Chapter 6: Monetary Policy

In the last chapter, we examined the economy from the perspective of a fiscal policy maker. In theory, fiscal policy can directly impact aggregate expenditures in the economy, allowing policy makers to move equilibrium output towards the full-employment level of output, (Y-bar).

Costs of Fiscal Policy
What are some of the costs of using fiscal policy to try and move the economy to full-employment equilibrium?

Using changes in government spending and taxes (fiscal policy) to move the AE curve comes at a cost. Considering how we ended chapter 5, it is likely that much of the discussion above centers around the national debt. In the event that policy makers want to increase the equilibrium level of output, fiscal policy involves either increasing G or decreasing T. These actions increase the deficit and if the changes are large enough, they can eventually lead to increases in taxes in order to pay interest on the debt.

The previous chapter also covered the inefficiencies associated with fiscal policy. In the United States, getting hundreds of politicians to agree on changes in spending and taxation is an arduous process. Even after agreeing on changes, implementing fiscal policy can have substantial time lags and is often less effective than our multiplier effect analysis in the previous chapter suggests.

Fortunately, there is another policy tool that can help move the economy to full-employment and that is monetary policy. Monetary policy is carried out by the central bank of an economy. It involves altering the money supply with the intention of changing the interest rate faced by households and consumers. In the United States, the Federal Reserve (the Fed) is the central bank and in order to carry out monetary policy, the 12 members of the Federal Open Market Committee (FOMC) meets eight times a year and determines the appropriate course of action. We will talk more about the Fed

below, but getting 12 individuals to come to an agreement on monetary policy is a bit easier than the hundreds of policy makers typically involved in fiscal policy decisions.

Because monetary policy involves examining the consequences of changes in the supply of money, we need to develop a market for money. If this sounds a little awkward, it is because it is. Money is not typically thought of as a good, but in this chapter, we will characterize the demand and supply of money in a supply-demand framework. From there, the relationship between monetary policy, aggregate expenditures and equilibrium output will be seen. Before moving forward, we need to define what exactly we mean by "money". So let's do that right now!

Chapter 6.1: Money and the Federal Reserve

Barter Economy

In order to understand what is meant by money, first imagine a world without money. An economy without money is defined as a barter economy and involves trading goods and services directly for other goods and services. Barter economies were common in early civilizations, but were eventually phased out due to the inefficiencies associated with trading.

Although barter economies are rare, they do exist. After the collapse of the Soviet Union, Russia struggled to maintain a reliable currency. Bartering in Russia in the 1990s accounted for over 50% of economic activity in some years.

This link is a story of how bartering stifled the economy in Russian. In the article, a supervisor at a fabric factory received word that concrete utility

poles arrived at the train station. This meant she would receive energy from the power company.

The road from fabric factory to energy takes a number of detours in the story. The fabric factory needed energy. Without money, all they could offer was fabric, which the utility company did not want. After learning that the utility company needed utility poles, the fabric factory presumably contacted the concrete company and found out that they wanted a car and a truck. Again, fabric was of no use.

It turned out that a nearby auto manufacturer could give the concrete company a car and a truck if they were supplied work shirts. The fabric factory was getting closer. They gave the sewing company fabric to produce the work shirts for the auto manufacturer and extra fabric as "payment". Giving fabric to the sewing company set off the necessary chain of events that allowed the fabric factory to eventually receive energy. This complicated chain of events is seen in the figure below.

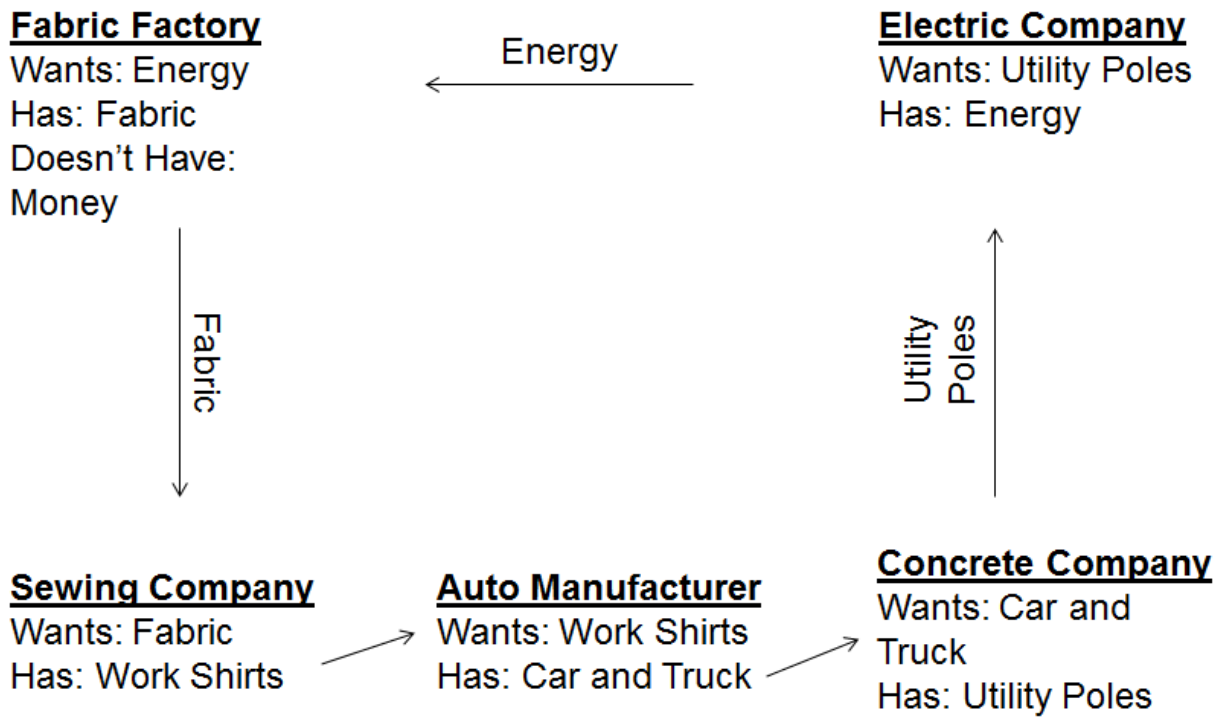


Figure 6.1.01

Hopefully when you see and read this example, you recognize that the long road from fabric to energy can be shortened considerably with money. Had the Russian Ruble been a stable currency, the fabric factory could have sold fabric to the sewing company (or any other company) in exchange for money. The money could then be used to purchase energy. All of a sudden, money eliminates the need for all the other transactions and is depicted in the figure below.

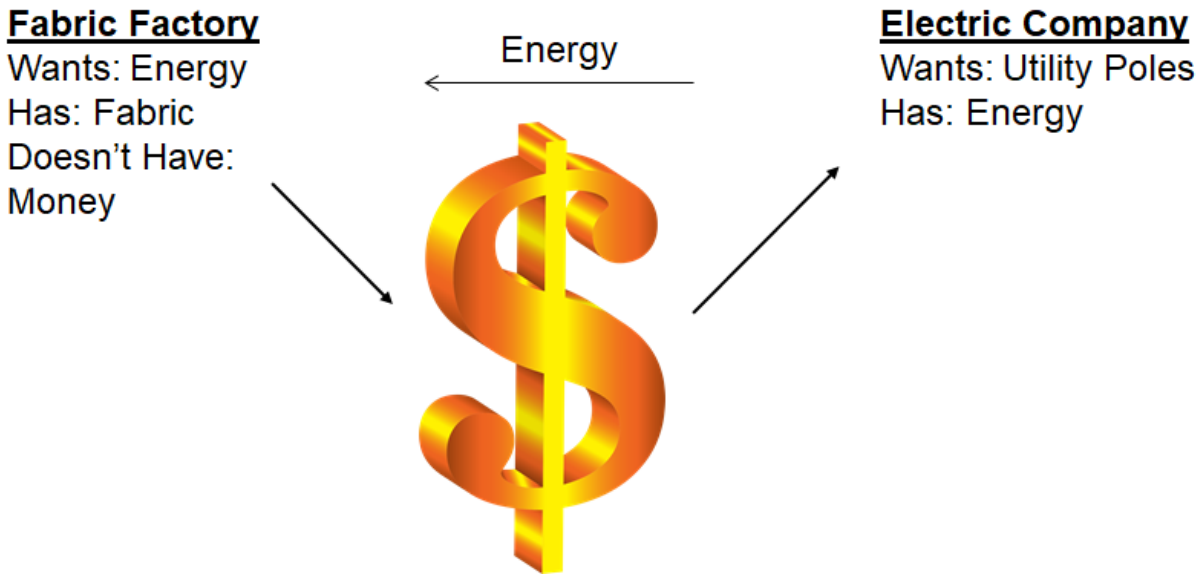


Figure 6.1.02

Bartering in Russia is less common today, but even as recently as 2009, bartering accounted for 3 to 4 percent of sales that took place in Russia. In the Solomon Islands, bartering still takes place.

