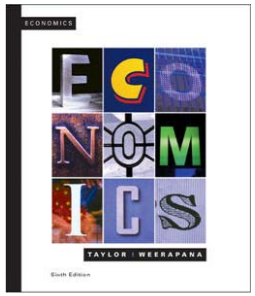
Economics 202
Principles Of Macroeconomics

Professor Yamin Ahmad

Lecture 11

- Aggregate Demand and Inflation
- Inflation Adjustment
- Inflation and Output in the short and long run



Big Concepts

- Inflation, Real Interest Rates and Aggregate Demand
- The Inflation Adjustment Line
- Inflation and Output in the short run and long run equilibria.

Note: These lecture notes are incomplete without having attended lectures

The Aggregate Demand Curve

Redefining Aggregate Demand

- Aggregate demand curve: a line showing a negative relationship between inflation and the aggregate quantity of goods and services demanded at that inflation rate.
- Figure 1 shows an aggregate demand curve. Note that inflation is plotted on the y-axis and real GDP is plotted on the x-axis.

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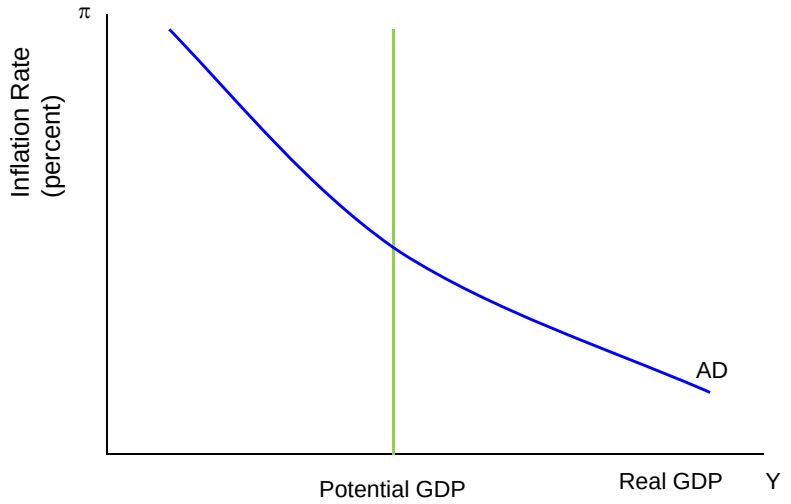
Figure 1: The Aggregate Demand Curve



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The Aggregate Demand Curve

Why is the aggregate demand curve downward sloping in inflation-output space? We explain this phenomenon in three stages:

- Stage 1: We explain the negative relationship between the real interest rate and real GDP
- Stage 2: We explain the positive relationship between the inflation rate and the real interest rate.
- Stage 3: We show how the two relationships combine to get the *AD* curve.

Interest Rates and Aggregate Demand

Consider Aggregate Demand:

$$Y^d = C(Y - \overline{T}, r, \ldots) + I(r, \ldots) + \overline{G} + NX(r, q, \ldots)$$

- Consumption is a function of:
  - Disposable Income
  - Real Interest Rates
  - Others…
- Investment is a function of:
  - Real Interest Rate
  - Expected Profit Rate, etc.
- Net Exports is a function of:
  - Real interest Rate
  - Real Exchange rate
  - Others

Interest Rates and Investment

- Investment is negatively related to the real interest rate because the real interest rate is the cost of borrowing.
  - Thus higher interest rates make borrowing more costly. This relationship holds regardless of whether the investment is for capital equipment or for residential investment.
- Note: Investment is the component of GDP that is most sensitive to the real interest rate.

Interest Rates and Net Exports

- Net exports are negatively related to investment because higher real interest rates will cause the country's currency to appreciate and decrease its net exports.
- Lower real interest rates will cause the country's currency to depreciate and increase its net exports.
- More on this topic in lecture 12.

