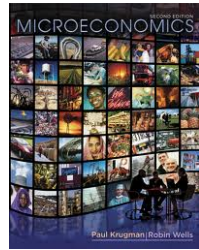


Economics 202 Principles Of Macroeconomics

Professor Yamin Ahmad

Lecture 9

- Aggregate Supply
- Aggregate Demand
- Macroeconomic Equilibrium



Big Concepts

- Determination of “Aggregate Supply”
 - Short Run vs. Long Run
- Aggregate Demand
- Equilibrium in the Economy

Note: These lecture notes are incomplete without having attended lectures

Production and Prices

- What forces bring persistent and rapid expansion of real GDP?
- What causes inflation?
- Why do we have business cycles?
- How do policy actions by the government and the Federal Reserve affect output and prices?

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Aggregate Supply Fundamentals

- The aggregate quantity of goods and services supplied depends on three factors:
 - The quantity of labor (L)
 - The quantity of capital (K)
 - The state of technology (Z)
- The **aggregate production function** shows how quantity of real GDP supplied, Y , depends on labor, capital, and technology.

Note: These lecture notes are incomplete without having attended lectures



Aggregate Supply

- The aggregate production function is written as the equation:

$$Y = F(L, K, Z).$$

- In words: the quantity of real GDP supplied depends on (is a function of) the quantity of labor employed, the quantity of capital, and the state of technology.
- The larger is L , K , or Z , the greater is Y .

Note: These lecture notes are incomplete without having attended lectures



Aggregate Supply

- At any given time, the quantity of capital and the state of technology are fixed but the quantity of labor can vary.
- The higher the real wage rate, the smaller is the quantity of labor demanded and the greater is the quantity of labor supplied.
- The wage rate that makes the quantity of labor demanded equal to the quantity supplied is the equilibrium wage rate and at that wage the level of employment is the **natural rate of unemployment**.

Note: These lecture notes are incomplete without having attended lectures



Aggregate Supply

We distinguish two time frames associated with different states of the labor market:

- Long-run aggregate supply
- Short-run aggregate supply

Note: These lecture notes are incomplete without having attended lectures



Long-Run Aggregate Supply

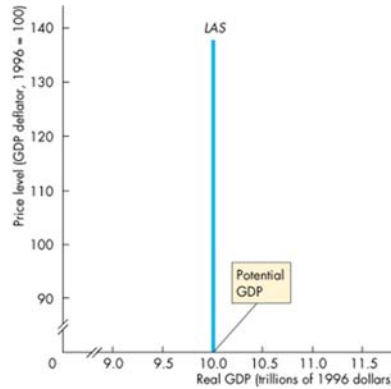
- The **macroeconomic long run** is a time frame that is sufficiently long for all adjustments to be made so that real GDP equals potential GDP and there is full employment.
- The **long-run aggregate supply curve** (*LRAS* or *LAS*) is the relationship between the quantity of real GDP supplied and the price level when real GDP equals potential GDP.

Note: These lecture notes are incomplete without having attended lectures



Aggregate Supply

- Figure 1 shows an *LAS* curve with potential GDP of \$10 trillion.
- The *LAS* curve is vertical because potential GDP is independent of the price level.
- Along the *LAS* curve all prices and wage rates vary by the same percentage so that relative prices and the real wage rate remain constant.



Note: These lecture notes are incomplete without having attended lectures



Short-Run Aggregate Supply

- The **macroeconomic short run** is a period during which real GDP has fallen below or risen above potential GDP.
- At the same time, the unemployment rate has risen above or fallen below the natural unemployment rate.
- The **short-run aggregate supply curve (SAS)** is the relationship between the quantity of real GDP supplied and the price level in the short run when the nominal wage rate, the prices of other resources, and potential GDP remain constant.

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Theories of Short-Run Aggregate Supply

The aggregate supply curve is upward sloping. Theories which attempt to explain these include:

- Sticky-Wage Theory
- Imperfect Information/Worker Misperception Theory
- Sticky-Price Theory
- [Summary of Different Models](#)

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The Sticky-Wage model

- Assumes that firms and workers negotiate contracts and fix the nominal wage before they know what the price level will turn out to be.
- The nominal wage they set is the product of a target real wage and the expected price level:

$$W = \omega \times P^e$$

Target real wage

$$\Rightarrow \frac{W}{P} = \omega \times \frac{P^e}{P}$$

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The Sticky-Wage model

$$\frac{W}{P} = \omega \times \frac{P^e}{P}$$

If it turns out that

then

$$P = P^e$$

Unemployment and output are at their natural rates.