Although you are unlikely to have crossed paths with bartering in Russia or the remote areas of Melanesia, bartering occurs near you. Check out your local Craigslist page and right in the middle of the page, in the "for sale" section, there is a link to "barter". There is probably a lot of "junk" you will come across, but there are often a few gems.

On May 6th, 2017, there was a post on the Los Angeles Craigslist barter page and an individual was looking to receive dental work in exchange for painting

a home. This specific request highlights the difficulty of a bartering system. The house painter may not have the funds to get necessary dental work, but can provide painting services. Unless a dentist in the area happens to need his or her house painted, this transaction is unlikely.

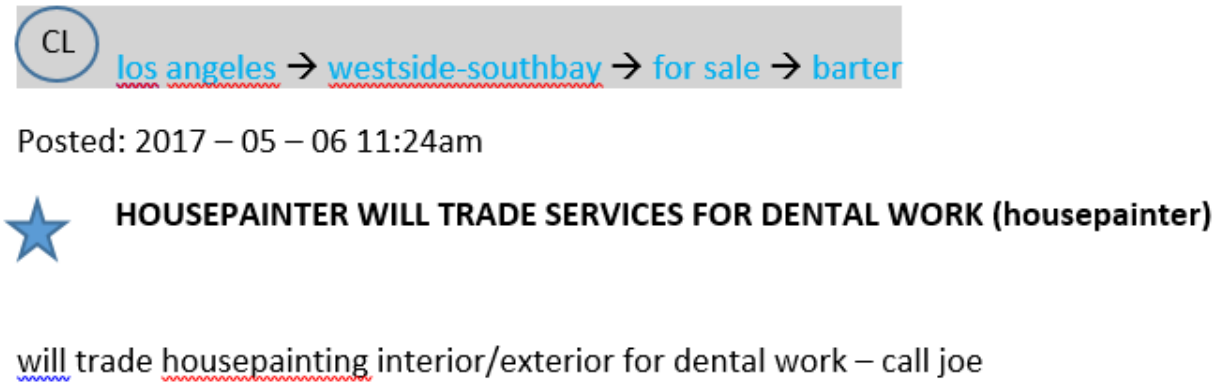


Figure 6.1.03

Well, it turned out that two days later, on May 8th, 2017, there was a Craigslist post from a dentist just north of Los Angeles, who happened to be willing to provide dental work in exchange for valuable goods and services! If this dentist needs his or her house painted, we may have a smooth transaction on our hands. What are the chances?!

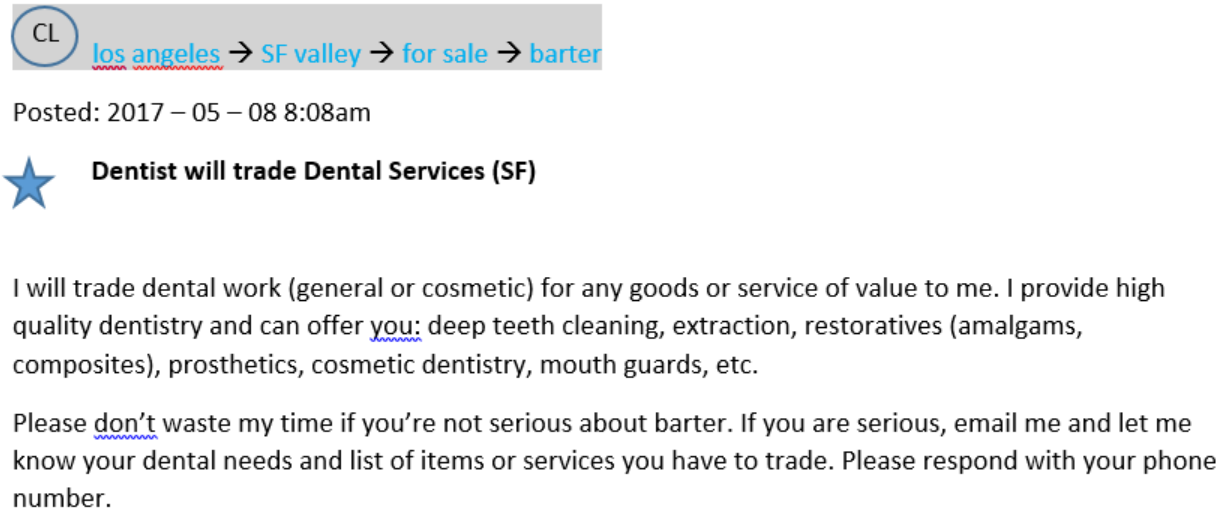


Figure 6.1.04

Now, it is possible the dentist contacted the house painter and was not happy with the services that were being offered. Or the dentist may not need any house painting. Regardless of how these stories ended, it does provide some localized insight into barter economies.

Take a look at your local Craigslist bartering page and share some of the more interesting bartering options available.

Craigslist Bartering

Go through a couple of bartering pages from your local Craigslist page. What are some unique bartering opportunities available?

Functions and Characteristics of Money

In early civilizations, bartering was a sufficient way to get all the households the goods and services that were needed. As economies became more complex, the inefficiencies of bartering grew and money came about as a natural way to reduce that inefficiency.

The term money is used often in our society today, but what exactly does it take for something to be considered money? There are three main functions of money, as we know it today.

Medium of Exchange

The most important function of money is that it has to be a means of payment that is used by consumers and accepted by sellers. The money itself does not have to be intrinsically useful to the seller, as long as it can be used to purchase something else of value. When a transaction has a medium of exchange available, bartering becomes unnecessary and the medium of exchange is used to transfer goods and services between buyers and sellers.

If something is not able to be used as a medium of exchange, transactions become difficult to make, particularly in a developed society. Imagine going to the bookstore and giving the cashier a nice camping chair in exchange for a

textbook. As much as you assure the cashier that the chair can be used to pay for the costs associated with the book, the chair will not be accepted as payment.

Unit of Account

A helpful function of money is that it can be used as a way to measure the value of all goods and services. Thinking back to the example in Russia, the amount of energy the fabric company received was equivalent to the amount of concrete utility poles sent to the utility company. This is roughly equivalent to the value of the car and truck the concrete company received. In this scenario, it is difficult to ascertain the true value of goods and services.

Money allows us to report the value of goods and service in a common unit. By having a common unit of measurement across the economy, the uncertainty about the value of goods and services in are reduced considerably compared to a barter economy.

Store of Value

A less commonly thought about function of money, but equally important as the previous two functions, is that money has to be able to store value. This means that the value of the money does not deteriorate quickly. When you received (or receive) your first paycheck, you probably deposited it into a bank account and slowly spent the money over the next few months (or the money is still saved). Had you been paid with gallons of fresh milk that expired in a week, you would probably have tried to get rid of that milk as soon as possible in exchange for goods and services that you value more.

Characteristics of Money

The functions of money naturally lead to money having particular characteristics that make transactions more efficient.

Accepted: In order for something to be defined as *money*, it must be accepted as a means of payment. If you take fresh milk and try to buy an iPhone, it will not be accepted.

Uniformity: Money in an economy should be identical from unit-to-unit. For example, what you can purchase with a $1 bill is the same as any other $1 bill.

Durability: Whatever is used as money in an economy must be durable. It should not break down or be overly fragile. A $1 bill will not fall apart if you travel around with it in your pocket (just take it out before you wash your clothes). On the other hand, dropping a carton of fresh milk can leads to a spill and makes the milk worthless. Even if you do not spill the milk, it will rot in a relatively short amount of time.

