# 2.5 Monetary Policy

## Interest rate determination and the role of a central bank

- Describe the role of central banks as regulators of commercial banks and bankers to governments.
- Explain that central banks are usually made responsible for interest rates and exchange rates in order to achieve macroeconomic objectives.
- Explain, using a demand and supply of money diagram, how equilibrium interest rates are determined, outlining the role of the central bank in influencing the supply of money.

While fiscal policy is enacted by a country's government with the aim of managing the level of aggregate demand to promote certain macroeconomic objectives, monetary policy is enacted by a country's **central bank**, which is a national bank that provides regulatory and banking services to a country's commercial banks and other lending institutions.

**Monetary policy** involves a central bank increasing or decreasing the nation's money supply to influence interest rates and the level of aggregate demand with the aim of promoting macroeconomic objectives such as price level stability and full employment.

The **nominal interest rate** is the annual rate a borrower must pay back a lender for the use of borrowed money. Nominal interest rates are determined in the money market, where the supply of money is determined by a country's central bank policy and the demand for money is determined by the nation's households, firms, government, and foreigners; basically, anyone who needs money as an asset or to purchase goods and services.

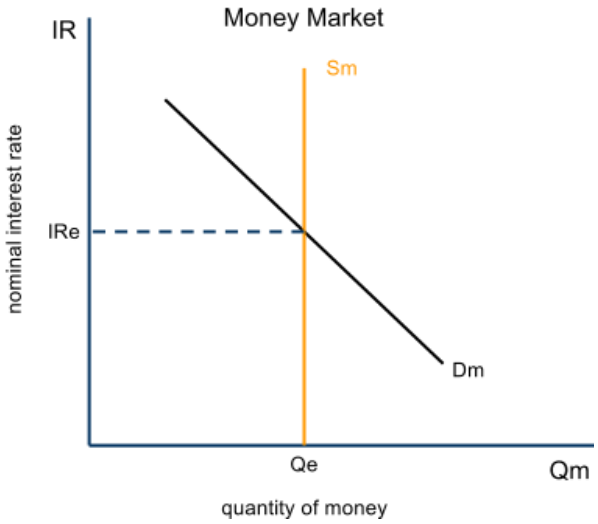
The **money market** shows the relationship between nominal interest rates and the supply and demand of money in an economy.

**Money demand** represents the quantity of money (M1) the public demands at a range of interest rates as an asset and for the purchase of goods, services, and resources. There are two elements of a nation's money demand:

- **Asset demand:** The demand for money as an asset is inversely related to the interest rate. As explained earlier in the chapter, at high interest rates less money is demanded, because the opportunity cost of holding money as an asset is higher. At low interest rates the opportunity cost of holding money as an asset decreases and the quantity demanded is higher.
- **Transaction demand:** The transaction demand for money depends on the level of output produced in the nation and the interest rate. At lower interest rates households are more willing to spend money on goods and services, while at higher interest rates the public demands less money for transactions, since the opportunity cost of buying stuff is higher when more interest can be earned in financial assets.

**Money supply** is independent of the nominal interest rate, and determined by the country's central bank. A central bank can increase or decrease the supply of money and thereby change the nominal interest rate through the use of **monetary policy**. Because it is determined by the central bank, money supply is not responsive to changes in interest rates. In other words, it's perfectly inelastic.

The graph below shows the money market in a nation:

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Equilibrium and disequilibrium in the money market

The **equilibrium interest rate** is determined by the supply of and demand for money in a country. A shift in the demand for money can lead to a change in the equilibrium interest rate. At equilibrium the quantity of money supplied is equal to the quantity demanded.

A money market will be in disequilibrium when the quantities demanded and supplied are not equal.

In the money market above, we can see why 5% is the equilibrium interest rate.