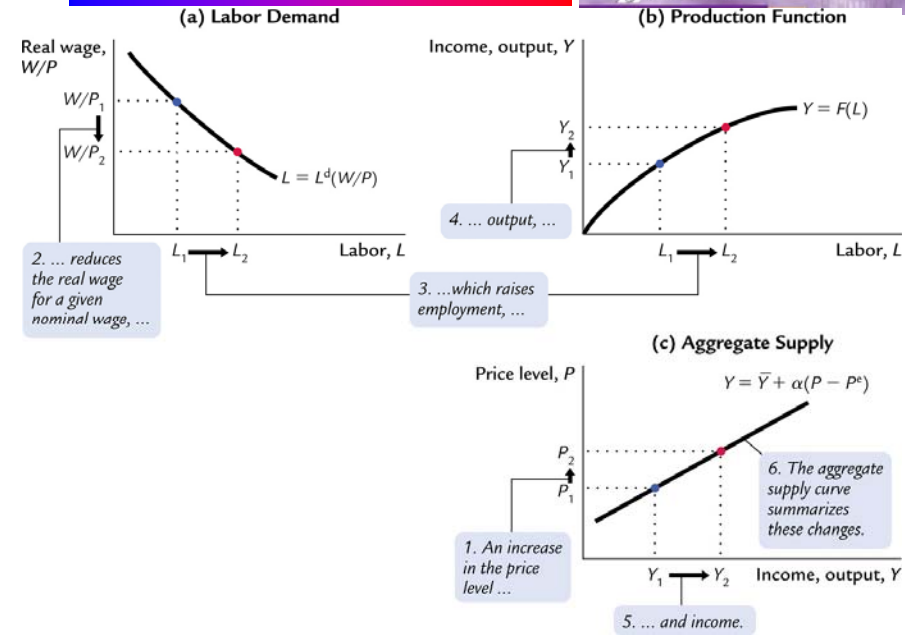
$$P > P^e$$

Real wage is less than its target, so firms hire more workers and output rises above its natural rate.

$$P < P^e$$

Real wage exceeds its target, so firms hire fewer workers and output falls below its natural rate.

Note: These lecture notes are incomplete without having attended lectures



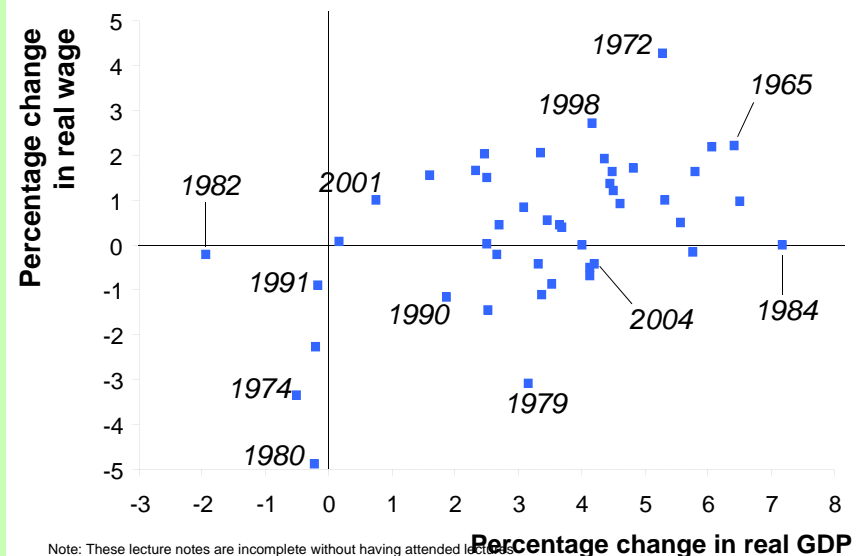
The Sticky-Wage model

- Implies that the real wage should be **counter-cyclical**, should move in the opposite direction as output during business cycles:
 - In booms, when P typically rises, real wage should fall.
 - In recessions, when P typically falls, real wage should rise.
- This prediction does not come true in the real world:

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The cyclical behavior of the real wage

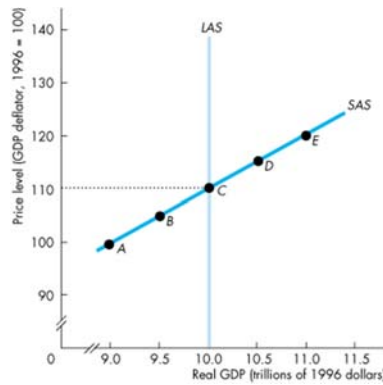


Note: These lecture notes are incomplete without having attended lectures



Aggregate Supply

- Figure 2 shows a short-run aggregate supply curve.
- Along the SAS curve, rise in the price level with no change in the nominal wage rate and other input prices increases the quantity of real GDP supplied—the SAS curve is upward sloping.

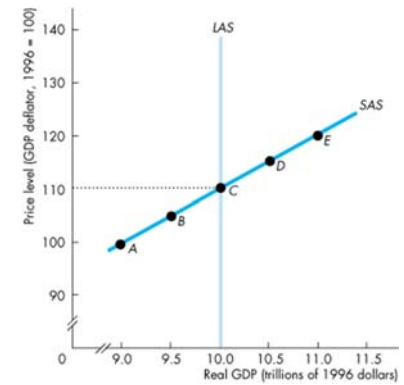


Note: These lecture notes are incomplete without having attended lectures



Aggregate Supply

- The SAS curve is upward sloping because a rise in the price level with no change in costs induces firms to bear a higher marginal cost and increase production;
- a fall in the price level with no change in costs induces firms to decrease production to lower marginal cost.