Interest Rates and Consumption

- Consumption is negatively related to interest rates because a higher real interest rate will encourage people to save more and consume less. A lower interest rate will encourage people to save less and consume more.
- Economists believe that the effect of the real interest rate on consumption is smaller than its effects on investment and net exports.

Interest Rates and GDP

Overall Effect

- Because investment, net exports, and consumption are all negatively related to the interest rate, aggregate spending should be negatively related to the real interest rate.
- i.e.

$$Y^d = C(Y - \overline{T}, r, \ldots) + I(r, \ldots) + \overline{G} + NX(r, q, \ldots) = Y^d(r, \ldots)$$

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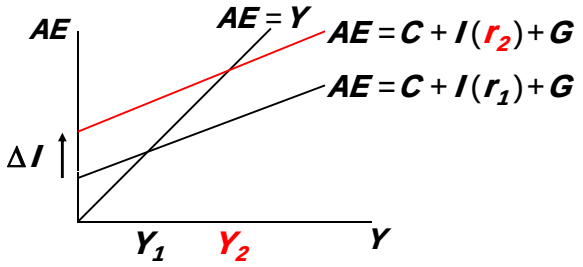
The Interest Rate, Spending Balance and Real GDP

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



- A lower real interest rate raises real GDP
- A higher real interest rate lowers real GDP

STAGE II: INTEREST RATES AND INFLATION

Interest Rates and Inflation

Monetary policy rule: a description of how much the interest rate or other instruments of monetary policy respond to inflation or other measures of the state of the economy.

Table 1 illustrates a hypothetical interest rate response of the central bank to changes in the inflation rate.

Interest Rate set by Central Bank/Federal Reserve

TABLE 1
A Numerical Example of Central Bank Interest Rate Policy

(a) Inflation Rate	(b) Nominal Interest Rate Decision (made by the central bank)	Resulting Real Interest Rate (b) 2 (a)
0.0	1.0	1.0
1.0	2.5	1.5
2.0	4.0	2.0
3.0	5.5	2.5
4.0	7.0	3.0
5.0	8.5	3.5
6.0	10.0	4.0
7.0	11.5	4.5
8.0	13.0	5.0

Interest Rates and Inflation

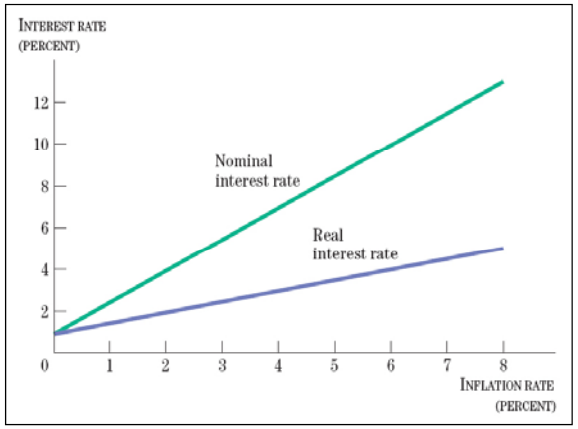
In Table 1, the central bank responds to higher inflation by raising interest rates. For example, if inflation increases from 5.0 percent to 6.0 percent, the central bank will respond by increasing the nominal interest rate from 8.5 percent to 10 percent.

The Taylor Principle

Definition: The Taylor Principle

- The increase in the interest rate must be greater than the increase in the inflation rate. This is because the real interest rate (nominal interest rate minus inflation rate) must rise for aggregate demand to fall.

Figure 3: A Monetary Policy Rule



The Fed Funds Rate

- Question: What interest rate does the Fed target?
- Answer: The Federal funds rate
  - The Federal Funds rate is the interest rate on overnight loans between banks that the Federal Reserve influences by changing the supply of funds (bank reserves) in the market.
- If the Fed wants to raise the federal funds rate, it must decrease the supply of reserves.
- If the Fed wants to lower the federal funds rate, it must increase the supply of reserves.

Open Market Operations

Definition: Open market operations: the buying and selling of government bonds in the open market.