Valuable: If a candidate for money satisfies all of the above characteristics, but could be easily produced, it would not be money for long. Money needs to be relatively difficult to produce or else the supply increases and reduces the value. This is why money is restricted by governments and efforts are made to stop counterfeit money. It is also why something like weeds from lawns are not used as money.

Divisible: Money must be divisible into small units so that goods and services of all values can be bought and sold. Most economies have cash and coins that reach small values and make cheap goods easy to purchase. Imagine you wanted a piece of candy, but that fresh milk you have been lugging around was in a one-gallon container. Do you then pour out some of the milk into a smaller container or give the extra milk to the cashier in hopes of getting some form of change? Well, the answer is, do not try and pay for something with a gallon of milk. It is not money.

Commodity Money

In our economy today, we often think of money as cash and coins. But there are many goods that satisfy the functions and contain the characteristics that are described above. Goods that have intrinsic value but can also serve as money in an economy are called commodity money. There are many examples of commodity money throughout history: gold, silver, spices, furs and salt, among others.

Commodity Money

Take a look on the internet for the most unique form of commodity money. What examples do you find?

Fiat Money

One of the concerns with using commodity money in an economy is that the value of the money can be quite volatile. The US dollar used to be backed by gold, but the volatility of the value of gold led to panics in the banking industry. Today, most economies operate with fiat money. Fiat money is money that has no value other than being a means of exchange.

Cash and coins in most countries do not have intrinsic value. A $100 bill is valuable in the sense that it can be used to purchase $100 worth of goods and services, but the bill itself has very little use. It could be something to write reminders on or make a cool paper airplane with. Beyond that, it is just a piece of paper that the government says has value, citizens believe has value and it can be used as a form of payment for goods and services. If citizens in an economy stop believing that fiat money has a value, the currency will become worthless.

Categories of Money

Moving forward we will analyze the economy assuming that citizens use fiat money to purchase goods and services and are paid in the same currency. Given that assumption, how much money is in the United States economy

today? That depends on how you define money. Money is typically categorized on how liquid it is. Liquidity is the ability for money to be used as a form of payment. Some types of money need to go through a transaction or paperwork before being used as a form of payment. Other, more liquid types of money can be used immediately to purchase goods and services.

M1 Money Supply

The most liquid form of money in an economy is defined as M1 money supply. The M1 money supply consists of:

- Cash and coins
- Checking Account Value
- Traveler's Checks

In July 2017, the M1 money supply in the United States was $3.5 trillion. All three parts of M1 money can be used as a form of payment immediately. No intermediate transaction needs to take place in order to use cash or check to purchase a good or service. Cash and coins ($1.49 trillion) and checking accounts ($2.04 trillion) make up nearly all (99.9%) of the M1 money supply .

Traveler's checks were a popular form a payment for travelers in the past, as they acted like cash, but were insured like credit cards. Learn more about traveler's checks here. The increased acceptance of credit cards around the world, along with reductions in foreign transaction fees when using credit cards has significantly reduced the number of traveler's checks in existence. Despite the reduction in popularity, there are still $2 billion (not trillion) traveler's checks in circulation in the United States today.

When we refer to "money" below, we will be talking about the M1 money supply. The amount of M1 money in an economy represents the amount of money that is available for consumers and firms to purchase goods and services today. Foreshadowing where we are headed, more spending will take place as the M1 money supply rises. When there is a lower level of M1 money

supply, there will be less money available for spending and fewer goods and services will be bought and sold.

M2 Money Supply

The size of the M1 money supply in the United States seems quite large. However, if we think a bit more about the other types of money that households and firms have, the money supply will grow even more. Types of money other than cash, coins and checking accounts are less liquid. That means there is a transaction cost or a penalty for using the money to purchase a good or service. Examples of less liquid forms of money include:

- Savings Deposits: need to transfer savings to checking before using and there are limits on the number of transfers per month.
- Time Deposits: also known as Certificate of Deposits (CDs). CDs require you to leave your money with the seller for a pre-determined amount of time in exchange for interest when the time period is up. You may be able to get your deposit back at any time, but you will be charged a fee and not earn interest.
- Money Market Accounts: similar to savings accounts, but minimum balances are required in exchange for higher interest rates.

Notice that all of these forms of money require some transaction before being able to be used as a form of payment. You can write a check that takes money directly out of your checking account, but there is not a way to directly pay for something using money from your savings account. Savings must be transferred to checking in order for the money to be used as a form of payment. If you were wondering, stocks and retirement portfolios are not part of the money supply, as they are often partial ownership in firms, not money.

The M2 money supply is equal to the M1 money supply, plus the less liquid forms of money listed above. As of July 2017, the less liquid forms of money were valued at $10 trillion! Quite a bit more than the size of the M1 money supply.

M2 Money Supply = M1 Money Supply + Less Liquid Money = $3.5 trillion + $10 trillion = $13.5 trillion

There are other less liquid forms of money that are essentially larger time deposits. The Federal Reserve recently stopped tracking these less liquid forms of money, as they are not useful for monetary policy.

Credit Cards

Often, people wrongly think of credit cards as money. Credit cards do have attributes that are similar to money but they are missing a very important characteristic. When you use a credit card to purchase a good or service, you are essentially taking out a short-term loan from the credit card company, the money then goes to the seller of the product and you pay the credit card company back at the end of the month.

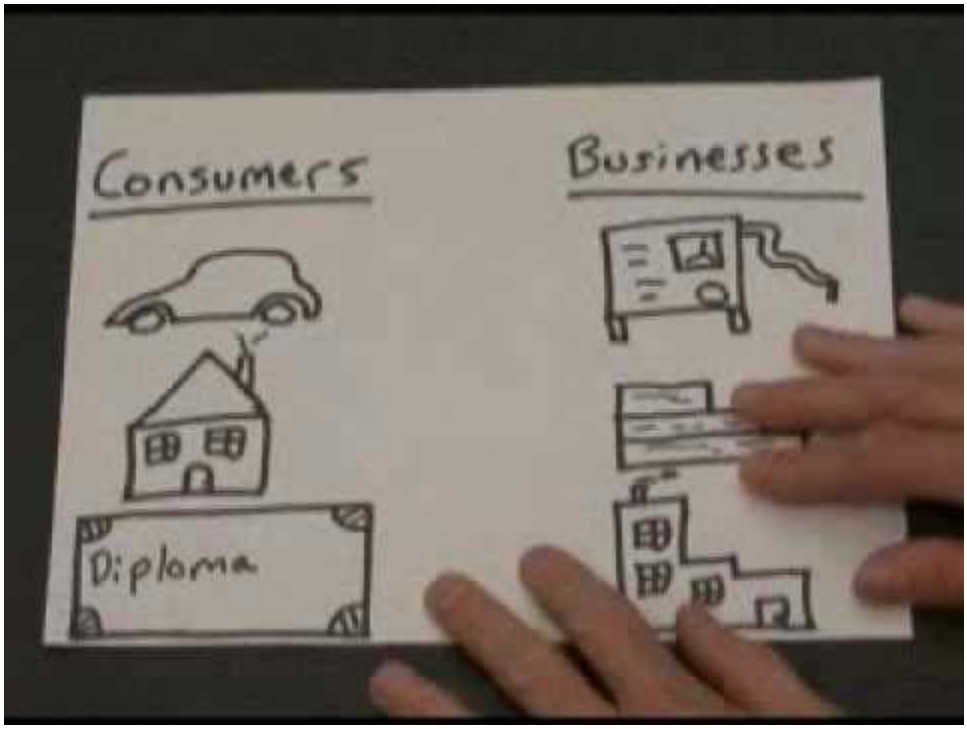
Credit cards are a means of payment, durable, acceptable, etc. But, the money used in a transaction involving a credit card is not yours! Having a credit limit on your card of $1000 simply means you can use the card to buy $1000 worth of goods. Eventually you will need to pay for those goods with your own money from a checking or savings account.

The Federal Reserve

Throughout this chapter, we have referred to the Federal Reserve (the Fed) a number of times. Before digging into monetary policy, it is worthwhile to take some time and really understand what the role of the Fed is.