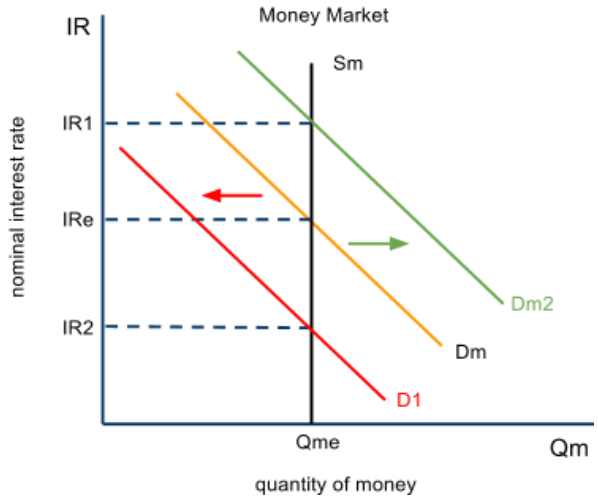
- **At 6%** the quantity of money demanded as an asset or for transactions by households, firms, the government, and foreigners is only $0.8 billion. The quantity supplied by the central bank, however, is $1 billion. There is a surplus of money in the economy, most likely sitting in banks' excess reserves going unloaned. Interest rates must fall in order for the money market to clear.
- **At 4%** the quantity of money demanded as an asset or for transactions is $1.2 billion, more than the $1 billion actually supplied. There is a shortage of money in the economy, meaning there is greater demand for money for spending and investments than there is supply. Interest rates must rise for the money market to clear.
- **At 5%** the quantity demanded equals the quantity supplied. Banks are mostly loaned out and do not have lots of excess reserves. Nor are there many borrowers who are unable to get money for the spending they would like to do.

Changes in money demand

Money demand will shift whenever there is a change any of the following:

- **Real GDP:** An increase in real GDP will increase income and consequently the demand for money throughout the economy. A fall in GDP causes money demand to decrease as there are fewer goods and services to buy.
- **Price level:** A higher price level will lead to higher demand for money as more money will be required to buy a given set of goods and services. A fall in prices will cause demand for money to decrease as less money is needed to buy the same amount of stuff.
- **Expectations about future price levels:** Even the expectation of higher prices in the future can increase demand for money today, as households and firms will rush to buy the things they need now before prices rise. Expected deflation will decrease demand for money as consumers and firms postpone spending today and wait for prices to fall in the future.

The graph below shows the effect of a change in money demand on the equilibrium interest rate in the money market.

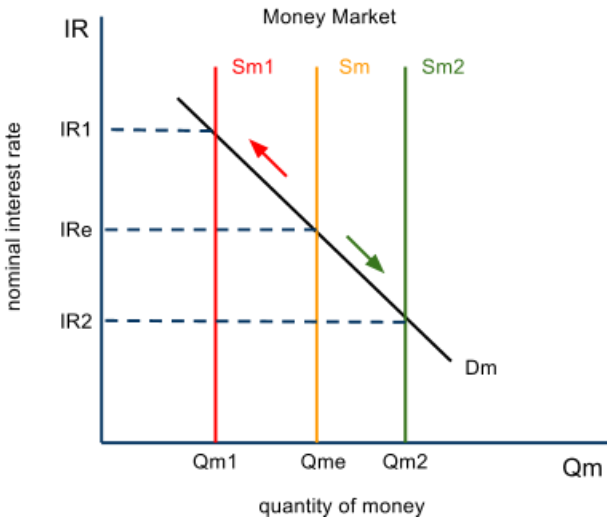



Observe the following:

- An increase in GDP or an increase in inflation causes an increase in demand for money to Dm2, which makes money scarcer. Banks must raise interest rates as money demand rises in order to prevent their being shortages of funds.
- A decrease in GDP or a decrease in the price level causes a decrease in demand for money to D1, which makes money less scarce. Banks must lower interest rates as money demand decreases in order to avoid an unwanted increase in their excess reserves.

