Chapter 4 - The Financial Sector

Financial Assets

A **financial asset** is any non physical asset that is relatively liquid (can be converted to cash) whose value is derived from a contractual claim. Cash is a financial asset with which everyone is familiar. It is basically a piece of paper that has no physical value (as land or precious metals do), rather its value is based on the contractual agreement between the holder of cash and the government that issued that cash. We believe in the value of cash because we believe that the government that issued it will manage its supply responsibly. Other types of financial assets include:

- Deposits at banks
- Bonds
- Equity (stocks)

Along with coins and paper money, demand deposits are the most "liquid" financial assets, meaning they can easily be used for the purchase of goods, services, or other assets. **Demand deposits** refer to money kept in an account at an institution such as a commercial bank against which checks can be written or a debit card can be used to buy goods and services.

If you have a checking account, then the money you see on your account statement either is your demand deposits. This money, while it is not necessarily held as cash by the bank, can be spent just like cash using a debit card.

Besides cash and demand deposits, people may choose to hold less liquid financial assets such as bonds and equities (stocks):

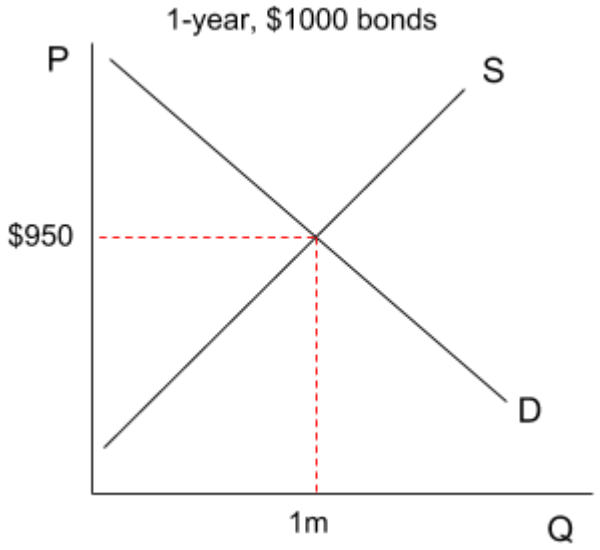
- **Bonds** are debt contracts that are issued by governments or corporations. They cannot be used as a means of payment and cannot be converted to cash easily enough to be considered a form of money.
- **Equities** (also called **stocks**) are ownership shares in a corporation. They are not considered money because they cannot be immediately converted to cash and exchanged for goods and services.

Governments and private companies can issue and sell bonds as a way of raising money to invest in public goods or capital. In order to attract investors in these bonds, the issuer must offer a yield (or interest), which is inversely related to the price of the bond.

For example, let's assume the US government wishes to borrow $1 billion from the public in order to finance a budget deficit (a shortfall of tax revenue compared to government spending). To raise the money, assume the government issues one million 1-year bonds with a face value of a $1,000 each (1 million × $1,000 = $1 billion). A bond represent a promise to pay the person who buys it the face value of the bond exactly one year in the future.

No rational investor would be willing to pay the face value for the bond, because it would not be profitable to lend the government $1,000 today only to get repaid exactly $1,000 in the future. In order to make the investment attractive, therefore, the government must sell the bond for something less than $1,000 today. The lower the price of the bond, the higher the **yield** (another term for the interest) earned by the investor who buys it.

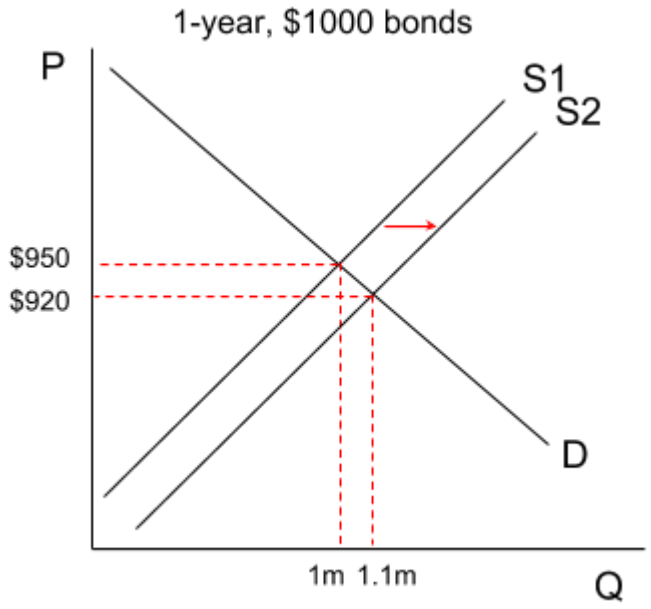
The graph below shows the market for 1-year, $1,000 US government bonds. The price of the bonds is determined by the supply (based on the amount of bonds issued by the government, which in turn is based on the government's need for borrowing), and the demand for bonds (based on the price investors have to pay).



At a price of $950, the government is able to sell 1 million bonds to investors. We can determine the interest these bonds will yield those who buy them, knowing that exactly one year after purchasing a bond an investor will be able to sell it back to the government for $1,000.

- Investor's purchase price = $950
- Price government pays after one year = $1000
- Investor's return = $50
- Interest on investment = $\frac{50}{950} \times 100 = 5.26\%$

An investor who pays $950 for a $1,000, 1-year bond will earn interest of 5.26%. What happens if the government needs to issue more bonds to finance an even larger budget deficit? The supply of bonds will increase and, just like in any market, the equilibrium price will decrease.



To raise more money, the government has supplied more bonds to the market. In so doing, the price of bonds has decreased. The lower price has made bonds a more attractive investment to investors, who will now enjoy a higher yield. We can calculate the new interest rate of 1-year, $1,000 government bonds:

- Investor's purchase price = $920
- Price government pays after one year = $1000
- Investor's return = $80
- Interest on investment = $\frac{80}{920} \times 100 =$ **8.69%**

As bond prices fall, the interest rate investors earn increases. Now, instead of earning just over 5% on their investment in government bonds, investors enjoy a nearly 9% return on the money they lend to the government.