In the late-1800s and early-1900s, bank runs were common in the United States. J.P. Morgan (yes, of J.P. Morgan and Chase) was a private citizen that was called on to help stabilize the economy a number of times. In December of 1913, the Federal Reserve Act created a central bank. Entire classes are taught on the history and behavior of the Federal Reserve, but for the sake of time, we will talk about some of the main points.

First, take a look at this video. It's about 10 minutes long and is a little dated, but provides a nice summary of the Federal Reserve:



The Fed has two main goals: (1) reduce unemployment and (2) create price stability. In this sense, the Fed is apolitical. By law, every action they take is required to try and achieve these two goals. This does not mean that it is easy to make the correct decision and many times, achieving one of these goals comes at the expense of the other. However, with members being appointed, not elected, and being legally bound to the two goals makes it possible for the Fed to always be working towards achieving their goals.

The Fed is headquartered in Washington, DC. There are 12 Federal Reserve Branches around the country, with additional regional banks surrounding the 12 primary branches . The location of the 12 branches was determined so that each bank represented economic activity in their region in the early 1900s.

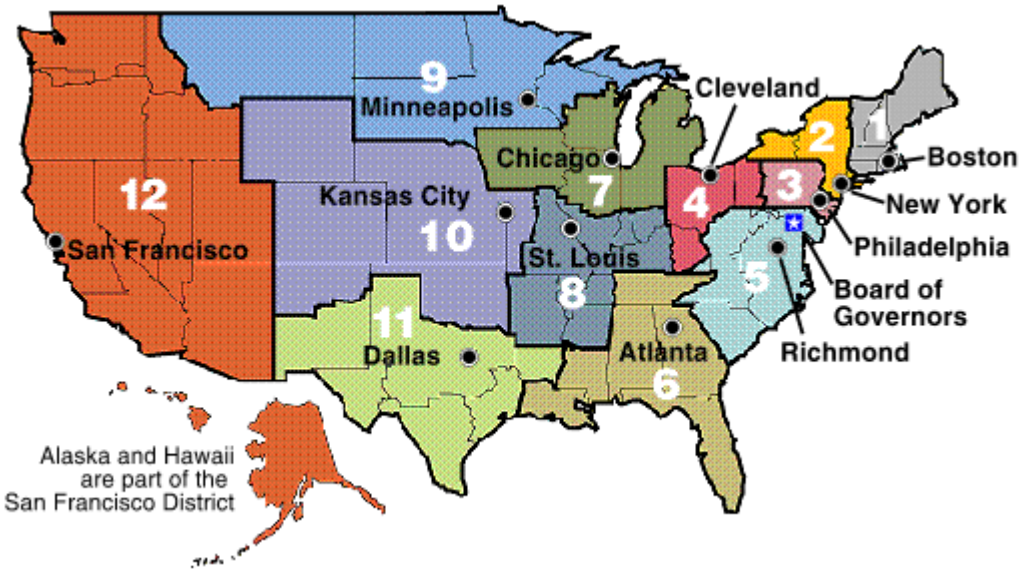


Figure 6.1.05

The state of Missouri has two branch banks, one in St. Louis and one in Kansas City. The St. Louis bank was at the center of economic activity along the Mississippi River and the Kansas City bank was at the edge of the agricultural center of the country. Each regional branch was strategically created in the early-1900s and have not moved since then. Although the economy has changed dramatically since the start of the 20th century, the speed in which information can be transferred has made it relatively easy for a branch to represent the activity in their region.

There are some key functions of the Federal Reserve that are discussed in the video above. The Fed is the overseer of all banks in the economy and can monitor unethical behavior. They are the bank for the government, which means that checks sent from the US government come through the Federal Reserve. The Fed also provides loans to banks, although private banks try to avoid this practice, as it may be a sign of weakness since loans are usually available from other private banks. Bonds are issued by the Federal Reserve as well.

These functions are important for us to keep in mind as we think about the economy as a whole. However, for the rest of the chapter (and book), the primary function of the Fed is to carry out monetary policy. Monetary policy,

as mentioned at the very beginning of this chapter, involves changes in the money supply (M1 money supply) that alter the interest rate.

In order to enact monetary policy, the Federal Open Market Committee (FOMC) meets about 8 times per year. The FOMC consists of the chair of the Federal Reserve, Janet Yellen, six board members and a rotating set of branch presidents. All branch presidents attend the FOMC meeting, but only the New York branch president is the only regional president that votes every meeting. Voting members rotate among the other 11 branches annually.

The Federal Reserve carries out monetary policy by simply increasing or decreasing the M1 money supply. Instead, they use open market operations, which is the buying and selling of Treasury bonds. By interacting in the bond market, the Fed alters the return on bonds, which in turn alters the amount of money in circulation.

We will see how bonds work in detail later, but for now, we can define a $100, 10-year Treasury bond to be a promise to pay the owner of the bond $100, 10 years after the purchase date. If the bond is backed by a stable government such as the United States, it will sell for less that $100, but not much less (around $98), since it is highly unlikely the US government would not be able to honor the bond. In the scenario that the US government is unable to honor the bonds, there will likely be bigger problems facing the country than making a $100 bond payment.

But lets get back to the Fed. When the Fed carries out monetary policy through open market operations, they are buying or selling bonds. In order to increase the money supply, the Fed needs to get more money into the hands of households. The way to do this is to buy bonds from the public, or make open market purchases. In this scenario, the Fed becomes a buyer in the bond market, driving up the price of the bond and making it more desirable for public bond owners to sell their existing bonds. This transaction essentially turns M2 money supply into liquid money.

Open market sales work in the opposite direction of open market purchases. The Fed puts their existing bonds up for sale. With more bonds on the market, the price of bonds become cheaper and a larger fraction of the public finds bonds more desirable than liquid money. The Fed sells the bonds to the public, removing liquid money from circulation and decreasing the M1 money supply.

If you are reading the previous paragraphs and saying to yourself, "if the Fed wants to increase the money supply they buy bonds and if they want to decrease the money supply they sell bonds...is that it?" Fortunately, for now, yes! That is how we want to start thinking about monetary policy. After next section, you will better understand the nuances of monetary policy, but for now, we want to think of the Fed as being able to influence the money supply through open market operations.

Monetary Policy

The Federal Reserve is responsible for carrying out monetary policy and they do so by altering the money supply through open market operations. Changing the money supply eventually alters the interest rate in the economy. We will model out a single interest rate in the next sections, but there are hundreds of unique interest rates in the economy. So how does the Fed choose which interest rate to target? In other words, when the Fed enacts monetary policy, how do they carry out open market operations?

The Federal Reserve targets the Federal Funds Rate. The Federal Funds Rate is the interest rate that banks charge one another for short-term (usually overnight) loans. Because individual banks are at the center of the interest rate targeted by the Fed, lets take a quick moment and define what is meant by a bank.

A bank is a firm that specializes in brokering loans between savers and borrowers. Individuals can save their money with a bank and the bank pays

the depositor interest on their deposit. The money the bank pays out is generated from the interest they charge borrowers for a loan. Because a bank exists, a borrower can go to one firm to borrow the necessary money and pay a single interest rate. The alternative to a bank for a borrower would be to search for 1000s of savers willing to loan them money and have individual loan agreements with each of them.

The goal of the bank is no different than any other firm: maximize profits. This means that they want to maximize the spread between the interest rate charged to borrowers and given to savers. Additionally, they would like to maximize the amount of loans given out.

If possible, the banks would like to loan out all of their deposits. However, when people put money in the bank, they expect to have access to their money at any time. Banks are required to keep a certain fraction of deposits on reserve so that depositors can access their money. The fraction of money required to be placed on reserve is called the Required Reserve Ratio (RRR).

In a simple world, there is only one bank. When the bank gets a deposit, they have to put a certain fraction on reserve (RRR) and then they will loan out the rest. If that loan is spent on local goods and services, the seller of those services will likely deposit that money into the bank and the bank will again loan out as much as possible (all but the RRR). This cycle will continue in a similar way to the multiplier effect in the previous chapter.