- If the Fed wants to lower the federal funds rate, it buys government bonds.
- If the Fed wants to lower the federal funds rate, it buys government bonds.

Interest Rates and Inflation

- Target inflation rate: the central bank's goal for the average rate of inflation over the long run.
- Some central banks, such as the Bank of England and the Reserve Bank of New Zealand, have explicit inflation targets.
- Historically, the Federal Reserve's inflation target has not been explicitly announced. However, as of late 2008, the Federal Reserve has started to post some medium-run inflation targets.

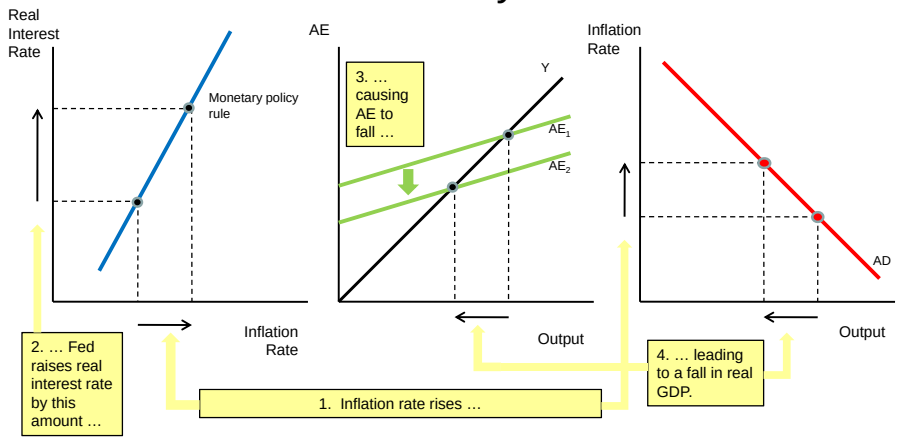
Stage 3: Derivation of the Aggregate Demand Curve

The aggregate demand curve has a negative slope—that is, a higher inflation rate results in a lower real GDP. Why?

Step:

1. A higher inflation rate will cause the central bank to raise the real interest rate by raising the nominal interest rate faster than the inflation rate.
2. The higher real interest rate decreases consumption, investment, and net exports.
3. This causes a decline in real GDP.

The Transmission Mechanism of Monetary Policy



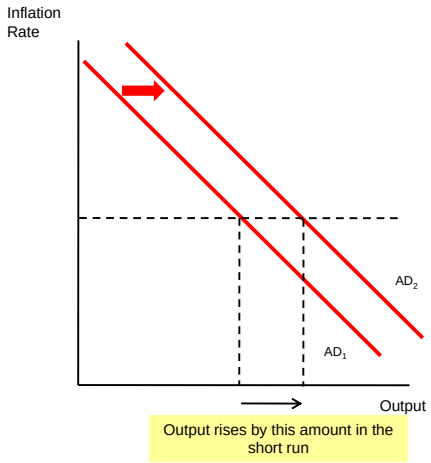
Shifts in the Aggregate Demand Curve

A shift in the aggregate demand curve can be caused by changes in the following:

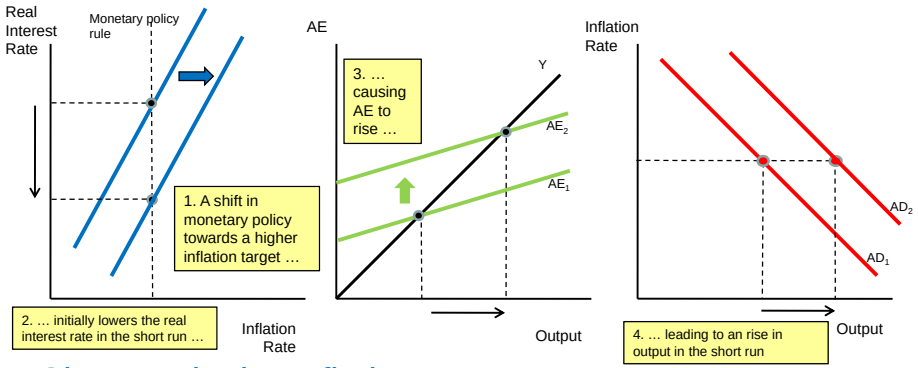
- Fiscal Policy, i.e. a change in Government purchases (G) or net taxes (T_0)
- Inflation target rate
- Net Exports (i.e. a change in X or M_0, or both)
- Changes in autonomous consumption (C_0)
- Changes in autonomous investment (I_0)