Why not just hold cash?

As we have learned, financial assets come in highly liquid forms (cash, demand deposits) and relatively illiquid forms (bonds and stocks). Why would anyone prefer a less liquid asset (that cannot be easily exchanged for goods and services) over a more liquid asset ("fun tickets", as some people call them, which can be quickly and easily spent on things like movies and travel and new clothes)?

Of course, the answer to this is that the most liquid financial assets generally do not earn any interest for those who hold them. Consider, for example, young Shannon, who has just inherited $1 million from a long-lost uncle who she did not even know existed. She has a couple of options:

- Fill a full-size pool with one million $1 bills and grab fistfulls of cash whenver she wants to buy something, or
- Invest in a mix of less liquid financial assets, including savings accounts, government bonds, private sector bonds, and equities.

While the first option certainly has its appeal (think Scrooge McDuck backstroking through his pool of gold coins), the second option is probably the more financially responsible thing to do. Here's why: the opportunity cost of holding money is the interest that could have been earned by investing in other financial assets, such as bonds.

Assume the government is selling $1,000 bonds at a price of $950 today. Shannon could invest her full $1 million inheritance into bonds and over the first year earn a return of $52,600, enough for her to live comfortably on without spending a single dollar of her inheritance itself.

An individual or institution's demand for money as an asset, therefore, is inversely related to the interest rate in the economy. At higher interest rates, less money is demanded by households as an asset, since the opportunity cost of money is greater. At lower interest rates, more money is demanded as an asset, since the opportunity cost of holding money is lower.

Nominal vs. Real Interest Rates

When talking about interest rates, it is important to distinguish between the nominal interest rate and the real interest rate.

- The **nominal interest rate** is the annual rate a borrower must pay back a lender for the use of borrowed money.
- The **real interest rate** is the annual rate a borrower must pay back a lender for the use of borrowed money expressed in dollars of constant value. The real interest rate is the nominal interest rate adjusted for inflation.

Lenders and borrowers will establish nominal interest rates based on their desired rate of return and the expected rate of inflation. For example, if a bank is lending money to Rahim, and the two agree that the bank should earn a real return of 5% each year the loan is paid back, then the bank and Rahim must establish a nominal interest rate that takes into account the expected inflation rate.

- Desired real return = 5%
- Expected inflation rate = 3%
- Nominal interest rate = 5% + 3% = **8%**

In order for the bank to earn a real return of 5% , it must charge a nominal interest rate of 8%, since inflation is expected to reduce the value of the money Rahim repays by 3%.

$$\textit{Nominal interest rate} = \textit{desired real rate} + \textit{expected inflation rate}$$

If we know the nominal interest rate and the rate of inflation, we can calculate the real interest rate.

$$\textit{Real interest rate} = \textit{nominal interest rate} - \textit{inflation rate}$$

The "inflation premium"

Lenders charge an "inflation premium" by adjusting the nominal interest rates they charge borrowers by the anticipated inflation rate. Higher expected inflation will lead banks to raise the inflation premium and increase the nominal interest rate on new loans. This way, banks are protected from the diminished purchasing power of the money they are repaid. The nominal interest rate established is the expected real interest rate plus the expected inflation rate.

Interest rate determination

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 will be introduced in more detail in a later section of this chapter.

Real interest rates are determined in the market for loanable funds, where the supply of savings and the demand for investment establish equilibrium interest rates in the economy. The loanable funds market will also be explored in more detail later in this chapter.

Definition, Measurement, and Functions of Money

Money is any asset that is widely accepted as a means of payment. Money can be either **commodity money** (whose value comes from the commodity from which it is made, such as a silver coin), or **fiat money** (which has no intrinsic value, such as paper currency). As long as the asset is widely accepted as payment for goods and services, it can be considered money.

The functions of money

Any asset used as money must serve three basic functions:

- **Medium of exchange:** Money must be widely accepted as a means for purchasing goods, services, or other assets. Therefore, money is best when it is portable and durable, able to remain in circulation for a long period of time without deteriorating. While coins are particularly durable, paper money is exceptionally portable. Both are universally accepted as a medium of exchange buy sellers.
- **Store of value:** Any asset that can transfer purchasing power from the present to the future is a store of value. When Shannon chooses not to spend $1000 today but instead saves it for future consumption, she puts faith into money's ability to store value for the future.
- **Unit of account:** Money is used as a means of expressing the value of something. When we say "this car cost $30,000" or "this car cost $3,000", we have a pretty good understanding of which car is nicer than the other. In this case money (dollars) are used as a unit of account; we know how much something is worth based on how much money one is willing to spend on it.

Measuring the money supply

A nation's money supply has several components, which are referred to as "M0", "M1", and "M2":

- **M0:** Also called the **"monetary base"**, M0 includes includes currency in circulation and commercial banks' reserves held at the central bank.
- **M1:** The M1 money supply includes the monetary base (M0) plus all the demand deposits of the nation's households.
- **M2:** The M2 money supply includes M1 plus less liquid forms of money, including savings accounts, small-denominated time deposits, and money market mutual funds. M2 is the broadest measure of a country's money supply.

Notice that not all financial assets are included in the money supply. Bonds, equities, and other relatively illiquid assets are not considered "money" since they do not fulfill all of money's requisite functions.

Consider the table below, which includes the value of the different types of money in Country X.

Type of asset	Value
Cash and bank reserves	$200 million
Demand deposits	$300 million
Savings deposits	$300 million
Small-denominated time deposits	$50 million
Money market mutual funds	$150 million

From this table, we can determine the size of each of the components of the country's money supply.

- **MO:** Cash and bank reserves = **$200 million**
- **M1:** M0 + demand deposits = 200 million + $300 million = **$500 million**
- **M2:** M1 + M2 + savings deposits, small-denominated time deposits, and money market mutual funds = $500 million + $300 million + $50 million + $150 million = **$1 billion**

Country X's total money supply equals $1 billion. This includes all forms of money, from the most liquid forms in the monetary base (M0) and demand deposits (M1) to the less liquid forms included only in M2. Notice that not included in the money supply are non-money financial assets such as the value of stocks and bonds.