As economies develop and more banks are in existence, the process becomes a bit more complicated. We will not go into that complication directly, but thinking about a more complex scenario will help us understand the importance of the Federal Funds Rate.

Imagine that a bank would like to give out a loan to a promising borrower. Unfortunately, they do not have the ability to give out anymore loans without reducing deposits below the Required Reserve Ratio (RRR). The bank can go

to a fellow bank and borrow funds in order to give out the loan. Because the two banks are financial institutions with a lot of money flowing through them everyday, the interest rate on the loan is relatively low. The interest rate that the banks charge one another in this example is the Federal Funds Rate that the Federal Reserve targets.

Why does changing the Federal Funds Rate alter the behavior of banks? If the Federal Funds Rate is high, the borrowing bank better be very certain that the loan they are about to give out is going to be paid back. If not, they will lose money on the deal. As the Federal Funds Rate increases, the rate the bank has to charge the borrower will also have to rise.

If the Federal Funds Rate is low, the borrowing bank does not incur a large cost as a result of the transaction. The loan they are giving out does not need to have as high of an interest rate and they can feel more comfortable giving out the loan. As the Federal Funds Rate decreases, the rate the bank has to charge the borrower will also decrease. Overall, we can think of the Federal Funds Rate as representing flexibility in the financial markets.

The figure below shows the relationship between the Federal Funds Rate and the 30-year mortgage rate between 1971 and 1999. As expected, the two rates follow one another closely. There are times where the spread between the two rates gets larger orsmaller, but they almost always move in the same direction.

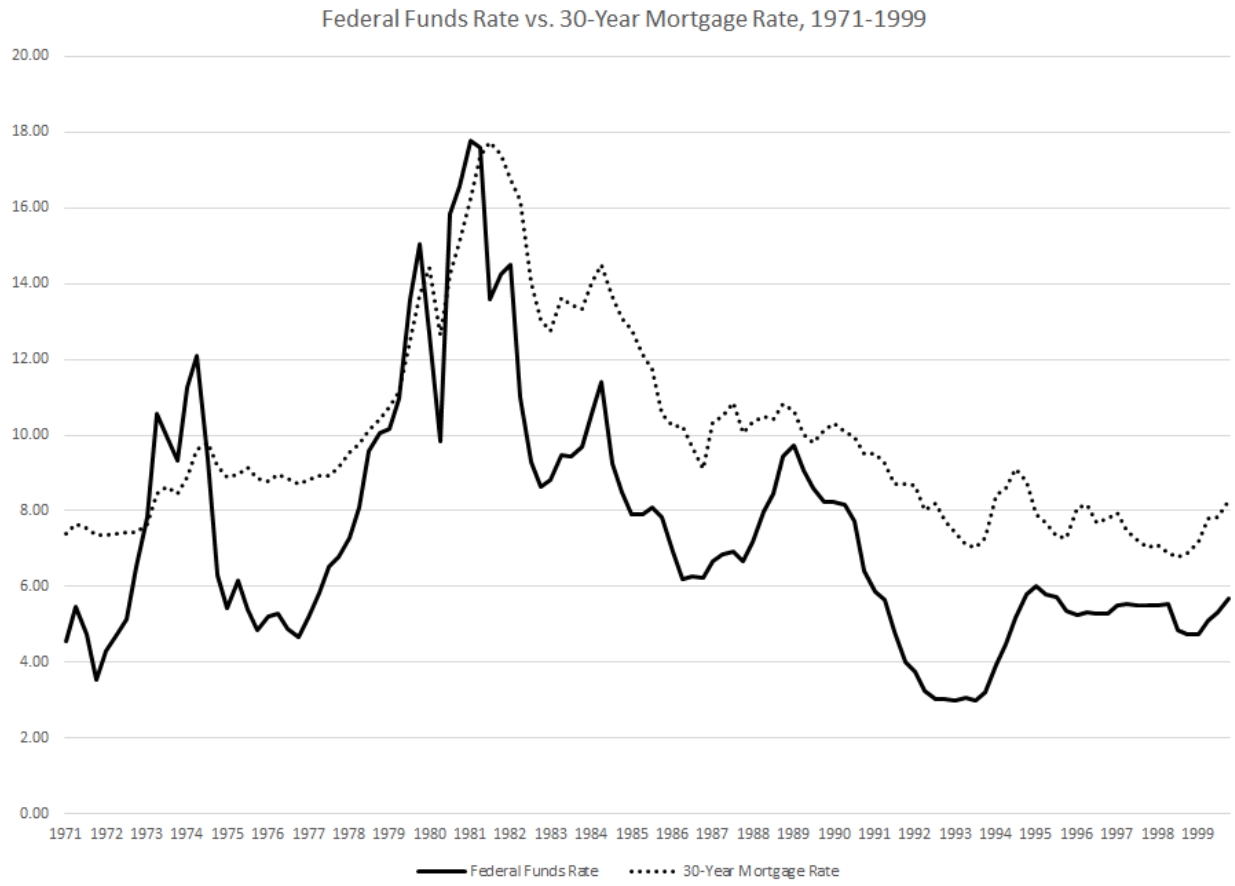


Figure 6.1.06

Because of the prominence of mortgage backed securities throughout the 2000s and the eventual increase in sub-prime loans, mortgage rates and the Federal Funds Rate were less correlated. Fears of inflation and an overheating economy in the mid-2000's led to an increase in the Federal Funds Rate. Mortgage rates did not respond as strongly, possibly because banks were not bearing all of the risk associated with the loans they brokered after they were transferred to mortgage backed securities.