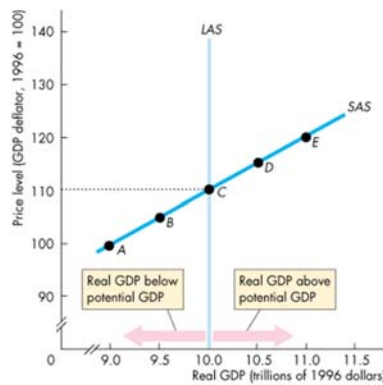


Note: These lecture notes are incomplete without having attended lectures



Aggregate Supply

- Along the SAS curve, real GDP might be above potential GDP...
... or below potential GDP.

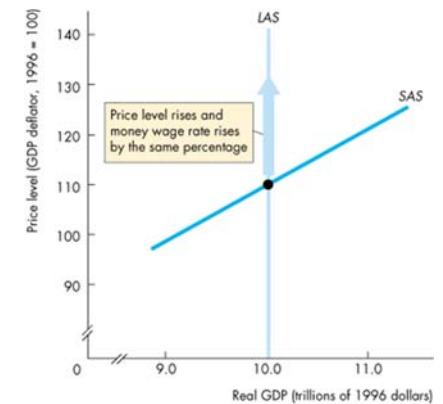


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Aggregate Supply

- Movement along the LAS and SAS Curves
 - Figure 3 summarizes what you've just learned about the LAS and SAS curves.
 - A change in the price level with an equal percentage change in the nominal wage rate causes a movement along the LAS curve.

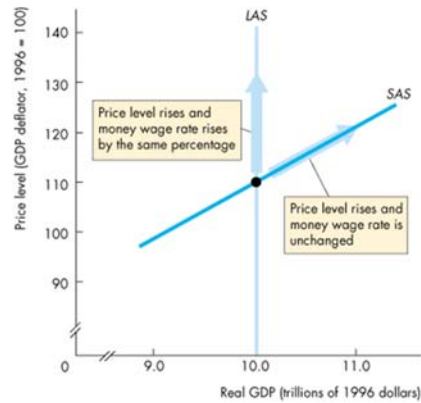


Note: These lecture notes are incomplete without having attended lectures



Aggregate Supply

- A change in the price level with no change in the nominal wage rate causes a movement along the SAS curve.



Note: These lecture notes are incomplete without having attended lectures



Changes in Aggregate Supply

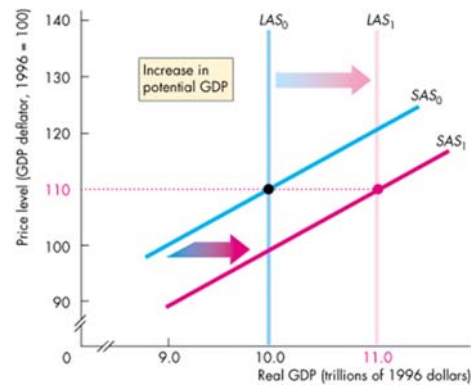
- When potential GDP increases, both the *LAS* and *SAS* curves shift rightward.
- Potential GDP changes, for three reasons:
 - Change in the full-employment quantity of labor
 - Change in the quantity of capital (physical or human)
 - Advance in technology

Note: These lecture notes are incomplete without having attended lectures



Aggregate Supply

- Figure 4 shows how these factors shift the *LAS* curve and have the same effect on the *SAS* curve.

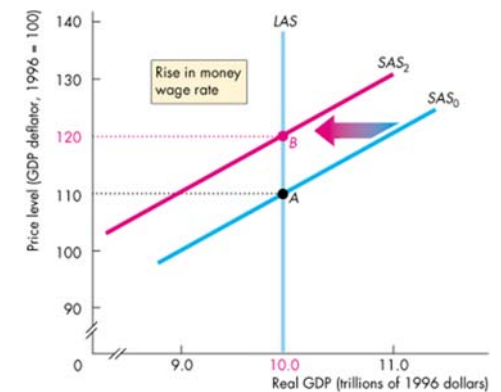


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Aggregate Supply

- Figure 5 shows the effect of a change in the nominal wage rate on aggregate supply.
- A rise in the nominal wage rate decreases short-run aggregate supply and shifts the *SAS* curve leftward.
- But it has no effect on long-run aggregate supply.