Banking and the Expansion of the Money Supply

Depository institutions, such as banks, serve a very important purpose in modern economies. By accepting deposits in checking and savings accounts, banks protect the money of the nation's households. By making loans to businesses and other households, banks provide money for investments in infrastructure, capital equipment, and housing for the economy. Banks act as the primary intermediary between households who wish to earn interest on their savings and businesses who want to borrow money for investment.

Whenever a bank accepts a deposit from a household, that money is considered a liability for the bank. A **liability** is created when someone owes someone else money because of a past transaction. For the depositor, the money is an **asset**, which means it is something of value that someone owns or is that someone is owed sometime in the future.

If James deposits $1,000 in a bank, that money is an asset for James and a liability for the bank. On the other hand, if a bank loans $1,000 to Jessica, that $1,000 is an asset for the bank and a liability for Jessica, since it is she who owes the bank money sometime in the future.

Balance sheets

Banks organize their assets and liabilities into **balance sheets**, which are accounting tools for visualizing and keeping track of the money coming and going into and out of a bank.

The table below is an example of a simple bank balance sheet for the Bank of Wonton.

Bank of Wonton's balance sheet			
Assets		**Liabilities**	
Reserves	$5,000	Demand deposits	$20,000
Loans	$15,000	Owner's equity	$5,000
Government bonds	$3,000		
Property	$2,000		
Total assets	**$25,000**	Total liabilities	**$25,000**

The first thing to notice about the bank's balance sheet is that it is balanced! A bank's assets always equal its liabilities. Let's go into some more detail about the different parts of the Bank of Wonton's balance sheet.

First the liabilities:

- This bank has total **demand deposits** of $20,000. This is the money bank customers have deposited and are able to write checks against or use their debit cards to buy stuff with. Demand deposits are a liability for the bank because they are other people's money. The bank is obliged to provide the depositors with these funds upon request.
- **Owner's equity** is the money the bank's founders (or investors) pitched in to start the bank with. This is a liability for the bank because if any of the investors ever wish to withdraw their equity and invest it elsewhere the bank would owe the individual his or her share of the equity.

The bank's total liabilities are the money it owes people, either depositors or the bank's investors.

Now for the assets:

- **Reserves** are the portion of the bank's total deposits that the bank has not loaned out. This is "cash on hand" at the bank (or, more likely, at the central bank in whatever country the Bank of Wonton operates in).
- **Loans** are the money the bank has loaned to private borrowers (such as businesses or households who have borrowed to invest in capital or housing). Loans are an asset because they represent money owed to the bank.
- **Government bonds** are loans the bank has made to the government. As learned in a previous chapter bonds are certificates of debt owed to the holder of the bond by the issuer of the bond. Since the government owes the bank this money, it is an asset for the bank.
- **Property** is the physical capital of the bank itself. This includes any buildings, land, computers, desks and chairs, and all other physical assets owned by the bank.

The bank's total assets are the money it is owed by others, the money it has on hand (reserves), and the bank's physical property.

Fractional reserve banking

By accepting deposits from households, then lending out a proportion of those deposits to borrowers, which themselves end up being deposited and lent out again and again, banks create new money through their everyday activities.

Commercial banks are required to keep a certain percentage of deposits in reserve. **Required reserves** are the portion of a bank's deposits the bank is required by the country's central bank to keep in reserve. For example:

- A reserve requirement of 20% means that a bank with total deposits equaling $1 million would have to keep $200,000 on reserve at the central bank. This money may not be loaned out by the commercial bank.
- With the other $800,000, the bank can make loans and charge interest on those loans. The bank's business model is to charge a higher interest rate to borrowers than it pays to households saving money with the bank.

Excess reserves are a bank's actual reserves minus required reserves. Banks are allowed to make loans only from their excess reserves.

The table below shows the balance sheet of the Bank of Mushu

Bank of Wonton's balance sheet			
Assets		**Liabilities**	
Required Reserves	$15,000	Demand deposits	$30,000
Excess reserves	$3,000	Owner's equity	$4,000
Loans	$8,000		
Government bonds	$5,000		
Property	$3,000		
Total assets	$34,000	Total liabilities	$34,000

The Bank of Mushu has $30,000 in total deposits and it is required to keep $15,000 in reserve. We can determine the **reserve requirement** (also called the **required reserve ratio**) by dividing the bank's required reserves by its total deposits:

$$Reserve\ requirement = \frac{required\ reserves}{total\ deposits}$$

$$= \frac{\$15{,}000}{\$30{,}000} = \mathbf{0.5}$$

The Bank of Mushu (and other banks in this country) are required to keep 50% of their total deposits in reserve. Typically, the actual money will be kept at the country's **central bank**, which is the national bank that sets bank regulations and controls the country's money supply (much more on central banks in a later section of this chapter).

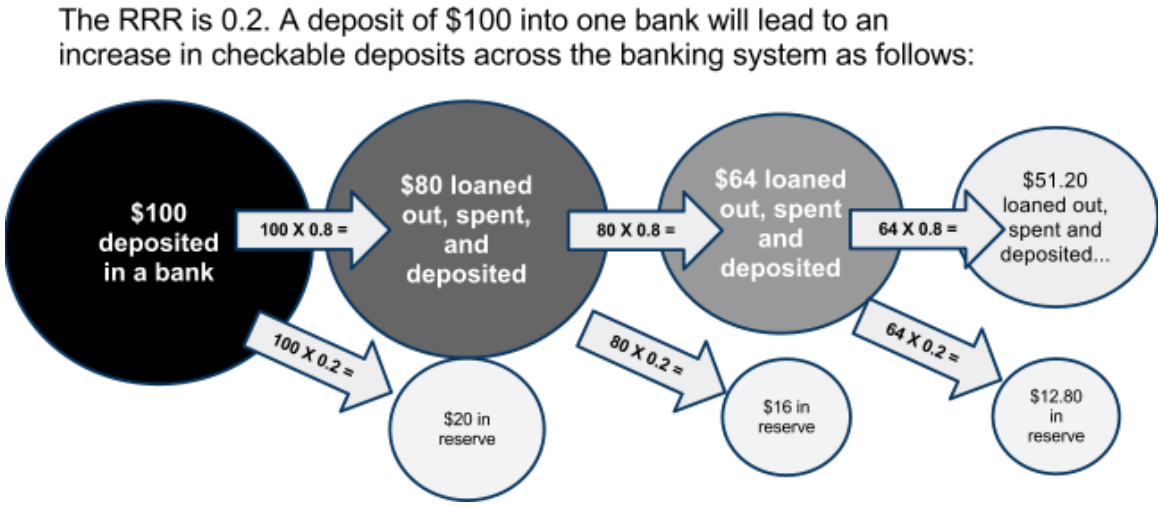
Notice that the bank has excess reserves of $3,000. This is money the bank can make new loans with. Excess reserves are the basis of the expansion of the money supply by the banking system.