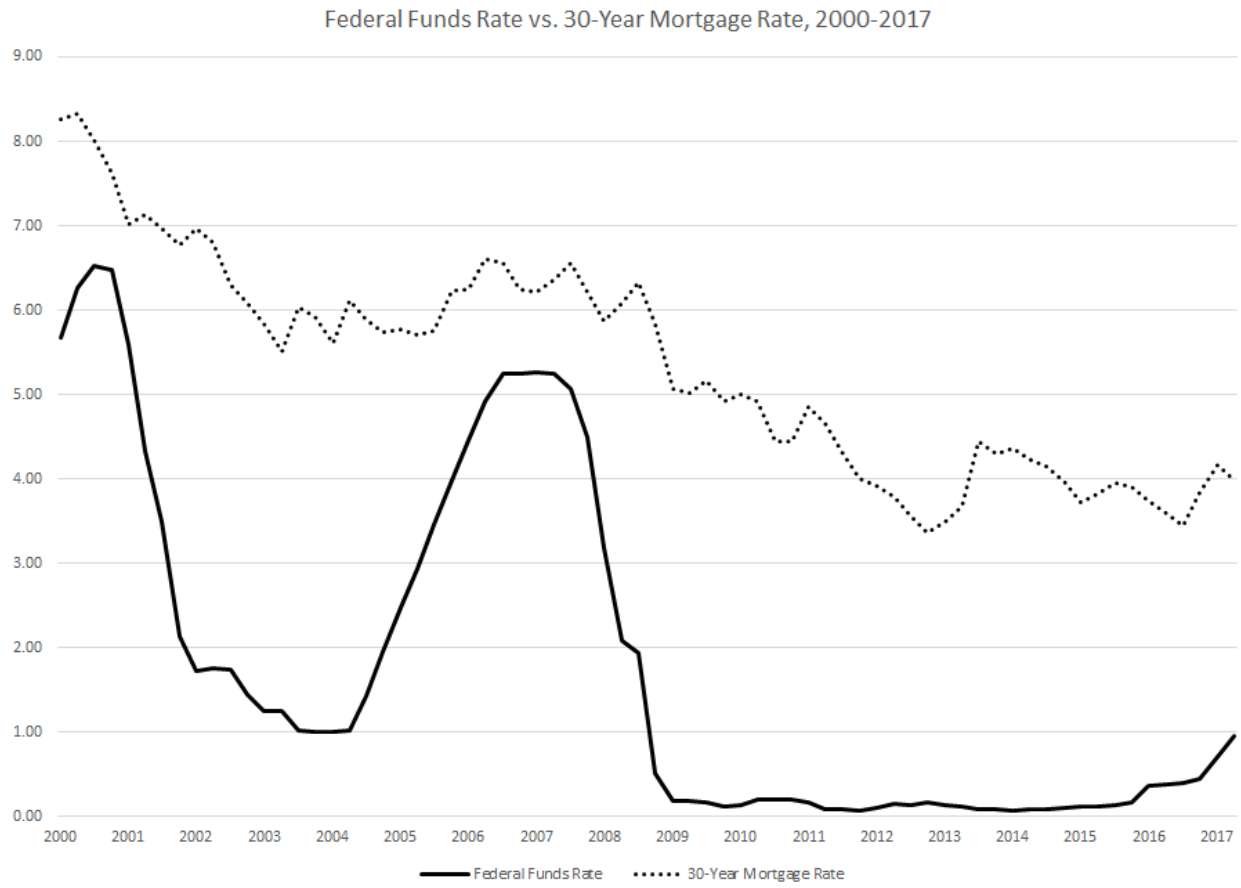


Figure 6.1.07

After the housing market crash in 2008, the Federal Reserve responded by significantly decreasing the Federal Funds Rate (to nearly 0%). The banks did not drop mortgage rates in a similar fashion. Even the most credit-worthy borrowers were not worth lending to if the mortgage rate was only 1%. There was a downward pressure on the mortgage rates after 2010, but much of this came from quantitative easing (QE). This somewhat controversial policy employed by the Fed involved purchasing mortgage backed securities, effectively allowing banks to remove them from their balance sheet.

More recently, the Fed has increased the Federal Funds Rate. There are many reasons for this behavior, as we will see below. The most important reason to not have the Federal Funds Rate near 0% is because it cannot go lower than 0%! This sounds simple enough, but if we happen to start experiencing a reduction in employment, the Fed would like to have a cushion in which they

can reduce the interest rates and stimulate the economy. The next sections will show how monetary policy carried out by the Fed is implemented.

Chapter 6.2: Supply and Demand for Money

So far we have learned in this chapter that the Federal Reserve controls the M1 money supply through open market operations. Their goal is to reduce unemployment and maintain price stability through the buying and selling of bonds. Their interaction in the bond market alters the Federal Funds Rate, which has historically been an indicator for other interest rates in the economy.

In order to determine the consequences of monetary policy and provide recommendations about the best course of action, we need to develop a model that shows us the consequences changes in the money supply. This leads us to the development of the market for money where we will combine the demand of money with the supply of money.

Demand for Money

In chapter 3, supply and demand was introduced using a product that most people are familiar with: gasoline. The idea of thinking about money as a good may feel odd, but that will slowly go away.

Let's start by depicting wealth in a household with a box. Literally a box. The size of the box is the amount of wealth a household has. Inside that box, a household allocates their wealth into many different forms. One form of wealth is money (M1 money). This is a useful form of wealth to have so that households can purchase goods and services without any transaction costs.

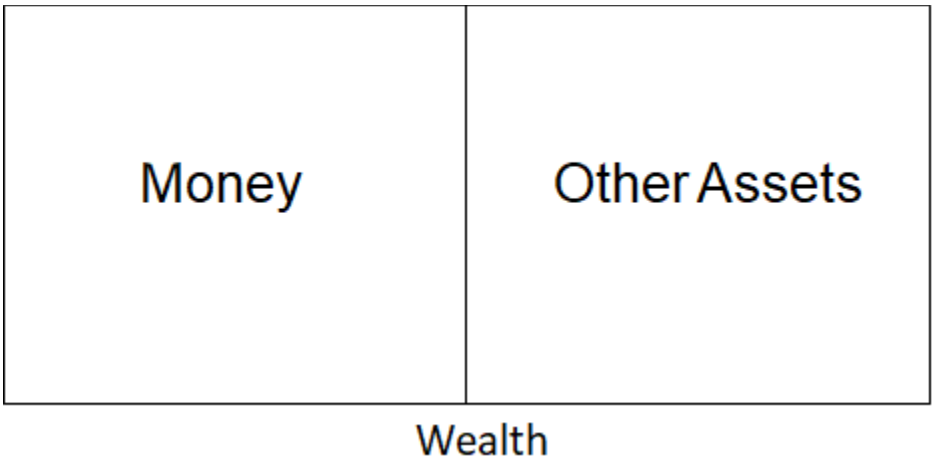


Figure 6.2.01

The rest of wealth that is not in the form of money is in the form of other assets. We can think of these other assets as the value of a house, stocks, bonds, savings and money market accounts. All of these other assets earn interest in some shape or form. For example, you may be paying for a house, but the house may also be rising in value. Stocks, bonds, savings accounts and money market accounts all have interest rates associated with them.

Money or Other Assets

You are trying to decide how much of your wealth you want to hold in cash. What is the benefit of your wealth being in the form of cash?

The most common answer to the question above usually involves spending power. If you want to purchase a good or service, such as food for dinner tonight, it is convenient to have some form of payment immediately available. Imagine having to sell a stock every time you needed some cash. This would be an significant inconvenience.

Other reasons to hold your wealth in the form of cash is to protect yourself from the risk of a housing crash or stock market crash. You may think your car is about to stop working and want to make sure you have enough money ready to buy a new one. These, and many other examples, show why one would want to hold their wealth in the form of cash.

Cash and Other Assets

You are trying to decide how much of your wealth you want to hold in cash. What is the cost of your wealth being in the form of cash?

On the flip side, holding your wealth in the form of cash can be costly. If you never purchase a home, you will never be able to capture any growth in housing values that may take place over time. Wealth that is just sitting as cash will not get a return from growth in stock prices and will not receive any interest from a bond or savings account.

For simplicity, assume that the "other assets" we have been referring to in our wealth decision are bonds. The bonds have an interest rate associated with them, which we will continue to define as *r*. If it is easier, you can think of the average interest rate of the non-money assets is r%.

Assume that a $100, 1-year bond has a 5% interest rate. This means that will earn 5% on every dollar put towards the bond. Purchasing a one-year bond means that the money dedicated to the bond is no longer liquid. In return, for not having liquidity, you receive a 5% return.

If you are considering purchasing this bond, every dollar in wealth you keep in the form of cash, you are foregoing a 5% interest rate. In other words, the **opportunity cost** of a dollar in cash is the interest you could have earned if the dollar was invested in the bond. The opportunity cost of money can be thought of as the price of money, which is equal to the interest rate.

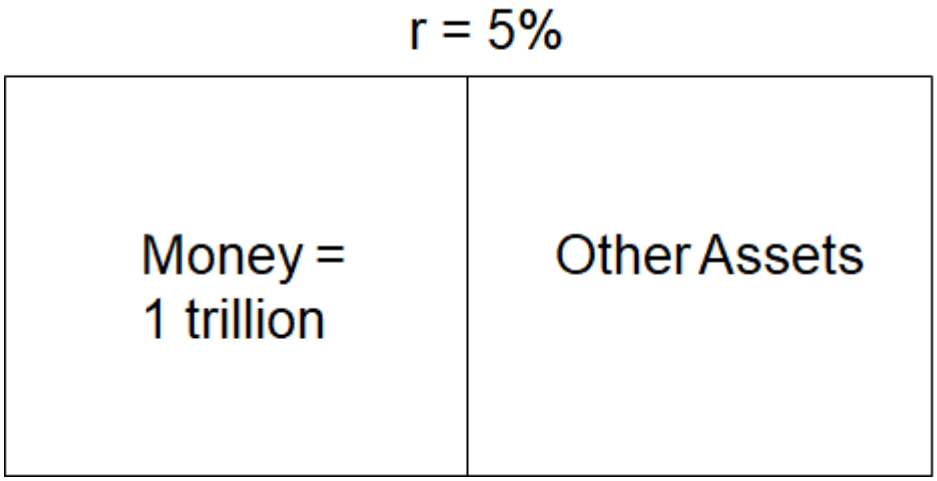


Figure 6.2.02

Now imagine that the wealth box represents all households in the economy. Also consider that the average interest rate on other assets, which we will call bonds, is 5%. Assume that households will have $1 trillion worth of their wealth held in cash when the interest rate is 5%.

The interest rate falls to 4%. Now the opportunity cost of holding wealth in the form of a dollar decreases from 5% to 4%. Households now find it in their best interest to hold more of their wealth in the form of cash.