Example: Fiscal expansion

- Suppose G ↑
- This increases GDP at any/every inflation rate
- Hence the AD curve shifts out and output increases in the short run



Shifts in the Aggregate Demand Curve



Changes in the Inflation Target Rate

- A higher inflation target requires a higher level of spending and a lower interest rate. This change will shift the *AD* curve to the right, as shown above.

Practice Problem

- Question: Suppose that autonomous consumption falls. Try to figure out the impact on the AD curve within this framework.
- Hint: Try to think about what happened to the AD curve in price-output space!
- Answer:

Summary of Shifts to the AD curve

- Anything that shifts the AE curve or the AD curve in price-output space will also shift the AD curve here in inflation-output space!
- Hence, increases in injections will cause the AD to shift to the right in the short run
- Increases in leakages will cause AD to shift to the left in the short run.

From the Short Run to the Long Run

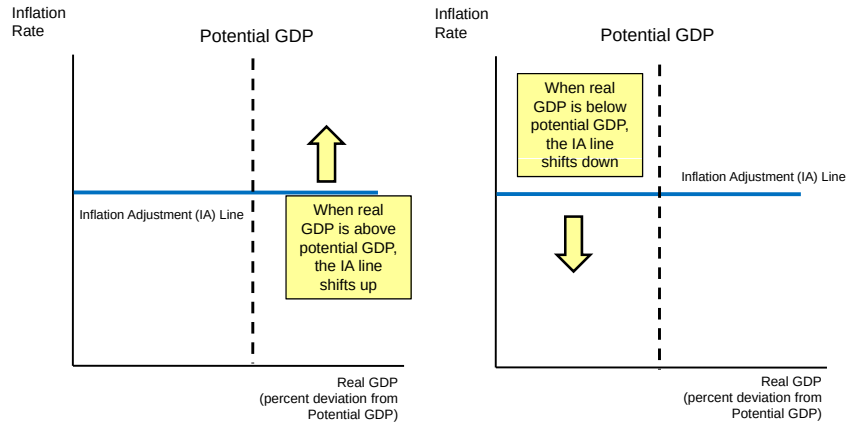
- Recall that in the short run, prices are sticky and hence inflation is sticky too!
- In the long run, prices gradually become unstuck and adjust in a way to try and make markets clear.
- Hence, to think about the long run, we need an inflation-adjustment line (IA line).

The Inflation Adjust Line

Definition: Inflation adjustment (*IA*) line: a flat line showing the level of inflation in the economy at a given point in time.

- The *IA* line shifts up when real GDP is greater than potential GDP; it shifts down when real GDP is lower than potential GDP.
- The *IA* line also shifts when expectations of inflation or raw material prices change.

Inflation Adjustment and Changes in Inflation



- A flat *IA* line indicates that firms and workers adjust their wages and prices in such a way that inflation remains steady in the short run as real GDP changes.

The Inflation Adjustment Line Is Flat

Two reasons why inflation does not change much in the short run:

1. Expectations of continuing inflation
2. Staggered wage and price setting by different firms throughout the economy

The Inflation Adjustment Line Is Flat

Expectations of Continuing Inflation

If inflation in the economy has been hovering at about 4 percent per year, then a firm can expect that its competitor's prices will increase by about 4 percent this year. Hence, the firm will need to raise its own prices by about 4 percent this year.