How banks create new money

Whenever a bank makes a loan to a borrower, new money is actually being created by the banking system. It sounds crazy, but it really does happen.

To understand how money is created in a fractional reserve banking system, assume that The Bank of Wonton receives a deposit of $100 and that the central bank requires all commercial

banks to keep 20% of their total deposits on reserve (the required reserve ratio is 0.2). The graphic below illustrates how this $100 deposit will lead to the creation of $400 of new money across the banking system.



Money deposited in one bank can be loaned out to borrowers, spent, deposited in other banks, and loaned out again. In this way, an initial change in bank deposits will lead to a greater change in the overall money supply in an economy. The degree that the money supply will be affected depends on the size of the money multiplier.

$$\textit{The Money Multiplier} = \frac{1}{\textit{Required Reserve Ratio}}$$

To determine the total impact on the money supply of an initial change in a bank's deposits, we can multiply the initial change in excess reserves by the money multiplier. For example, when $100 is deposited in the Bank of Wonton:

- Required reserves increase by $20.
- Excess reserves increase by $80.
- Assuming the bank loans out all of its excess reserves, we can multiply the change in excess reserves by the money multiplier:

$$80 \times \frac{1}{0.2} = 80 \times 5 = \mathbf{\$400}$$

The initial deposit of $100 will lead to $400 of new money throughout the economy.

The amount predicted by the simple money multiplier may be overstated because it does not take into account a bank's desire to hold excess reserves or the public holding more currency. Our assumption in the calculation above is that:

- the bank loans out all of its excess reserves, and
- borrowers spend and deposit all the money that is loaned by banks

In reality, banks may choose to hold some of their excess reserves as cash and households

may choose to hold some of their savings as cash. The fancy terms for this behavior is **liquidity preference**. Depending on the degree of banks' and the public's liquidity preference, the money multiplier in reality will be smaller than that predicted by the simple equation above..

The money multiplier is the ratio of the money supply to the monetary base. To understand why, let's revisit our money supply table from earlier in the chapter:

Consider the table below, which includes the value of the different types of money in Country X.

Type of asset	Value
Cash and bank reserves	$200 million
Demand deposits	$300 million
Savings deposits	$300 million
Small-denominated time deposits	$50 million
Money market mutual funds	$150 million

Recall that the total money supply (M2) in this country was $1 billion. The monetary base (M0, which includes cash and bank reserves) is $200 million. The money multiplier can be calculated as the ratio of M2 over M0.

$$Money\ multiplier = \frac{M2}{M0}$$

$$= \frac{\$1\ billion}{\$200\ million} = 5$$

There is just $200 million of actual cash in this economy. Yet, from this relatively small amount of cash there is a money supply of $1 billion. All the demand deposits, savings deposits, and money in small-denominated time deposits and money market mutual funds is money that was created through the lending activities of commercial banks from the reserves created through households' deposits.

The Money Market

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

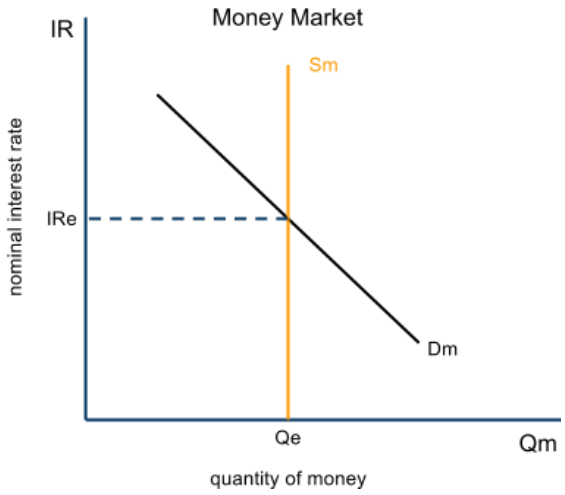
Money demand represents the quantity of money (M1) the public demands at a range of interest rates as an asset and for the purchase of goods, services, and resources. There are

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, where 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.

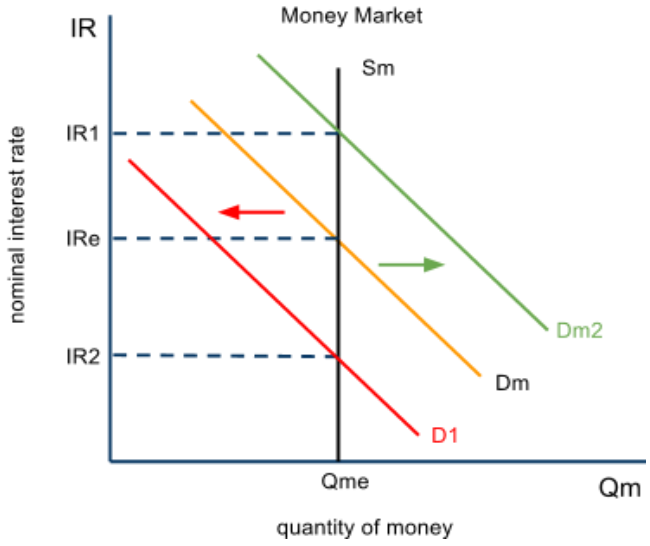
- **At 6%** the quantity of money demanded as an asset or for transactions by households, firms, the government, and foreigners is only $0.8 billion. The quantity supplied by the central bank, however, is $1 billion. There is a surplus of money in the economy, most likely sitting in banks' excess reserves 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.