Changes in the money supply
If the supply of money changes, the equilibrium interest rate will change in the economy. Money supply changes result from monetary policy actions taken by the central bank.

The graph below shows the effect of shifts in the money supply curve on the equilibrium interest rate.




Central bank action that causes the money supply to increase (from Sm to Sm2) will cause interest rates to fall. Banks' excess reserves increase, so they will lower the rates they charge

to attract more borrowers.

Central bank action that causes the money supply to decrease (from Sm to Sm1) will cause interest rates to rise. Banks' have less in their excess reserves and some may even have to raise rates to attract more depositors or and fewer borrowers. Unless rates increase, banks will fall short in meeting their required reserves and there will be a shortage of money.

## Monetary policy and short-term demand management

- Explain how changes in interest rates can influence the level of aggregate demand in an economy.
- Describe the mechanism through which easy (expansionary) monetary policy can help an economy close a deflationary (recessionary) gap.
- Construct a diagram to show the potential effects of easy (expansionary) monetary policy, outlining the importance of the shape of the aggregate supply curve.
- Describe the mechanism through which tight (contractionary) monetary policy can help an economy close an inflationary gap.
- Construct a diagram to show the potential effects of tight (contractionary) monetary policy, outlining the importance of the shape of the aggregate supply curve.

Introduction to monetary policy
A central bank's manipulation of the money supply and nominal interest rates is known as **monetary policy**. Central banks implement monetary policies to achieve macroeconomic goals, such as price stability, full employment, and economic growth.

A **central bank** is the institution in most modern, market economies that controls the overall supply of money in the nation's economy. Most central banks act independently of the nation's government, and are thus, in theory, insulated from political agendas and influence. Examples include:

- In the US: the Federal Reserve Bank
- In the UK: the Bank of England
- In China: the People's Bank of China
- In Japan: the Bank of Japan
- In Switzerland: the Swiss National Bank
- In the Eurozone: the European Central Bank

Every major world economy has a central bank. Below is a snapshot of one CB and the roles it plays in the nation's banking system and wider economy

| The Federal Reserve Bank of the United States | |
|---|---|
| **Overview of the Federal Reserve Bank of the United States** | • 12 branches located in different regions of the country<br>• Coordinated by the Fed's Board of Governors<br>• The "Fed" provides banking services to commercial banks<br>➢ Accept deposits, lends money (called the "discount window", only if commercial banks can't borrow from one another would they borrow from the Fed), issues new currency to private banks<br>• FOMC - Federal Open Market Committee: 12 individuals, including the Chairman of the Fed (Bernanke). Purpose is to buy and sell government securities to control the nation's money supply and influence interest rates. Execute monetary policy. |
| **Functions of the Federal Reserve Bank** | • Issue currency: the Fed can inject new currency into the money supply by issuing Federal Reserve Notes (dollars) to commercial banks to be loaned out to the public.<br>• Setting reserve requirements: this is the fraction of checking account balances that commercial banks must keep in their vaults. The larger the reserve requirement, the less money commercial banks can loan out.<br>• Lending money to banks: The Fed charges commercial banks interest on loans, this is called the "discount rate".<br>• Controlling the money supply: this in turn enables the Fed to influence interest rates. |

The tools of monetary policy

Changing the money supply will cause interest rates to increase or decrease, which can then influence the level of aggregate expenditures in the economy. A central bank has three tools for increasing or decreasing the supply of money in an economy:

- **The buying and selling of government bonds:** Every commercial bank will invest some of its depositors money in illiquid government bonds. Bonds are not money, so if a central bank wishes to increase the supply of money in the economy, it can buy bonds from commercial banks using newly printed cash (which IS money!) If the goal is to reduce the money supply, a central bank can sell bonds to commercial banks, which results in less money in circulation and more illiquid government bonds on banks' balance sheets.
- **Changing the required reserve ratio:** The required reserve ratio (RRR) is the percentage of a bank's total deposits it is required to keep in reserve. By reducing the reserve requirement, a central bank immediately increases commercial banks' excess reserves, which frees up money for new loans. By increasing the reserve requirement, a central bank immediately reduces the amount of excess reserves in the banking system and commercial banks must raise interest rates to meet the higher reserve requirement.
- **Changing the discount rate:** The discount rate is the interest rate the central bank charges commercial banks for short-term loans. If this rate is lowered, banks will be more willing to make loans to private borrowers and interest rates will fall. If the discount rate is increased, banks will be less willing to loan to private borrowers and the interest rate will increase.