Note: These lecture notes are incomplete without having attended lectures

Summarizing Aggregate Supply

- **LRAS:** $\bar{Y} = F(K^*, L^*, Z)$
- **SRAS:** $Y = \bar{Y} + \alpha(P - P^e)$
- Factors that shift supply:
 - LRAS: K^* , L^* and Z
 - SRAS: K^* , L^* , Z , W and P^e
- Factors that cause movements along supply:
 - LRAS: W , P and P^e
 - SRAS: P

Note: These lecture notes are incomplete without having attended lectures

Aggregate Demand

- The quantity of real GDP demanded, Y^d , is the total amount of final goods and services produced in the United States that people, businesses, governments, and foreigners plan to buy.
- This quantity is the sum of consumption expenditures, C , investment, I , government purchases, G , and net exports, $X - M$. That is:

$$Y^d = C + I + G + X - M$$

Note: These lecture notes are incomplete without having attended lectures

Aggregate Demand

Buying plans depend on many factors and some of the main ones are:

- The price level
- Expectations
- Fiscal and monetary policy
- The world economy

Note: These lecture notes are incomplete without having attended lectures

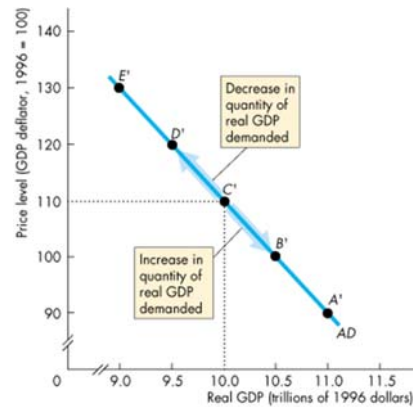
Aggregate Demand Curve

- **Aggregate demand** is the relationship between the quantity of real GDP demanded and the price level.
- The aggregate demand (AD) curve plots the quantity of real GDP demanded against the price level.

Note: These lecture notes are incomplete without having attended lectures

Aggregate Demand

- Figure 6 shows an *AD* curve.
- The *AD* curve slopes downward for two reasons:
 - A wealth effect
 - Substitution effects



Note: These lecture notes are incomplete without having attended lectures

Aggregate Demand: Wealth Effect

- **Wealth effect** A rise in the price level, other things remaining the same, decreases the quantity of real wealth (money, bonds, stocks, etc.).
- To restore their real wealth, people increase saving and decrease spending, so the quantity of real GDP demanded decreases.
- Similarly, a fall in the price level, other things remaining the same, increases the quantity of real wealth.
- With more real wealth, people decrease saving and increase spending, so the quantity of real GDP demanded increases.

Note: These lecture notes are incomplete without having attended lectures

Aggregate Demand: Substitution Effect

- **Intertemporal substitution effect** A rise in the price level, other things remaining the same, decreases the real value of money and raises the interest rate.
- Faced with a higher interest rate, people try to borrow and spend less so the quantity of real GDP demanded decreases.
- Similarly, a fall in the price level increases the real value of money and lowers the interest rate.
- Faced with a lower interest rate, people borrow and spend more so the quantity of real GDP demanded increases.

Note: These lecture notes are incomplete without having attended lectures

Aggregate Demand

- **International substitution effect** A rise in the price level, other things remaining the same, increases the price of domestic goods relative to foreign goods, so imports increase and exports decrease, which decreases the quantity of real GDP demanded.
- Similarly, a fall in the price level, other things remaining the same, decreases the price of domestic goods relative to foreign goods, so imports decrease and exports increase, which increases the quantity of real GDP demanded.

Note: These lecture notes are incomplete without having attended lectures

Changes in Aggregate Demand

- A change in any influence on buying plans other than the price level changes aggregate demand.
- The main influences on aggregate demand are:
 - Expectations
 - Fiscal and monetary policy
 - The world economy

Note: These lecture notes are incomplete without having attended lectures

Aggregate Demand

- Expectations about future income, future inflation, and future profits change aggregate demand.
- Increases in expected future income increase people's consumption today, and increases aggregate demand.
- A rise in the expected inflation rate makes buying goods cheaper today and increases aggregate demand.
- An increase in expected future profits boosts firms' investment, which increases aggregate demand.

Note: These lecture notes are incomplete without having attended lectures

Aggregate Demand

- **Fiscal policy** is the government's attempt to influence economic activity by changing its taxes, spending, deficit, and debt policies.
- A tax cut or an increase in transfer payments increases households' **disposable income**—aggregate income minus taxes plus transfer payments.
- An increase in disposable income increases consumption expenditure and increases aggregate demand.

Note: These lecture notes are incomplete without having attended lectures

Aggregate Demand

- Because government purchases of goods and services are one component of aggregate demand, an increase in government purchases increases aggregate demand.
- **Monetary policy** is changes in the interest rate and quantity of money.
- An increase in the quantity of money increases buying power and increases aggregate demand.
- A cut in the interest rate increases expenditure and increases aggregate demand.

Note: These lecture notes are incomplete without having attended lectures



Aggregate Demand

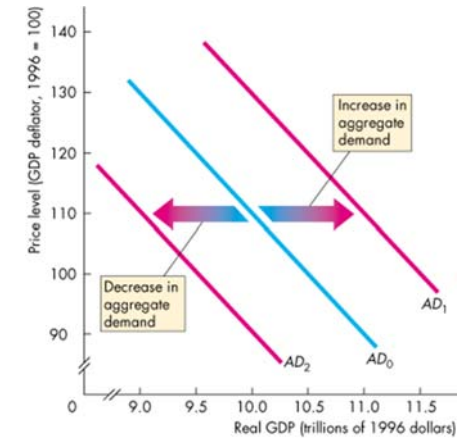
- The world economy influences aggregate demand in two ways:
 - A fall in the foreign exchange rate lowers the price of domestic goods and services relative to foreign goods and services, increases exports, decreases imports, and increases aggregate demand.
 - An increase in foreign income increases the demand for U.S. exports and increases aggregate demand.