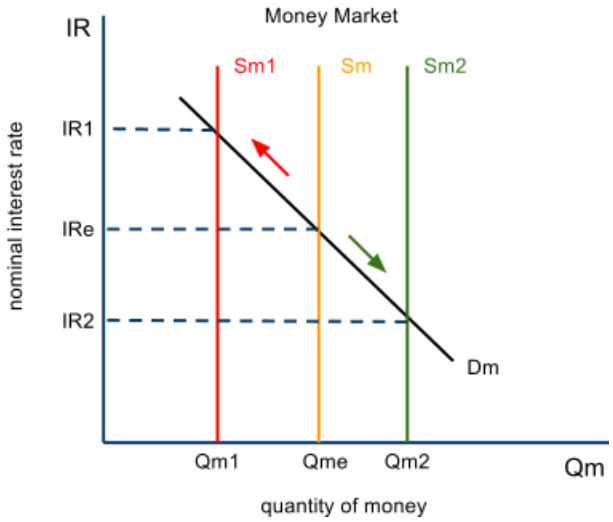
Observe the following:

- 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

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

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 • Coordinated by the Fed's Board of Governors • The "Fed" provides banking services to commercial banks ➢ 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 • 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. • 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. • Lending money to banks: The Fed charges commercial banks interest on loans, this is called the "discount rate". • 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 (remember our balance sheets from earlier in this chapter?) Bonds are not money. So if a central bank wishes to increase the supply of money in the economy, it can simply 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 RRR, a central bank immediately increases commercial banks' excess reserves, which frees up money for new loans. By increasing the RRR, 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:

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

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

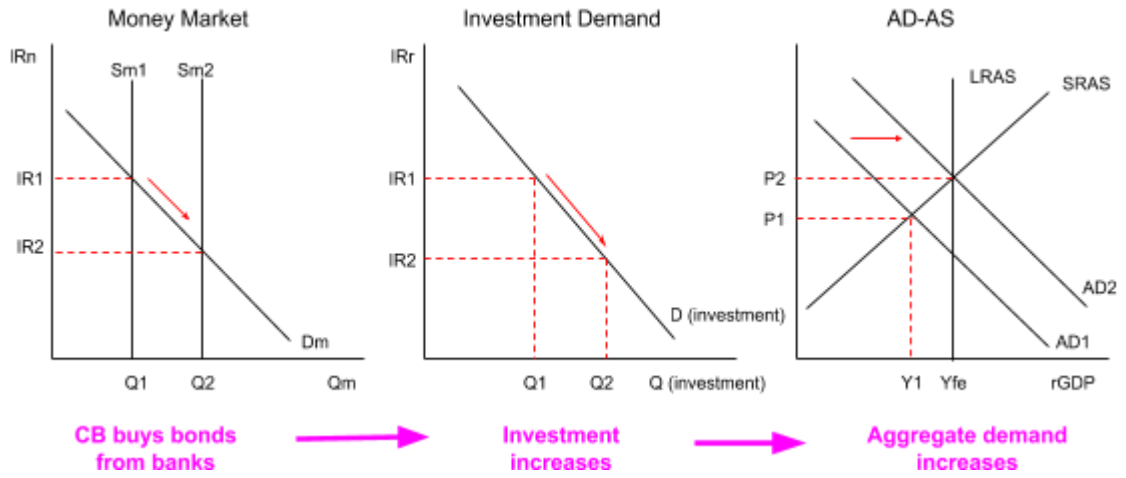
If the central bank wishes to increase the money supply by $10 billion, it must purchase $2 million in government bonds from the public. Doing so will increase banks' excess reserves by $2 billion, which will increase the money supply based on the money multiplier.

$$\Delta\ in\ money\ supply\ = \Delta\ in\ excess\ reserves\ \times\ money\ multiplier$$

$$= \$2\ billion\ \times 5\ =\ \mathbf{\$10\ billion}$$

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.

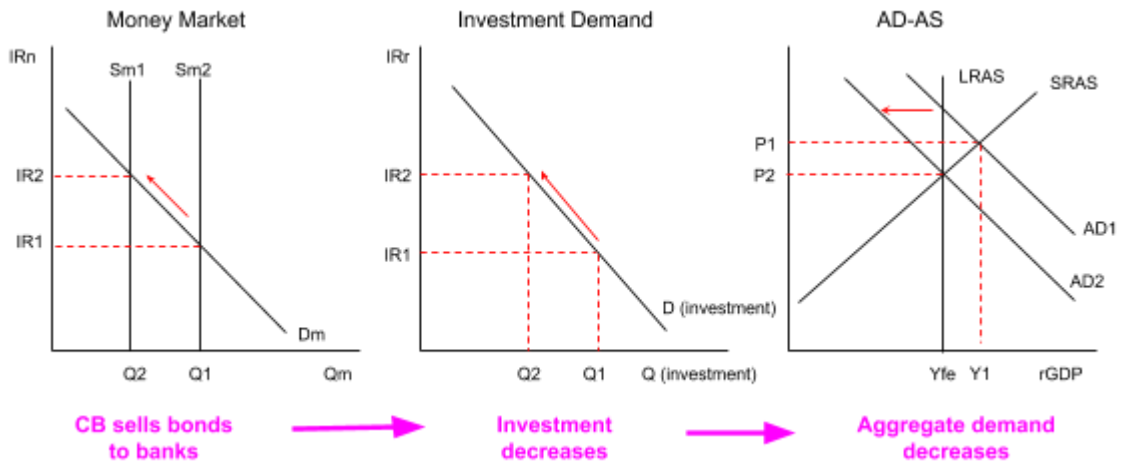
Let's assume the central bank wishes to reduce the money supply by $5 billion. With the money multiplier, we can calculated how much the central bank should sell in government bonds to the public. All we must do is divide the desired change in the money supply by the money multiplier:

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

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

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 rate, 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.