Next we'll go into more detail of how each of the tools of monetary policy works.

Buying and selling of bonds
Sometimes called **"open market operations"**, a central bank's interventions in the bond market is the most commonly employed monetary policy tool. Open market operations can be employed as either an **expansionary monetary policy** (one that increases the money supply and reduces interest rates) or a **contractionary monetary policy** (one that reduces the money supply and increases interest rates).

When the goal is to reduce interest rates and stimulate aggregate demand, a central bank will buy bonds from commercial banks and the public. An open market purchase of government bonds will cause the money supply to increase by a magnitude determined by the **money multiplier**.

For example, assume the central bank of Wahoovia desires to reduce interest rates and to do so it aims to increase the money supply by $10 billion. The reserve requirement is 20% in Wahoovia. The money multiplier can be calculated:

$$\text{Money multiplier} = \frac{1}{\text{RRR}}$$

$$= \frac{1}{0.2} = 5$$

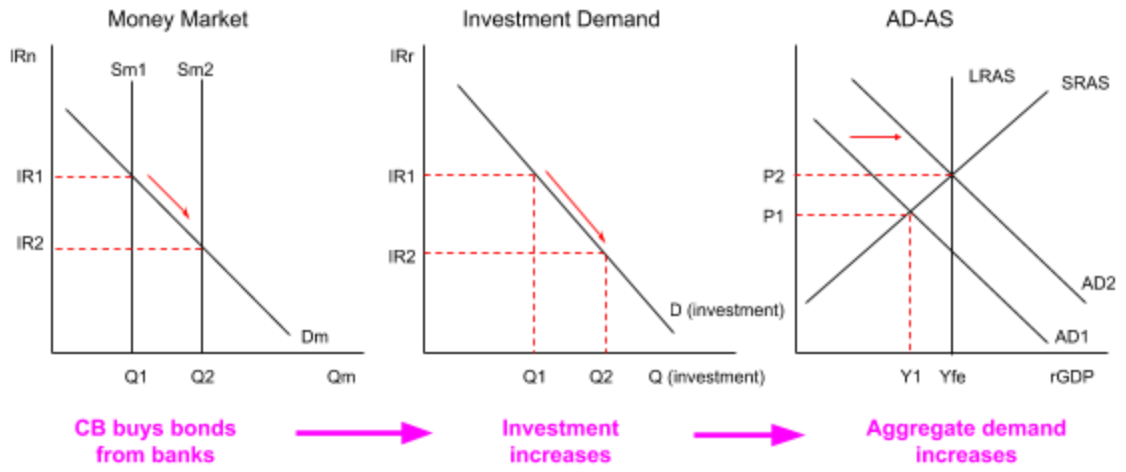
If the central bank wishes to increase the money supply by $10 billion, it must purchase $2 million in government bonds from the public. Doing so will increase banks' excess reserves by $2 billion, which will increase the money supply based on the money multiplier.

$$\Delta \text{ in money supply} = \Delta \text{ in excess reserves} \times \text{money multiplier}$$

$$= \$2 \text{ billion} \times 5 = \$10 \textit{ billion}$$

A $2 billion purchase of government bonds by the central bank of Wahoovia will increase the money supply by $10 billion. Banks will loan out the initial $2 billion increase in their excess reserves, which will create new deposits and new loans across the banking system until the ultimate increase in the money supply is multiplied five times.