Note: These lecture notes are incomplete without having attended lectures



Aggregate Demand

- Figure 7 illustrates changes in aggregate demand.
- When aggregate demand increases, the AD curve shifts rightward...
- ... and when aggregate demand decreases, the AD curve shifts leftward.



Note: These lecture notes are incomplete without having attended lectures



Short-Run Macroeconomic Equilibrium

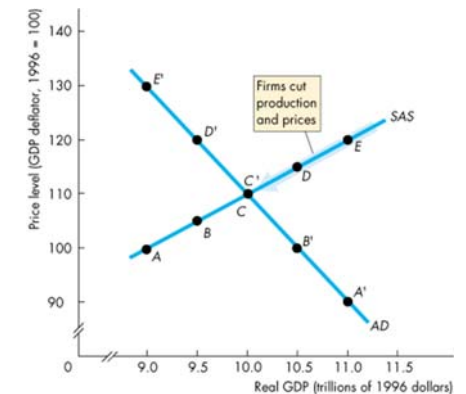
Short-run macroeconomic equilibrium occurs when the quantity of real GDP demanded equals the quantity of real GDP supplied at the point of intersection of the AD curve and the SAS curve.

Note: These lecture notes are incomplete without having attended lectures



Macroeconomic Equilibrium

- Figure 8 illustrates a short-run equilibrium.
- If real GDP is below equilibrium GDP, firms increase production and raise prices...
- ... and if real GDP is above equilibrium GDP, firms decrease production and lower prices.

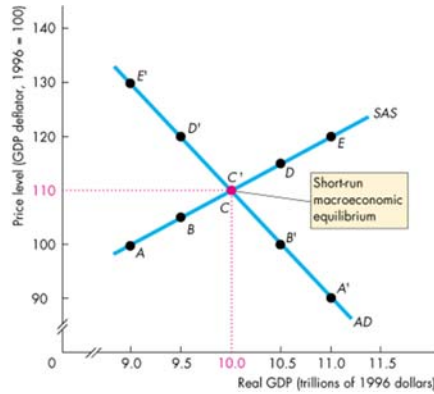


Note: These lecture notes are incomplete without having attended lectures



Macroeconomic Equilibrium

- These changes bring a movement along the SAS curve toward equilibrium.
- In short-run equilibrium, real GDP can be greater than or less than potential GDP.



Note: These lecture notes are incomplete without having attended lectures



Long-Run Macroeconomic Equilibrium

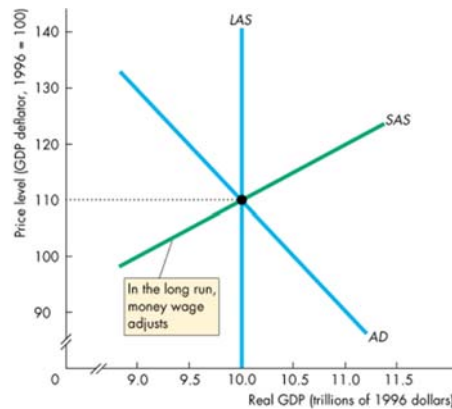
Long-run macroeconomic equilibrium occurs when real GDP equals potential GDP—when the economy is on its *LAS* curve.

Note: These lecture notes are incomplete without having attended lectures



Macroeconomic Equilibrium

- Figure 9 illustrates long-run equilibrium.
- Long-run equilibrium occurs where the AD and LAS curves intersect and results when the nominal wage has adjusted to put the SAS curve through the long-run equilibrium point.



Note: These lecture notes are incomplete without having attended lectures



Example Question: Part I

Consider the table:

1. What is the level of output at the short run equilibrium?
2. What is the level of output at the long run equilibrium?
3. What is the expected price level?

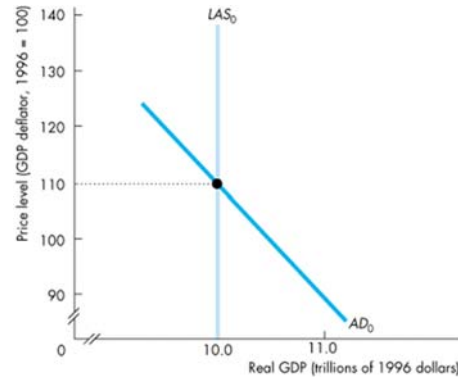
Price Level	Aggregate Demand	SRAS	LRAS
140	9.0	12.0	10.0
130	9.5	11.5	10.0
120	10.0	11.0	10.0
110	10.5	10.5	10.0
100	11.0	10.0	10.0

Note: These lecture notes are incomplete without having attended lectures



Economic Growth and Inflation

- Figure 10 illustrates economic growth and inflation.