Raising 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 is 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

Inflation targeting in monetary policy

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 most 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.

Evaluating monetary policy

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. ➢ 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. ➢ 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 ➢ 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 ➢ When private spending (consumption and investment) are deeply depressed, a decrease in interest rates may not be enough to stimulate spending and AD ➢ 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. ➢ 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.

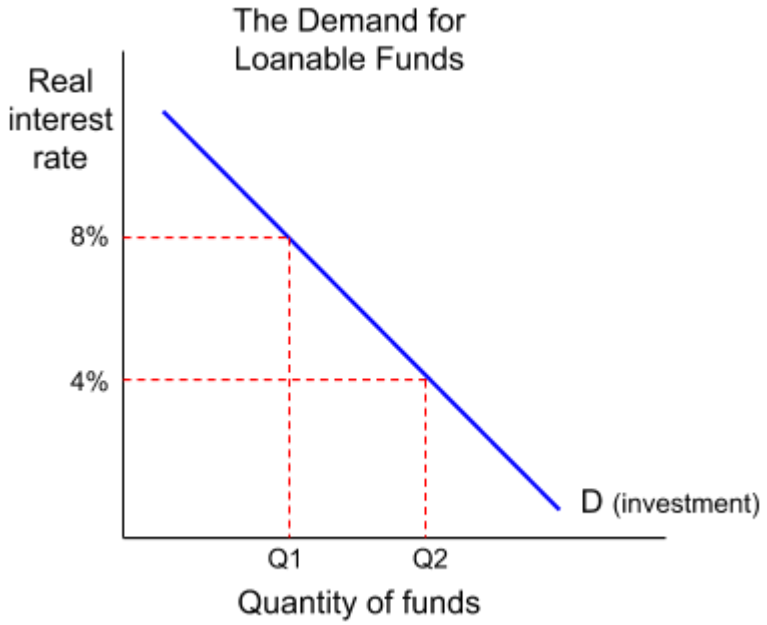
For example, assume a country's central bank lowers interest rates to stimulate AD during a recession.

- 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!

The Loanable Funds Market

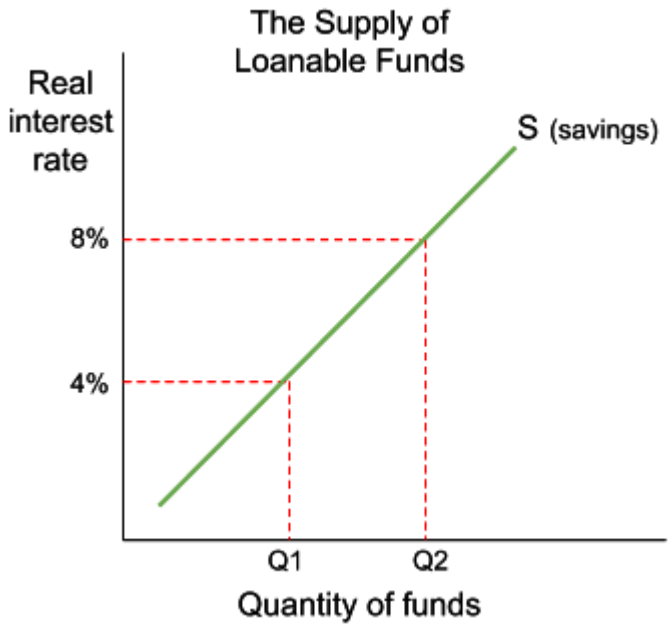
In chapter 3, when explaining the components of aggregate demand, a graph was introduced that showed the inverse relationship between the real interest rate and the quantity of funds demanded for investment in the economy. That graph is seen below.



The demand for investment is also known as the **demand for loanable funds**. Demand for loanable funds represents the quantity of money (funds) demanded for investment in capital equipment by firms and in housing and property by households. At higher real interest rates, you'll recall, less funds are demanded since the cost of repaying any borrowed funds is higher. At lower real interest rates, more funds are demanded since the cost of repaying loans is lower.

To complete our **loanable funds market**, which shows the behavior of a nation's savers and borrowers, we must add a **supply of loanable funds** curve to our graph.

The supply of loanable funds describes the relationship between the real interest rate and the quantity of funds supplied by a nation's savers (households, firms). The graph below shows the supply of loanable funds.



At low interest rates, households are willing to supply less funds to the banking sector, since the opportunity cost of holding money as cash or of spending their money is lower (they'll miss out on less interest income).

However, at higher interest rates households are willing to supply more funds to the banking sector. Basically, households are willing to save more at high interest rates and save less at low interest rates. There is a direct relationship between the real interest rate and the quantity of funds saved by households.

The supply of loanable funds represents the sum of both private sector and public sector savings. Another way to look at this is that the total savings in a nation (S) is equal to national income (Y) minus consumer spending (C) and government spending (G). Whatever is earned by a nation and not spent is, well… saved!

$$National\ savings\ (S) = National\ income\ (Y) - Consumption\ (C) - Government\ spending\ (G)$$

or...

$$S = Y - C - G$$

Recall that national income (Y) equals the sum of consumption, government spending, investment, and net exports. Let's imagine a simple, closed economy without any international trade. In this economy, national income is made up of just consumption, government spending, and investment. Therefore, if income minus consumption and government spending equals savings, then savings must equal investment.

$$Y = C + G + I$$

and...

$$S = Y - C - G$$

therefore...

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

so…

$$S = I$$

In a closed economy, the amount of savings and investment are equal. Funds that are saved by the private and public sector are invested.

Consider the table below, which shows the expenditures in a Shrubville, a country that is completely isolated and does not trade with any other countries.

Category	**Amount (millions of $)**
Consumption	600
Investment	300
Government spending	100

Shrubville's total GDP (Y) is the sum of C, I, and G.