The effect of an expansionary monetary policy can be observed in the graphs below:




The purchase of government bonds by the central bank has resulted in a fall in the nominal and the real interest rate, an increase in investment (and interest sensitive consumption such as the purchase of new cars) and an increase in AD.

- Notice that before the expansionary monetary policy this country had a recessionary gap of Y1-Yfe.
- However, after the stimulus, AD has increased to the full employment level.

A contractionary monetary policy will have the opposite effect on output, employment, and the price level. Assume that rather than a recession, Wahoovia is facing high inflation.

An open market sale of government bonds by the central bank will reduce the money supply, raise interest rates, and reduce interest sensitive spending in the economy.

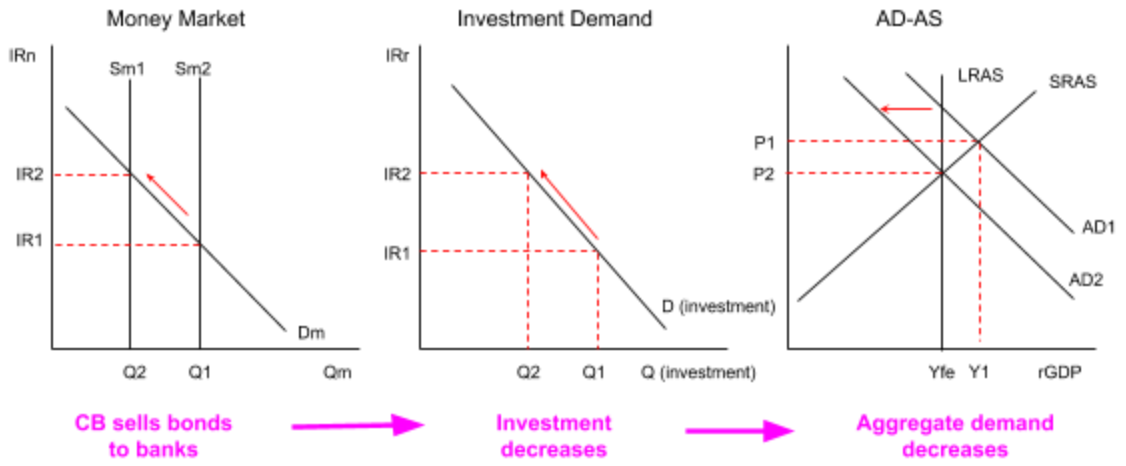
Let's assume the central bank wishes to reduce the money supply by $5 billion. With the money multiplier, we can calculated how much the central bank should sell in government bonds to the public. All we must do is divide the desired change in the money supply by the money multiplier:

$$\text{needed sale of bonds} = \frac{\text{desired change in money supply}}{\text{money multiplier}}$$

$$= \frac{\$5 \text{ billion}}{5} = \mathbf{\$1 \text{ billion}}$$

The central bank of Wahoovia should sell $1 billion in government bonds to the public. Doing so will reduce the supply of liquid money in the economy, reducing banks' excess reserves and reduce the overall money supply by $5 billion.

The effect of a contractionary monetary policy can be observed in the graphs below.




The sale of government bonds by the central bank has resulted in an increase in the nominal and the real interest rates, a decrease in investment (and interest sensitive consumption such as the purchase of new cars) and a decrease in AD.

- Notice that before the expansionary monetary policy this country had an inflationary gap of Yfe-Y1.
- However, after the stimulus, AD has fallen to the full employment level.

The reserve ratio as a tool of monetary policy
Changing the reserve ratio is a powerful way to stimulate or reduce total spending in the economy. It impacts more than just the proportion of deposits banks must keep in reserve.

For example, assume the US Fed wishes to reduce the total amount of money in circulation to increase the interest rate and reduce consumption and investment. By raising the reserve ratio, it can achieve a smaller money supply and a higher interest rate, but also a smaller money multiplier.