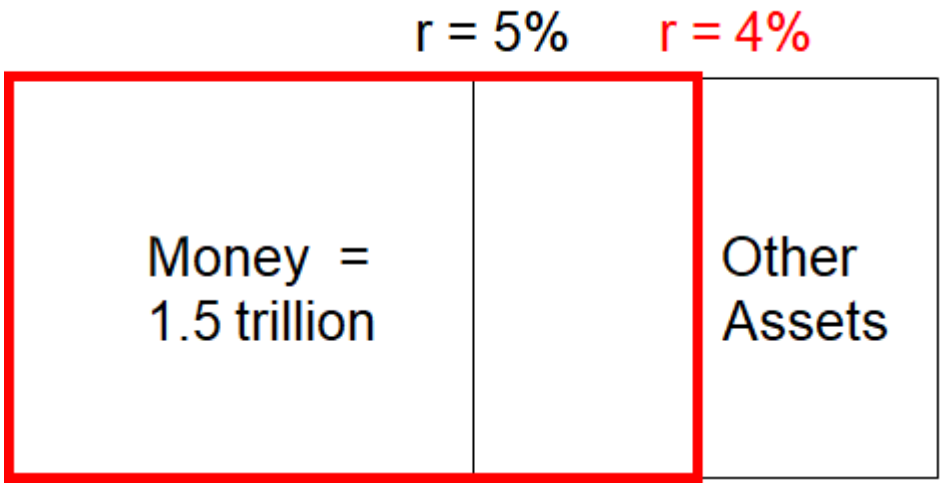


Figure 6.2.03

In the figure above, the red box represents the amount of wealth held in cash when the interest rate decreases. At a 4% interest rate, the amount of wealth in the form of money increases to $1.5 trillion.

This example illustrates the foundation of the **demand for money**. Just like other goods and services, the demand for money shows us the relationship between the amount of money (M1) demanded by households and firms and the price of money (interest rate).

As the interest rate decreases, the cost of holding wealth in the form of cash decreases, which increases the money demanded. Rising interest rates are associated with households moving their wealth out of cash into other assets in order to take advantage of the higher return.

The information generate from our basic example above can be used to create a money demand curve. We will use similar axes on for our money demand curve as we did in chapter 3 when we looked at gasoline and housing. However, because the price of money is the interest rate, we can label the vertical axis, *r*. The horizontal axis is the quantity of money, but instead of using *Q*, money is the only good we are focused on and we can use *M* to define the quantity of money.

The initial interest rate was 5% and the quantity of money demanded at this rate was $1 trillion. Label this situation, point A. When the interest rate is 4%, the quantity of money demanded increased to $1.5 trillion. Label this situation, point B.

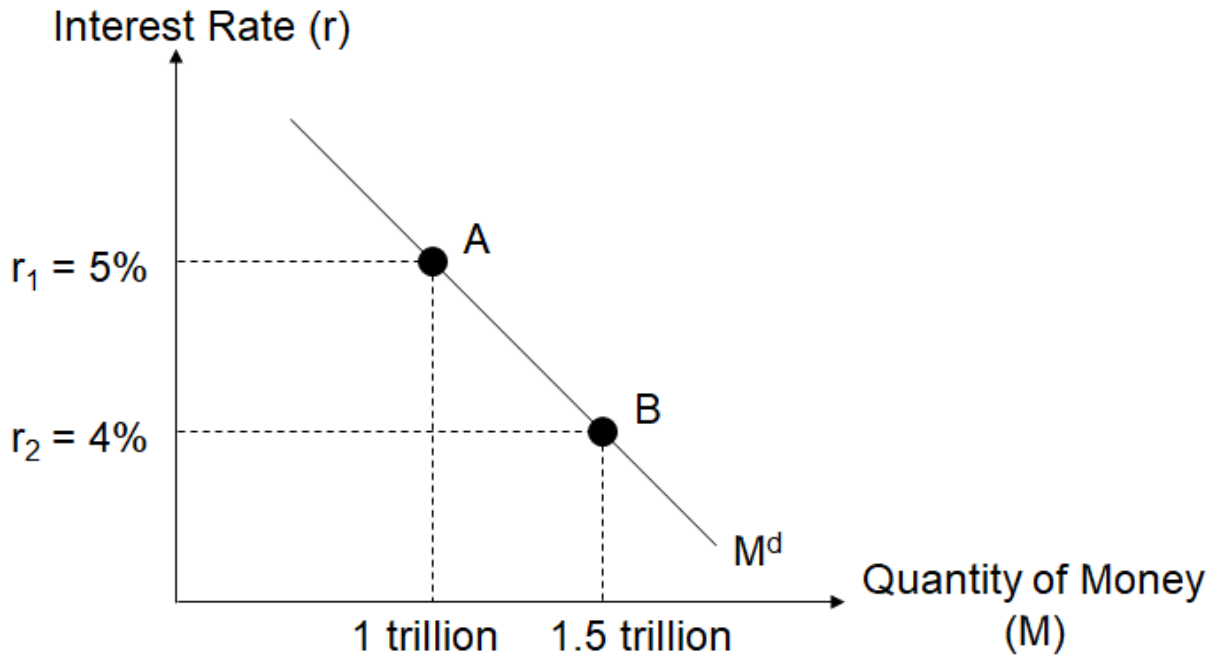


Figure 6.2.04

Drawing a line between point A and point B suggests that we could have used any interest rate between 4% and 5% in our examples. The quantity of money demanded would then lie somewhere between 1 and 1.5 trillion. We can find the quantity of money demanded at all interest rates, connect all the points

and generate the money demand curve, which is labeled M^d in the figure above.

Increasing the interest rate reduces the quantity of money demanded, which moves us up and to the left, along the money demand curve. Decreasing the interest rate increases the quantity of money demanded, again moving us along the money demand curve, but in the opposite direction. Overall, the money demand curve shows us amount of money demanded at all interest rates.

Question 6.1: Money Demand

True or False: A change in the overall price level in the economy leads to a movement along the money demand curve.

A

True

B

False

Question 6.2: Money Demand

The Federal Reserve is planning to increase interest rates. Most likely, this means that

A

The Federal Reserve wants to shift the money demand curve.

B

The Federal Reserve would like to decrease the quantity of money demanded.

C

The Federal Reserve would like to increase the quantity of money demanded.

D

The Federal Reserve would like households to reduce their holding of assets such as stocks, bonds and savings.

Question 6.1 is a reminder that when we are talking about a demand curve, the only events that move us along the curve is a change in the price or quantity. Any other event that changes the quantity demanded will lead to a shift in the demand.

Question 6.2 is a bit more difficult and is a preview where we are headed later in the chapter. In 2017, the Federal Reserve has slowly increased the Federal Funds Rate. Increasing the interest rate that households and firms face is equivalent to increasing the price of money, which will lead to a decrease in the quantity of money demanded. There is a movement along the money demand curve (up and to the left) as households move their wealth out of money and into other assets.

Shifts in Money Demand

The two previous questions are a reminder that changes in the price of any good (including money) will cause a movement along the demand curve. When discussing the market for money, changes in the interest rate (the price of money) will move us along the money demand curve. So what shifts the demand for money?

Recall the previous two discussion questions: what are the benefits and costs of holding wealth in the form of cash? The amount of cash held by the public represents a willingness to spend on goods and services. If households and firms do not plan on making purchases in the foreseeable future, it makes sense for them to invest the money into an asset with a return equal to the interest rate. On the other hand, if a chunk of wealth will be spent on goods and services soon, the transaction costs associated with moving wealth from cash to assets and back are likely not worth it.

Consistent with our analysis of demand in chapter 2, anything that changes the quantity demanded for a good that is not the price will cause a shift in the demand curve. There are many possible things that will change the amount of

wealth that is held in the form of cash other than the interest rate. To keep things simple, we will focus on just two main shocks that shift the money demand curve.

The General Level of Prices (P): The biggest shifter of the money demand curve in the short-run is the general level of prices in the economy, which we will denote as *P*. Is this the same thing as the CPI we talked about in chapter 3? Yes, it is! As the general level of prices increase in the economy, households will find themselves needing more cash to maintain their current standard of living. This will lead to an increase in the quantity of money demanded, irrespective of the interest rate.