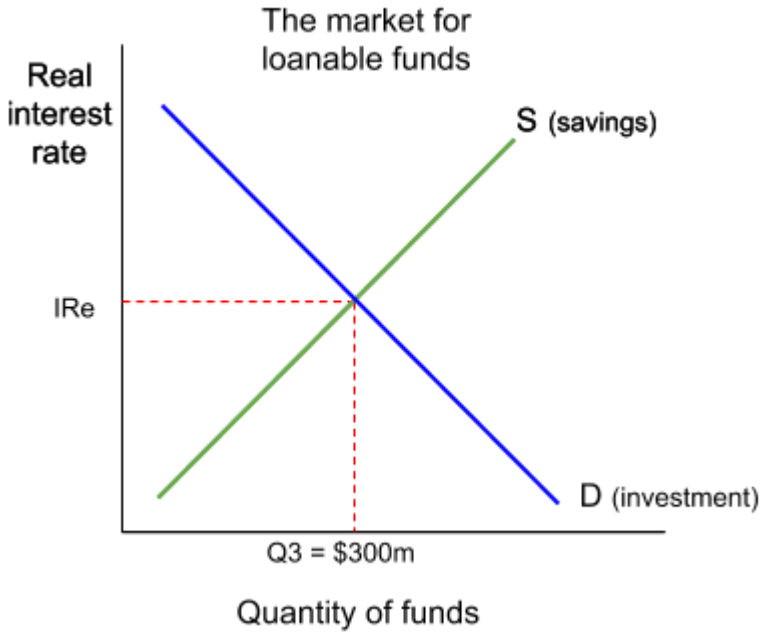
$$Y = C + I + G = 600 + 300 + 100 = \textbf{\$1,000 } \textbf{\textit{million}}$$

To determine how much savings there is in Shrubville, we can subtract consumption and government spending, which leaves us with investment.

$$National\ savings\ (S) = Y - C - G = \$1,000m - \$600m - \$100m = \textbf{\$300 million}$$

The country's savings of $300 million equals the investment of $300 million. Why is savings equal to investment? Because every dollar the country invests must first have been saved by a household, firm, or the government.

Returning to our loanable funds market graph, we can see that the equilibrium in the loanable funds market occurs where the quantity of funds supplied by savers equals the quantity of funds demanded by investors. In other words, the market is in equilibrium when savings equals investment!



In an **open economy** (one that trades goods and services and engages in foreign investment with other countries) investment equals the sum of national savings and net capital inflows. **Net capital inflows** measure investment into an economy's assets by other countries minus investment into other countries' assets by domestic investors.

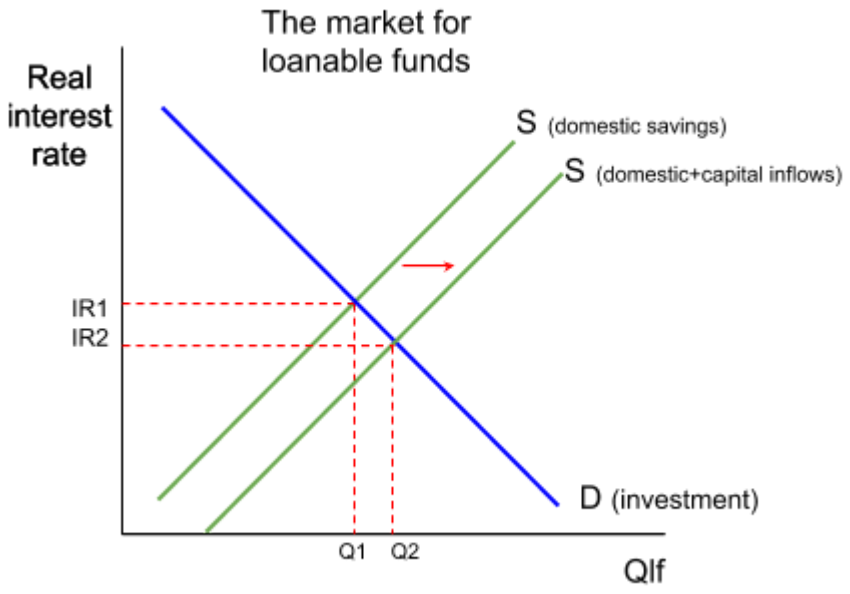
- If foreigners invest more in the domestic economy than is invested abroad by domestic investors, net capital inflows will be positive
- If domestic investors spend more on foreign capital than foreigners spend in the home economy, net capital inflows are negative (a negative net capital inflow is also called a **capital outflow**).

$$Investment\ (I) = National\ savings\ (S) + net\ capital\ inflows$$

When net exports are negative, a country spends more through trade than it earns. To balance its international accounts, countries with which the home country trades will invest in domestic assets. The resulting net capital inflow increases the supply of loanable funds in

the domestic market, reducing interest rates at home.

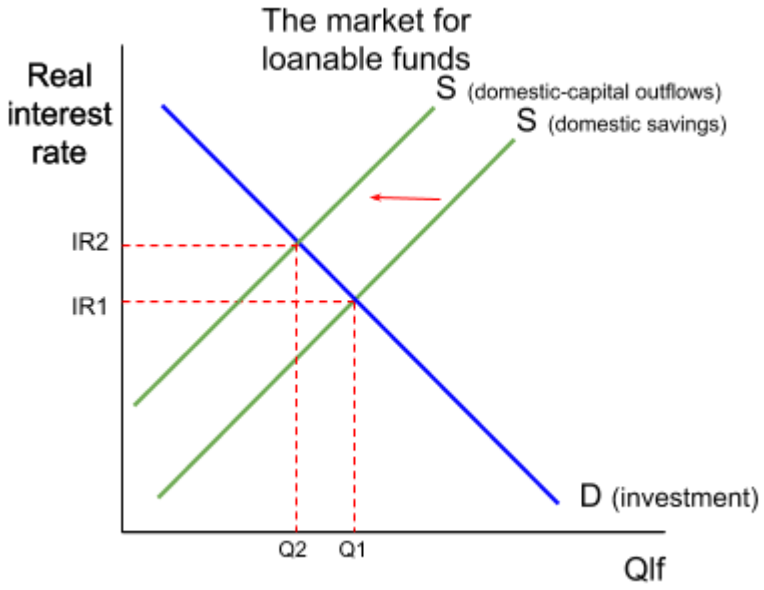
The effect of a negative trade balance (X<M) and a net capital inflow is seen in the graph below:



Investment in the home economy (Q2) equals the sum of domestic savings and foreign capital inflows. The inflow of foreign capital increases the supply of loanable funds and drives down the real interest rate and the equilibrium quantity of funds demanded.