The table below shows the effect of an increase in the RRR from 0.10 to 0.15.

| | **Before the Fed's action** | **After the Fed's Action** |
|---|---|---|
| **Required Reserve Ratio** | 0.10 | 0.15 |
| **Money Multiplier** | $\frac{1}{0.10} = \mathbf{10}$ | $\frac{1}{0.15} = \mathbf{6.67}$ |

Effect of the Fed's Action:

- With fewer excess reserves to lend out, the money supply decreases and the interest rate rises.
- When new deposits are made, banks must now keep a larger proportion in reserve, reducing the overall money supply in the economy.

- For every $1 increase in excess reserves in the future, only $6.67 of new money will be created compared to $10 before the Fed's action.

Changing the reserve requirement is a powerful, albeit rarely used tool of contractionary monetary policy.

Reducing the reserve requirement increases the money supply and could be used as an expansionary monetary policy.

- A decrease in the reserve requirement from 0.10 to 0.5 would double the money multiplier from 10 to 20.
- Banks would immediately see their required reserves halve, increasing their excess reserves and the amount of new loans they could make in the economy.
- For every $1 increase in excess reserves in the future, $20 of new money could be creates compared to just $10 before the Fed's action.

The discount rate as a tool of monetary policy
The discount rate is the interest rate that the central bank charges to commercial banks that wish to borrow funds to meet shortfalls in their required reserves. The central bank will make short term loans to commercial banks if they wish to make loans that would otherwise result in their reserves falling below the required level.

The central bank is the **lender of last resort** for commercial banks, meaning that generally commercial banks prefer to borrow from one another to meet their reserve requirements, but when not enough funds are available from other commercial banks, they can turn to the central bank to meet shortfalls in their required reserves.

By increasing the discount rate, the central bank sends a signal to commercial banks that making loans beyond what they have in their excess reserves is a bad idea, because the cost of repaying the borrowed funds will be higher for the bank.

Lowering the discount rate sends the signal that it is okay to makes loans beyond what commercial banks have in their excess reserves, because borrowing from the central bank to make up the shortfall is relatively cheap!

Like the reserve requirement, changing the discount rate is a relatively infrequently used tool of monetary policy.

The relative importance of the three monetary policy tools
The three tools of monetary policy are called into action to varying degrees by the world's central banks. The most commonly used tool is open market operations, while reserve ratios and discount rates tend to be changed less frequently.

| Relative Importance of the Monetary Policy Tools | |
|---|---|
| **Open Market Operations** | Open-market operations are the buying and selling of government bonds in the financial market. Because it is the most flexible, bond holdings by the central bank can be adjusted daily, and have an immediate impact on banks' reserves and the supply of money in the economy |
| **Reserve Ratio** | The required reserve ratio is RARELY changed. RRR in the US has been .10 since 1992. Reserves held by the Central Bank earn little or no interest; therefore if RRR is raised, banks' profits suffer dramatically since they have to deposit more of their total reserves with the Fed where they earn almost no interest. Banks prefer to be able to lend out as much of their total reserves as possible |
| **Discount Rate:** | Until recently, the discount rate in the US was rarely adjusted on its own, and instead hovered slightly above the federal funds rate. In 2008, the US Fed lowered the discount rate to very low levels as uncertainty among commercial banks brought private lending to a halt. The "discount window" is only supposed to be used in the case of private lenders being unable to acquire funds, hence the Fed is the lender of last resort |

## Monetary policy and inflation targeting

- Explain that central banks of certain countries, rather than focusing on the maintenance of both full employment and a low rate of inflation, are guided in their monetary policy by the objective to achieve an explicit or implicit inflation rate target.

As we have demonstrated above, changes in the money supply can have immediate impacts on aggregate expenditures, output, employment, and the price level. In this way, monetary policy provides a powerful tool for stimulating or contracting the overall economy and promoting macroeconomic stability.

