income.
- Second, plot production as a function of income.
- In Equilibrium, production equals demand.



Practice Example 1:

Suppose that:

- $C=475 + 0.75(Y-T)$
- $T = 100$
- $I = 150$
- $G = 250$

1. Calculate the equation for the AE (Aggregate Expenditure) curve
2. What is real GDP in equilibrium?



The Multiplier

Definition: The **multiplier** is the amount by which a change in autonomous expenditure is magnified or multiplied to determine the change in equilibrium expenditure and real GDP.



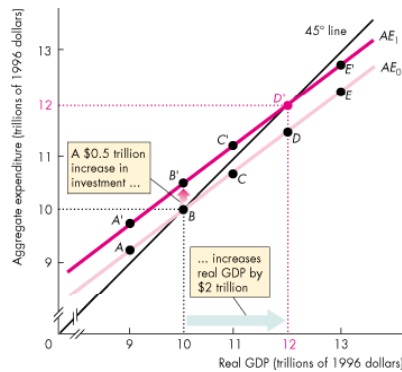
The Basic Idea of the Multiplier

- An increase in investment (or any other component of autonomous expenditure) increases aggregate expenditure and real GDP and the increase in real GDP leads to an increase in induced expenditure.
- The increase in induced expenditure leads to a further increase in aggregate expenditure and real GDP.
- So real GDP increases by more than the initial increase in autonomous expenditure.



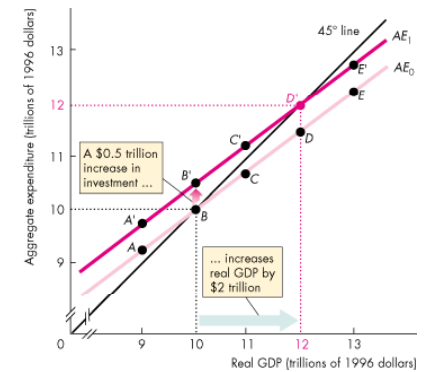
The Multiplier Effect

- Figure 3 illustrates the multiplier.
- The Multiplier Effect:
 - The amplified change in real GDP that follows an increase in autonomous expenditure is the **multiplier effect**.



The Multiplier Effect

- When autonomous expenditure increases, inventories make an unplanned decrease, so firms increase production and real GDP increases to a new equilibrium.





The Multiplier

- Why Is the Multiplier Greater than 1?
 - The multiplier is greater than 1 because an increase in autonomous expenditure induces further increases in expenditure.
- The Size of the Multiplier
 - The size of the multiplier is the change in equilibrium expenditure divided by the change in autonomous expenditure.



The Multiplier

- Ignoring induced imports and income taxes, the marginal propensity to consume determines the magnitude of the multiplier.
- The multiplier equals $1/(1 - MPC)$ or, alternatively, $1/MPS$.



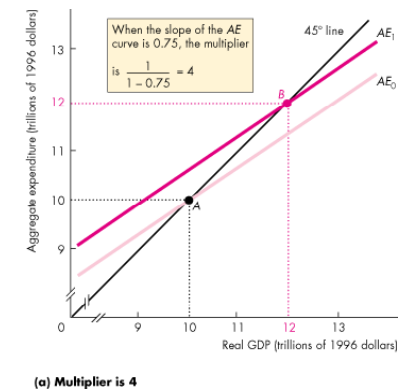
Imports and Income Taxes

- Income taxes and induced imports both reduce the size of the multiplier.
- Including income taxes and induced imports, the multiplier equals $1/(1 - \text{slope of the } AE \text{ curve})$.



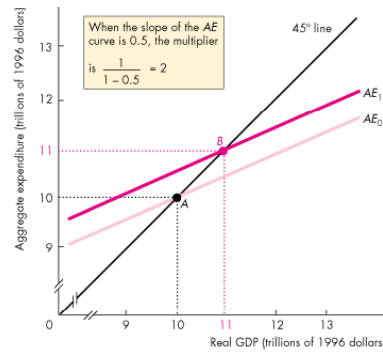
The Multiplier

- Figure 4 shows the relation between the multiplier and the slope of the *AE* curve.
- In part (a) with no imports (or imports are autonomous) and no income taxes, the slope of the *AE* curve is 0.75 and the multiplier is 4.



The Multiplier

- In part (b), when you include *either* income taxes or induced imports, the slope of the AE curve is 0.5 and the multiplier is 2.