When net exports are positive, a country earns more from trade than it spends. To balance its international accounts, the country will supply funds to the countries buying its goods for investment in those economies. The resulting net capital outflow reduces the supply of loanable funds in the domestic market, driving up interest rates at home.

The effect of a positive trade balance (X>M) and a net capital outflow is seen in the graph below:



Investment in the home economy (Q2) equals the sum of domestic savings and foreign capital inflows (which in this case, are negative). The outflow of capital into foreign economies reduces the domestic supply of loanable funds and drives the equilibrium interest rate up, reducing the quantity of domestic investment.

In an open economy, investment is the sum of national savings and net capital inflows from abroad.

Changes in the equilibrium interest rate

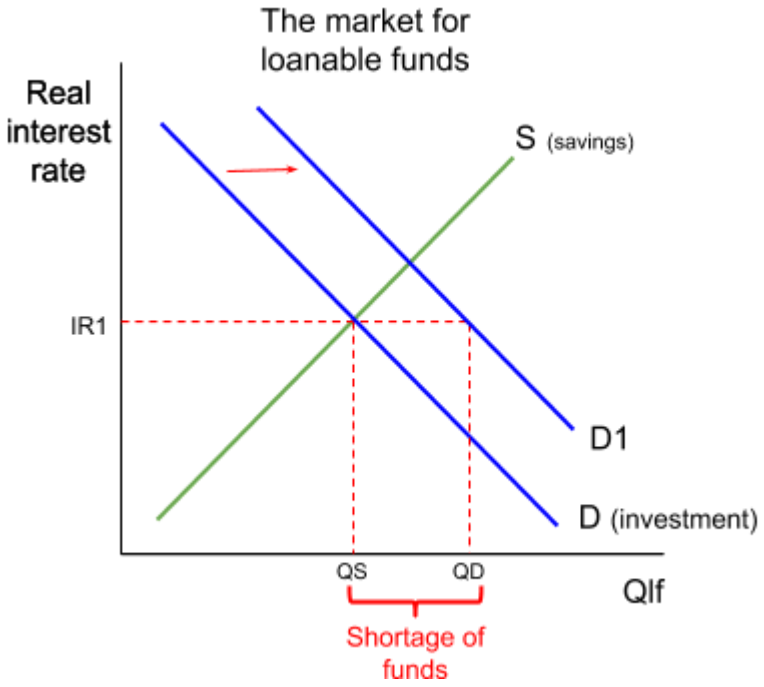
Whenever there is a shift in the demand or supply of loanable funds, there will be a temporary disequilibrium in the market until market forces drive the real interest rate toward a new equilibrium.

Factors that affect the demand for loanable funds include:

- Changes the determinants of investment in the economy, including
  - business confidence
  - expected future inflation or deflation
  - the degree of excess capacity
  - changes in technology
- Changes in the government's budget surplus or deficit
  - an increase in a government's budget deficit (when government spending exceeds tax revenues) increases demand for loanable funds
  - an increase in a budget surplus (when spending is less than tax revenues) reduces demand for loanable funds.

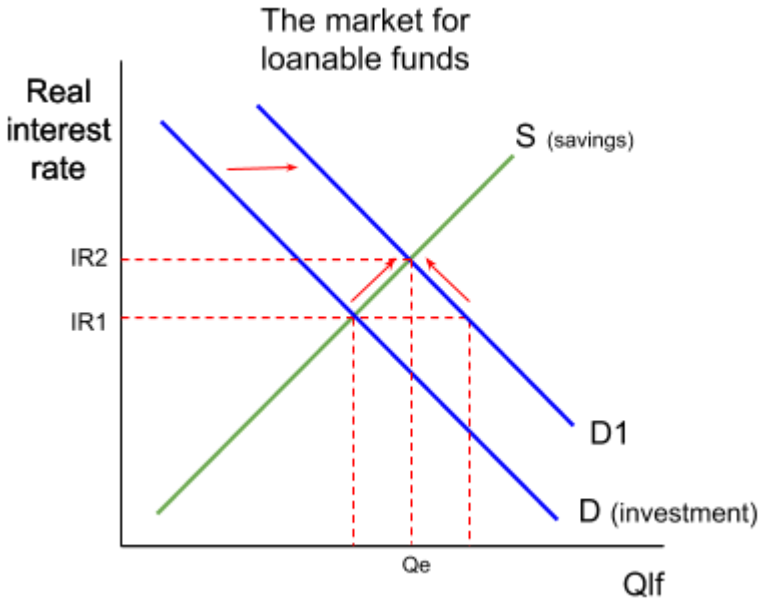
In the next chapter we'll examine how a deficit financed expansionary fiscal policy (when government spending increases without an increase in taxes) can cause the real interest rate to increase and "crowd out" private investment.

Assume businesses expect inflation to increase in the future, so they increase investment in capital equipment today. The graph below shows the effect of increased investment demand in the loanable funds market.



Higher expected inflation has increased demand for loanable funds.

- However, at the original equilibrium interest rate of IR1, there is a shortage of loanable funds.
- Interest rates must rise to restore equilibrium in the market.
- Higher interest rates will encourage households to save more, supplying more funds to businesses to invest in capital with.



When the interest rate rises, the market clears once again. The market is now at equilibrium at a new higher interest rate of IR2 and a greater equilibrium level of investment of Qe.

Factors affecting the supply of loanable funds

Factors that affect the supply of loanable funds include:

- Changes in the willingness of households to save, such as
  - expected inflation or deflation
  - future employment prospects
  - the level of consumer confidence
- Changes in international capital flows
  - capital inflows increase supply
  - capital outflows decrease supply

The effect of a change in the supply of loanable funds on equilibrium in the market can be seen earlier in this chapter on the section on net capital flows.