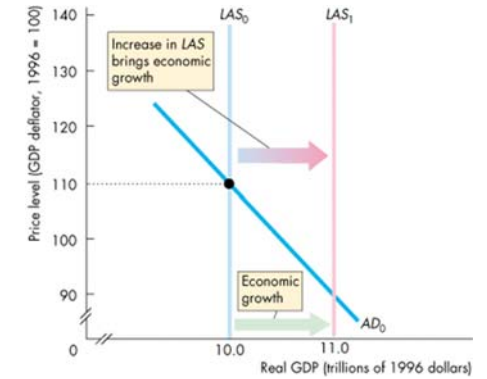


Note: These lecture notes are incomplete without having attended lectures



Macroeconomic Equilibrium

- Economic growth occurs because the quantity of labor grows, capital is accumulated, and technology advances, all of which increase potential GDP and bring a rightward shift of the LAS curve.

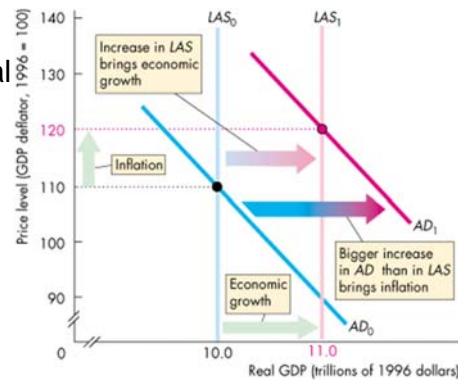


Note: These lecture notes are incomplete without having attended lectures



Macroeconomic Equilibrium

- Inflation occurs because the quantity of money grows faster than potential GDP, which increases aggregate demand by more than long-run aggregate supply.
- The AD curve shifts rightward faster than the rightward shift of the LAS curve.



Note: These lecture notes are incomplete without having attended lectures



The Business Cycle

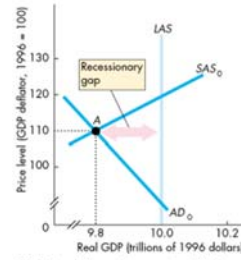
The business cycle occurs because aggregate demand and the short-run aggregate supply fluctuate but the nominal wage rate does not change rapidly enough to keep real GDP at potential GDP.

Note: These lecture notes are incomplete without having attended lectures

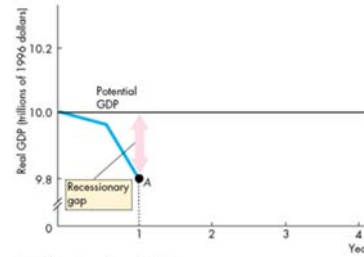


Macroeconomic Equilibrium

- A **below full-employment equilibrium** is an equilibrium in which potential GDP exceeds real GDP.
- Figures 11(a) and (d) illustrate below full-employment equilibrium.
- The amount by which potential GDP exceeds real GDP is called a **recessionary gap**.



(a) Below full-employment equilibrium



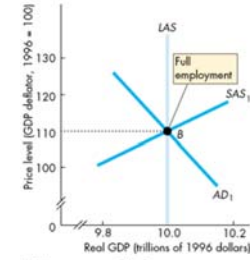
(d) Fluctuations in real GDP

Note: These lecture notes are incomplete without having attended le (d) Fluctuations in real GDP

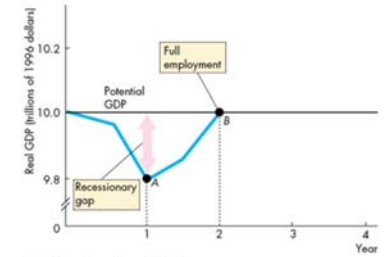


Macroeconomic Equilibrium

- A **long-run equilibrium** is an equilibrium in which potential GDP equals real GDP.
- Figures 11(b) and (d) illustrate long-run equilibrium.



(b) Long-run equilibrium



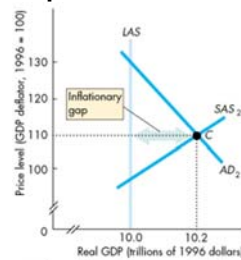
(d) Fluctuations in real GDP

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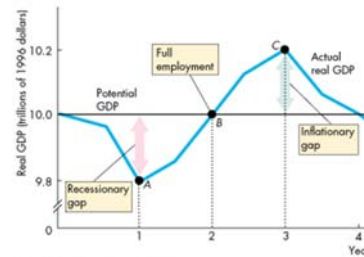


Macroeconomic Equilibrium

- An **above full-employment equilibrium** is an equilibrium in which real GDP exceeds potential GDP.
- Figures 11(c) and (d) illustrate above full-employment equilibrium.
- The amount by which real GDP exceeds potential GDP is called an **inflationary gap**.