The Inflation Adjustment Line Is Flat

Staggered Wage and Price Setting

Not all wages and prices adjust at the same time in the economy. On any given day, there will always be a wage or a price changing, but the vast majority of the wages and prices in the economy will remain constant.

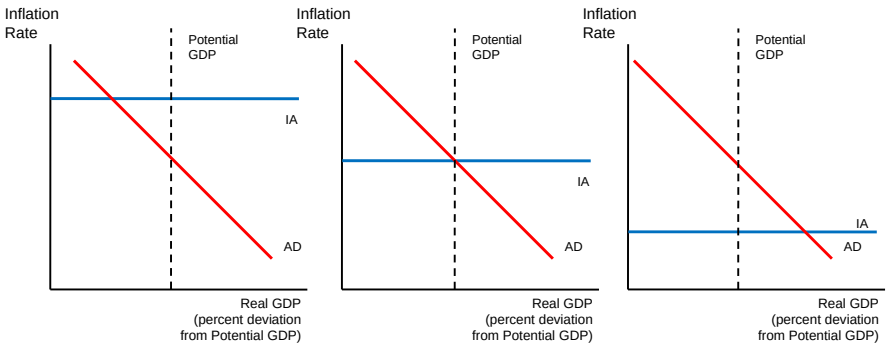
The *IA* Line Shifts When Real GDP Departs from Potential GDP

- When real GDP in the short run is above potential GDP, the *IA* line will start to rise until the real GDP equals potential.
- When real GDP in the short run is below potential GDP, the *IA* line will start to drop until the real GDP equals potential.
- When the real GDP equals potential (in either the short or long run), the *IA* line will not shift.

Changes in Expectations or Commodity Prices

- An increase in the expectations of inflation will shift the *IA* line upward. A decrease in the expectations of inflation will shift the *IA* line downward.
- An increase in the prices of commodities will shift the *IA* line upward. A decrease in the prices of commodities will shift the *IA* line downward.

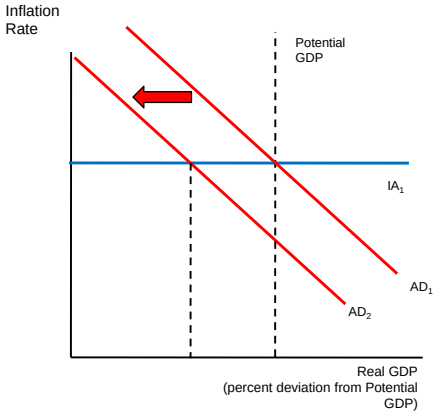
Combining IA and AD Curves: Determining Real GDP and Inflation



Impact of Policy Actions and Shocks on Inflation and Output

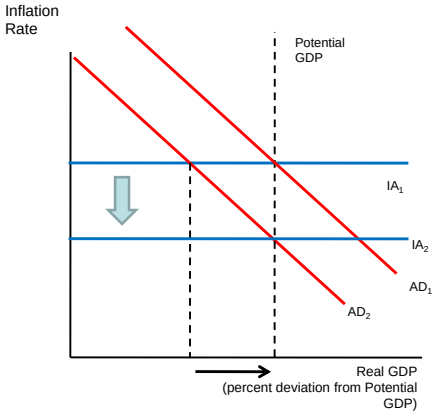
Example 1: Fiscal Contraction

- Starting at a long run equilibrium, consider the impact of an increase in taxes, T_0.
- This reduces spending and demand in the short run, causing the AD curve to shift leftwards.
- In the short run, output falls and real GDP is less than potential GDP



Transition from the Short Run to the Long Run

- As we move from the short run to the long run, the inflation rate declines and the IA line starts to shift down since real GDP in the short run equilibrium is less than potential GDP.
- Over time, we converge back on potential GDP.