(b) Multiplier is 2

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Summary of Impact on Multiplier Magnitude

- The multiplier is larger:
 - The greater the marginal propensity to consume (c_1)
 - The smaller the marginal tax rate (t_1)
 - The smaller the marginal propensity to import (m_1)
- Note: Autonomous/Lump sum taxes, i.e. $T=t_0$ and autonomous imports m_0 do not affect the value of the multiplier

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Using Words

Summary (cont.):

- An increase in demand leads to an increase in production and a corresponding increase in income. The end result is an increase in output that is larger than the initial shift in demand, by a factor equal to the multiplier.

To estimate the value of the multiplier, and more generally, to estimate behavioral equations and their parameters, economists use **econometrics**—a set of statistical methods used in economics.

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Practice Example 2:

Consider once again the scenario in example 1.

- $C = 475 + 0.75(Y - T)$
- $T = 100$
- $I = 150$
- $G = 250$

Suppose that firms increase investment by 100. What happens to real GDP in equilibrium? How much does it change by?

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How Long Does It Take for Output to Adjust?

Describing formally the adjustment of output over time is what economists call the **dynamics** of adjustment.

- Suppose that firms make decisions about their production levels at the beginning of each quarter.
- Now suppose consumers decide to spend more, that they increase c_0 .
- Having observed an increase in demand, firms are likely to set a higher level of production in the following quarter.
- In response to an increase in consumer spending, output does not jump to the new equilibrium, but rather increases over time.



An Alternative Characterization of the Goods Market Equilibrium

- Investment, Savings and the Market for Loanable Funds



Market For Loanable Funds

Saving is the sum of private plus public saving.

- **Private saving** (S), is saving by consumers.
- **Public saving** equals taxes minus government spending.
 - If $T > G$, the government is running a **budget surplus** — public saving is positive.
 - If $T < G$, the government is running a **budget deficit** — public saving is negative.

$$Y = C + I + G \qquad Y - T - C = I + G - T$$

$$S = I + G - T \qquad I = S + (T - G)$$



Investment Equals Saving: An Alternative Way of Thinking about Goods-Market Equilibrium

$$I = S + (T - G)$$

The equation above states that equilibrium in the goods market requires that investment equals saving—the sum of private plus public saving.

This equilibrium condition for the goods market is called the **IS relation**. What firms want to invest must be equal to what people and the government want to save.

Investment Equals Saving: An Alternative Way of Thinking about Goods-Market Equilibrium

- Consumption and saving decisions are one and the same.

$$S = Y - T - C$$

$$S = Y - T - c_0 - c_1(T - T)$$

$$S = -c_0 + (1 - c_1)(Y - T)$$

- The term $(1 - c_1)$ is called the **marginal propensity to save**.

In equilibrium:

$$I = -c_0 + (1 - c_1)(Y - T) + (T - G)$$

Rearranging terms, we get the same result as before:

$$Y = \frac{1}{1 - c_1} [c_0 + \bar{I} + \bar{G} - c_1 T]$$

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Summary

- The Consumption Function depicts the relationship between (household) consumption expenditures and its direct relationship to disposable income.
- The marginal propensity to consume represents the fraction of every dollar increase in disposable income that is consumed. The level of autonomous consumption represents the amount of consumption expenditures households would purchase, independent of disposable income.

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Summary

- The Aggregate Expenditures/Keynesian model focuses on the demand side of the economy. Prices are held fixed (short run) and supply adjusts to meet demand. Hence, changes in demand lead to fluctuations in the business cycle.
- Goods Market Equilibrium is given by setting supply equal to demand. In the workhorse Keynesian (Aggregate Expenditures) model, it is where aggregate planned expenditure (AE curve) equals actual production (45° line)
- A change in autonomous expenditures (the intercept of the AE line) leads to a more than one for one change in equilibrium GDP. This concept is the Multiplier.

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Summary

- The size of the multiplier in a closed economy depends on the marginal propensity to consume (mpc) and the marginal tax rate (t_1). In an open economy, it also depends on the marginal propensity to import, m_1 . The multiplier is higher:
 - The higher the mpc
 - The lower the marginal tax rate, t_1
 - (And in an open economy, the lower the marginal propensity to import, m_1 .)
- The IS equation is an alternative way to think about goods market equilibrium and represents equilibrium in the loanable funds market

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