(c) Above full-employment equilibrium



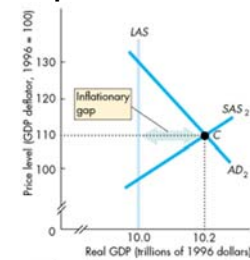
(d) Fluctuations in real GDP

Note: These lecture notes are incomplete without having attended le (d) Fluctuations in real GDP

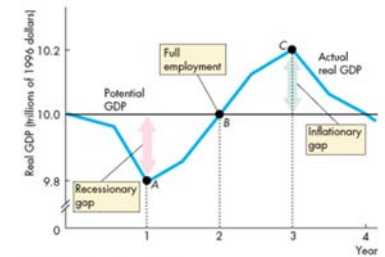


Macroeconomic Equilibrium

- Figure 11(d) shows how, as the economy moves from one type of short-run equilibrium to another, real GDP fluctuates around potential GDP in a business cycle.



(c) Above full-employment equilibrium



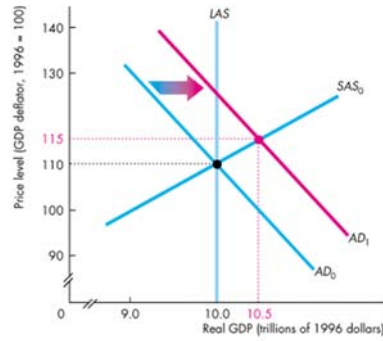
(d) Fluctuations in real GDP

Note: These lecture notes are incomplete without having attended le (d) Fluctuations in real GDP



Fluctuations in Aggregate Demand

- Figure 12 shows the effects of an increase in aggregate demand.
- Part (a) shows the short-run effects.
- Starting at long-run equilibrium, an increase in aggregate demand shifts the AD curve rightward.



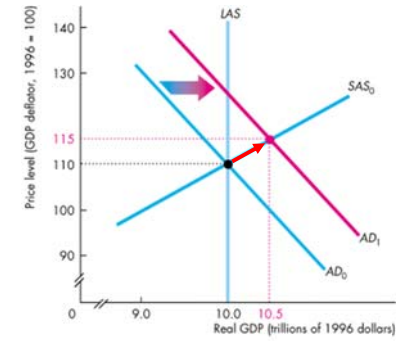
(a) Short-run effect

Note: These lecture notes are incomplete without having attended lectures



Macroeconomic Equilibrium

- Firms increase production and raise prices—a movement along the SAS curve.



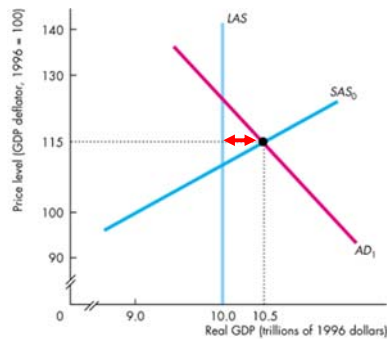
(a) Short-run effect

Note: These lecture notes are incomplete without having attended lectures



Macroeconomic Equilibrium

- Figure 12(b) shows the long-run effects.
- Real GDP increases, the price level rises, and in the new short-run equilibrium, there is an inflationary gap.



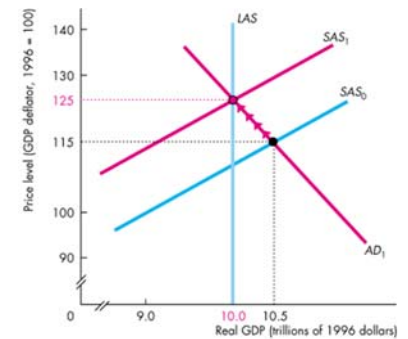
(b) Long-run effect

Note: These lecture notes are incomplete without having attended lectures



Macroeconomic Equilibrium

- The nominal wage rate begins to rise and short-run aggregate supply begins to decrease.
- The SAS curve shifts leftward.
- The price level rises and real GDP decreases until it has returned to potential GDP.



(b) Long-run effect

Note: These lecture notes are incomplete without having attended lectures



Example Question: Part II

Consider our previous example:

- What kind of equilibrium is the short run equilibrium?
- What will happen as we move from the short run to the long run?

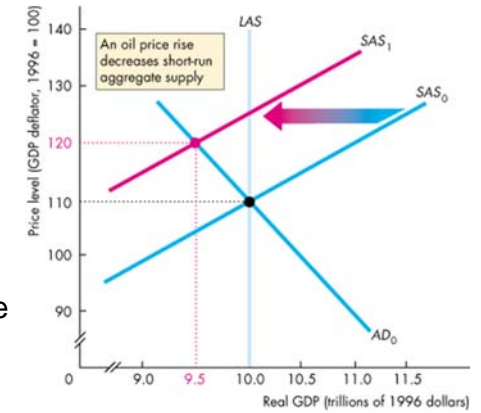
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120	10.0	11.0	10.0
110	10.5	10.5	10.0
100	11.0	10.0	10.0

Note: These lecture notes are incomplete without having attended lectures



Fluctuations in Aggregate Supply

- Figure 13 shows the effects of a decrease in aggregate supply.
- Starting at long-run equilibrium, a rise in the price of oil decreases short-run aggregate supply and the SAS curve shifts leftward.