Details of the Components of Spending

In the short run, a fiscal contraction has the following effects:

- A decrease in real GDP
- No change to investments, because real interest rates are unchanged in the short run
- A decrease in consumption, because consumption spending is positively related to real GDP/ real income
- An increase in net exports, because imports are negatively related to real GDP

Details of the Components of Spending

In the long run, a fiscal contraction has the following effects:

- A return of the real GDP level to the potential GDP level
- Higher consumption, investment, and net exports than before the drop in government spending, because interest rates decreased to bring the economy back to potential GDP

Changes in Monetary Policy

Definition: Disinflation

- A reduction in the inflation rate from a monetary policy action
- Example: The interest rate decreases from 10 percent to 3 percent.

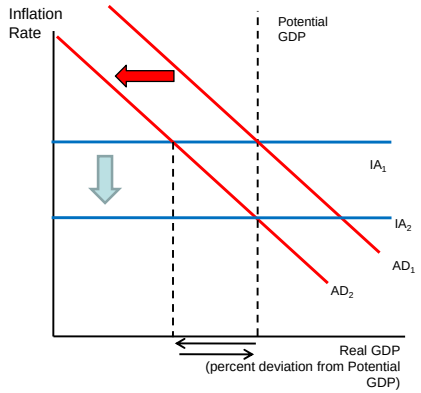
Definition: Deflation

- A decrease in the overall price level (or a negative interest rate).
- Example: The CPI (or any other measure for the general price level) decreases from 140 to 130.

Impact of Policy Actions and Shocks on Inflation and Output

Example 2: Monetary Contraction

- Starting at a long run equilibrium, consider the impact of a monetary tightening where the Fed lowers the inflation target or contracts the money supply
- The resulting monetary contraction has a similar impact that reduces demand in the short run, causing the AD curve to shift leftwards.
- Over time, the monetary contraction lowers the inflation rate, increasing output.



The Volcker Disinflation

The scenario illustrated in the previous slide is very similar to the disinflation that occurred in the United States in the early 1980s, when Paul Volcker was Fed Chairman. The real GDP fell below potential GDP, and the unemployment rate rose to 10.8 percent.

By 1982, recovery was on its way. By 1985, the economy was near its potential.

Reinflation and the Great Reinflation

Reinflation: an increase in the inflation rate caused by a change in monetary policy.

Great Reinflation: a period in the 1960s and 1970s when the Fed and other central banks around the world allowed inflation rates to increase.

Price Shocks

Definition: Price shock

- A change in the costs of production (rise in marginal costs) or an increase in the price of a key commodity such as oil, usually because of a shortage, that causes a shift in the inflation adjustment line;
- Also called a supply shock

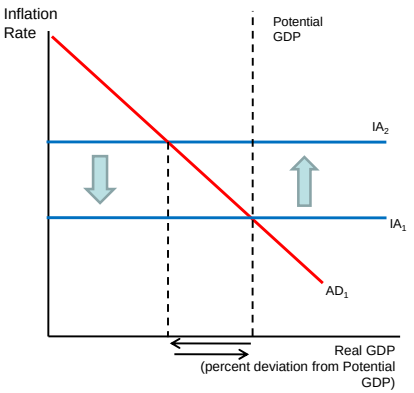
Definition: Demand shock

- A shift of the components of the aggregate demand curve that leads to a shift in the aggregate demand curve.

Impact of Policy Actions and Shocks on Inflation and Output

Example 3: Price Shock

- Starting at a long run equilibrium, consider the impact of a price shock due to an increase in the costs of production, or the price of oil, or other commodities.
- The shock raises the IA line upwards, causing output to decline.
- Since we are producing below potential GDP in the short run, the inflation rate falls slowly over time.
- In the long run we return to potential GDP.



Stagflation

Definition: Stagflation

- A situation in which both high inflation and high unemployment occur simultaneously.
- In the previous slide the intersection between the short-run *IA* line and the *AD* curve illustrates stagflation, as the economy experiences high inflation and a GDP below potential.