The primary objective of some central banks, however, is to focus their policies on promoting price level stability; more specifically, central banks tend to have a **target inflation rate** that they attempt to maintain in the economy. For most major, developed economies, the target inflation rate is typically in the range of 2% to 3%.

If actual inflation is below the target rate, central banks tend to engage in expansionary monetary policy. For example, assume Wahoovia is currently experiencing inflation of just 1%.

- The central bank fears that this low rate of inflation could discourage investment and possibly lead to deflation and rising unemployment.
- The central bank should buy bonds on the open market.
- The money supply increases and interest rates fall.
- Low interest rates will make borrowing and spending more attractive to businesses

and households.
- More investment and consumption should boost AD and increase the equilibrium price level.
- When inflation returns to the 2%-3% range the central bank could stop buying bonds. Inflation is back within its target range.

What if inflation is higher than the target rate? Say Wahoovia instead has 5% inflation.
- The central bank fears this will lead to even higher inflation as consumers scramble to buys things before they get even more expensive.
- Also, high inflation is eroding the real income of Wahoovians.
- The central bank decides to intervene and sell bonds on the open market.
- The money supply decreases and interest rates rise.
- Higher interest rates make borrowing more costly so households and firms prefer to save more and spend less.
- Less investment and consumption reduces AD and brings down the equilibrium price level.
- When inflation returns to the 2%-3% range the central bank could stop selling bonds. Inflation is back within its target range.

## Evaluation of monetary policy

- Evaluate the effectiveness of monetary policy through consideration of factors including the independence of the central bank, the ability to adjust interest rates incrementally, the ability to implement changes in interest rates relatively quickly, time lags, limited effectiveness in increasing aggregate demand if the economy is in deep recession and conflict among government economic objectives.

As with fiscal policy, the effectiveness of monetary policy may be hindered by **time lags**. By the time central bank policymakers have identified and quantified a macroeconomic problem (deflation, high inflation), and intervened to correct the problem, there is the chance that macroeconomic conditions could have changed sufficiently to render the bank's intervention ineffective.

Additionally, the effectiveness of monetary policy as a tool for combating inflation or a recession may be limited by other factors.

| **Factors that may limit the effectiveness of monetary policy** | |
|---|---|
| **The degree of inflation:** | In periods of extremely high inflation, it is unlikely that a contractionary monetary policy alone will be adequate to bring inflation under control.<br>➢ The expectation of high inflation creates a strong incentive among households and firms to spend money in the present rather than waiting till the future, when prices are expected to be higher.<br>➢ A substantial increase in interest rates (to a level higher than the expected inflation rate) would be required to reign in present spending reduce aggregate demand<br>➢ Contractionary fiscal policy (higher taxes, reduced government spending) may be needed to support higher interest rates during periods of high inflation |

| | |
|---|---|
| **The depth of the recession:** | In periods of weak demand, high unemployment and deflation, it is unlikely that an expansionary monetary policy alone will be adequate to bring an economy back to full employment<br>➢ When private spending (consumption and investment) are deeply depressed, a decrease in interest rates may not be enough to stimulate spending and AD<br>➢ With the expectation of future deflation, the private sector has a strong incentive to save, since money saved now will be worth more in the future.<br>➢ Expansionary fiscal policy may be needed to reinforce the decrease in interest rates to boost demand to its full employment level. |

Supply-side effects of monetary policy
While monetary policy is generally considered a demand-side policy (since changes in interest rates directly affect investment, a component of AD), it can also impact the level of aggregate supply in a country.

For example, assume a country's central bank lowers interest rates to stimulate AD during a recession.

- Lower interest rates lead to more investment and consumption, so AD increases.
- More investment leads to an increase in the nation's capital stock.
- More capital makes labor more productive and reduces production costs over time, increasing SRAS and LRAS.
- The increase in AD brings the recession to an end, while the increase in LRAS means the economy's potential output has increased.

If the economic conditions are right and firms are willing to invest, expansionary monetary policy can contribute to long-run economic growth!