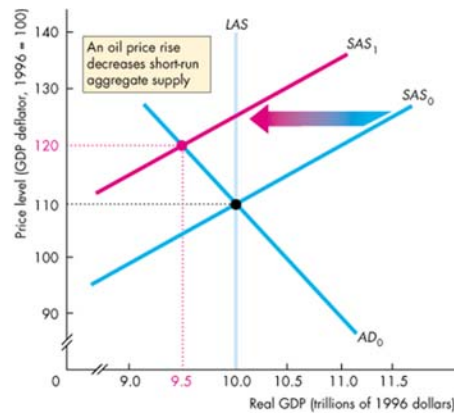


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Macroeconomic Equilibrium

- Real GDP decreases and the price level rises.
- The combination of recession combined with inflation is called *stagflation*.

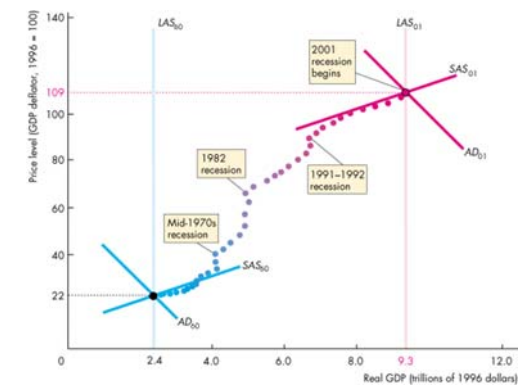


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U.S. Economic Growth, Inflation, and Cycles

- Figure 14 interprets the changes in real GDP and the price level each year from 1960 to 2001 in terms of shifting AD, SAS, and LAS curves.

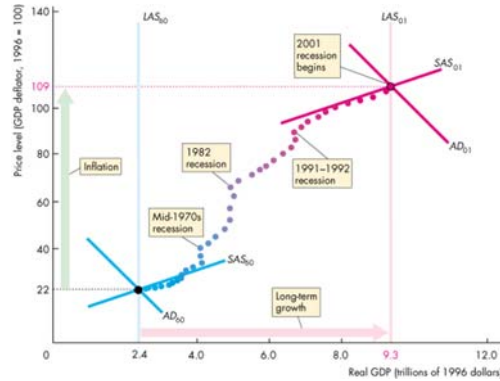


Note: These lecture notes are incomplete without having attended lectures



U.S. Economic Growth, Inflation, and Cycles

The figure shows the business cycle,
 ...inflation,...
 ...and long-term economic growth.

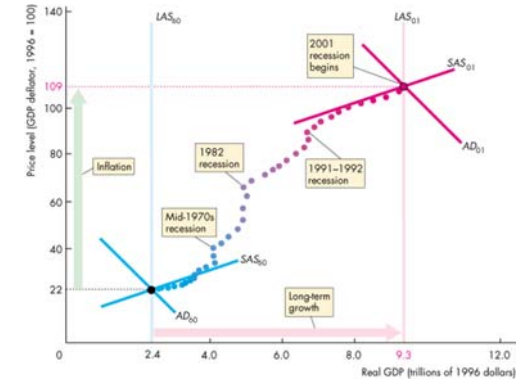


Note: These lecture notes are incomplete without having attended lectures



U.S. Economic Growth, Inflation, and Cycles

- From 1960 to 2001:
- Real GDP and potential GDP grew from \$2.4 trillion to \$9.3 trillion.
- The price level rose from 22 to 109.
- Business cycle expansions alternated with recessions.



Note: These lecture notes are incomplete without having attended lectures



U.S. Economic Growth, Inflation, and Cycles

To Summarize:

- Economic Growth
 - Real GDP growth was rapid during the 1960s and 1990s and slower during the 1970s and 1980s.
- Inflation
 - Inflation was the most rapid during the 1970s.
- Business Cycles
 - Recessions occurred during the mid-1970s, 1982, 1991–1992, 2001, and from the end of 2007 to mid 2009.

Note: These lecture notes are incomplete without having attended lectures



Review Questions:

1. What is the distinction between the short run and long run? What do the SRAS and LRAS curves look like? Why?
2. Using the Sticky Wage Theory, explain the slope of the SRAS curve.
3. Changes in which factors would lead to movements along the (a) SRAS curve, (b) LRAS curve.
4. Suppose that the price level and nominal wages both rise by the same percentage. What happens to the aggregate supply? Which curve does it move along? What happens if only the price level rises and wages stay constant?
5. What factors would cause the SRAS curve to shift? What factors would cause the LRAS curve to shift?
6. What does the AD curve show? Why does it slope downwards?
7. Changes in which factors would cause (a) movements along the AD curve, (b) shifts of the AD curve?
8. What do we mean by (a) short run macroeconomic equilibrium (b) long run macroeconomic equilibrium? What are the three types of short run macroeconomic equilibria?
9. How do fluctuations in aggregate demand and short-run aggregate supply bring fluctuations in real GDP around potential GDP?
10. What are the key distinctions between the Keynesian Aggregate Expenditures Model and the Aggregate Demand-Supply Model? How do they differ in their assumptions?

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