The reasoning beyond this is straightforward. Households do not make drastic changes in their consumption of goods and services in the short-run. When the general level of prices increase, households will be inconvenienced if they decrease the amount of food, energy or gasoline they consume. Some households will adjust to the price increase by consuming less, but other households will be able to draw more from their savings or less-liquid assets and maintain their current level of consumption.

Our wealth box from above can be used to show how an increase in the price level alters the quantity of money demanded. At point A in the example above, the interest rate is 5%. Assume also that the price level (CPI or GDP Deflator) is 100. The quantity of money demanded in this setting is 1 trillion.

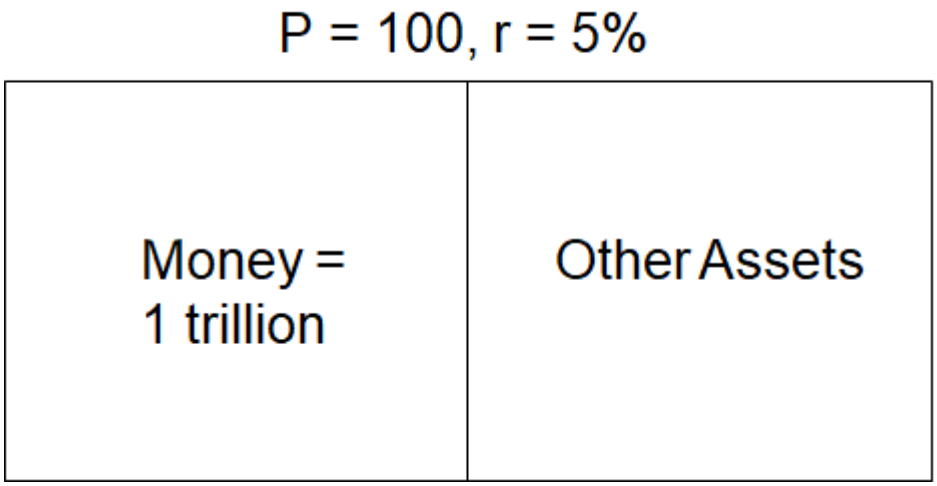


Figure 6.2.05

Assuming the interest rate remains at 5%, an increase in the price level to 120 will cause households to convert some of their liquid assets to money. There is no change in the size of the wealth box, but now the quantity of money demanded is $1.5 trillion.

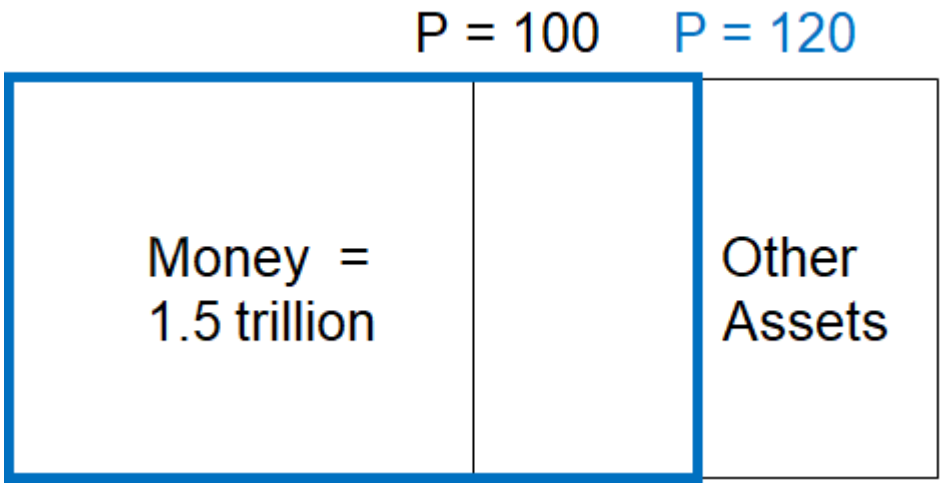


Figure 6.2.06

Because the quantity of money demanded increased but the interest rate did not change, there is a shift in the money demand curve. The figure below shows the original money demand curve from above and labels it, M^d_1. In parenthesis, the price level of 100 is noted and at an interest rate of 5%, the quantity of money demanded is 1 trillion (point A).

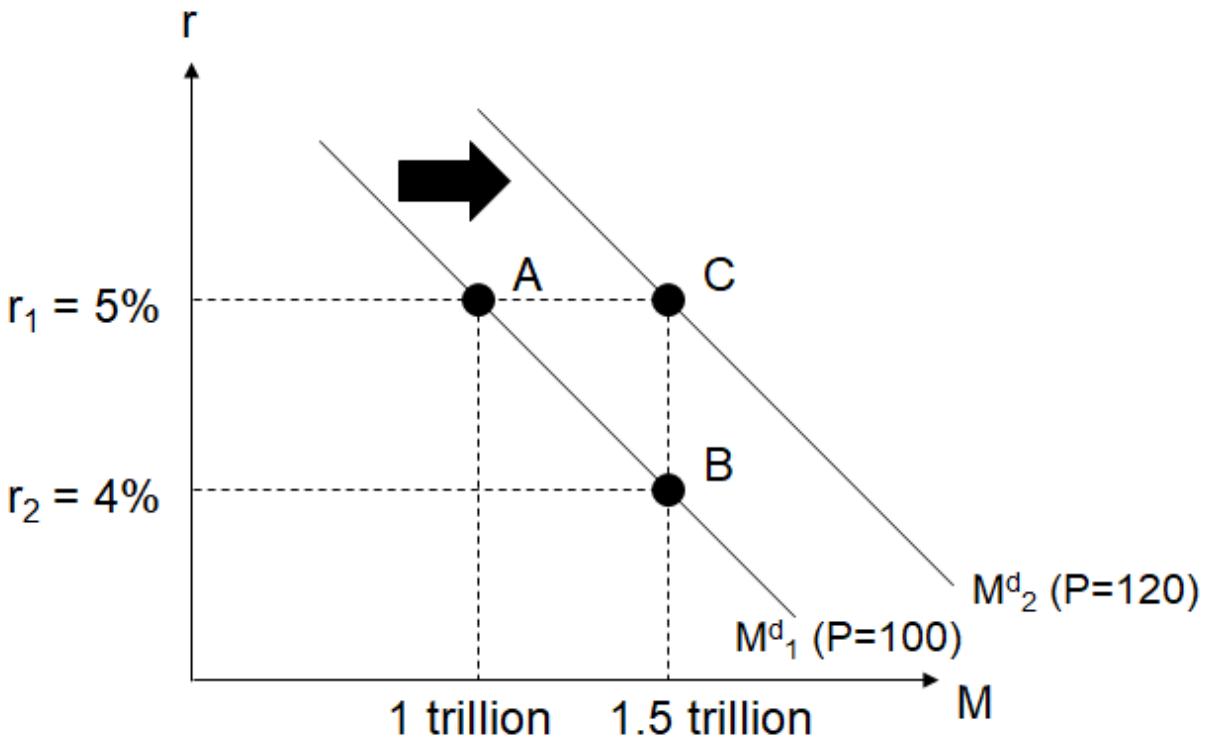


Figure 6.2.07

When the price level rises to 120, the quantity of money demanded increases from 1 trillion to 1.5 trillion if the interest rate remains 5%. Point C corresponds to the blue box above in our wealth example above. Because the quantity of money demanded is now 1.5 trillion, but the interest rate is still 5%, there is a new money demand curve at M^d_2 (P=120). Notice that the new money demand curve shifted to the right. When talking about supply and demand curves, remember that increases mean that the curves shift right and decreases shift curves left.

A price decrease would work in the opposite direction. When prices are lower, less money is needed to maintain current levels of consumption and the quantity of money demanded, regardless of interest rate. This would shift the money demand curve left.

Wealth: The quantity of money demanded also changes when wealth increases or decreases. Lets go back to the original wealth box in order to show how wealth can influence the quantity of money demanded.

Suppose that at point A, when the interest rate is 5% and the price level is 100, the level of wealth is also $2 trillion. This means that on average, 50% of wealth is held in the form of money.

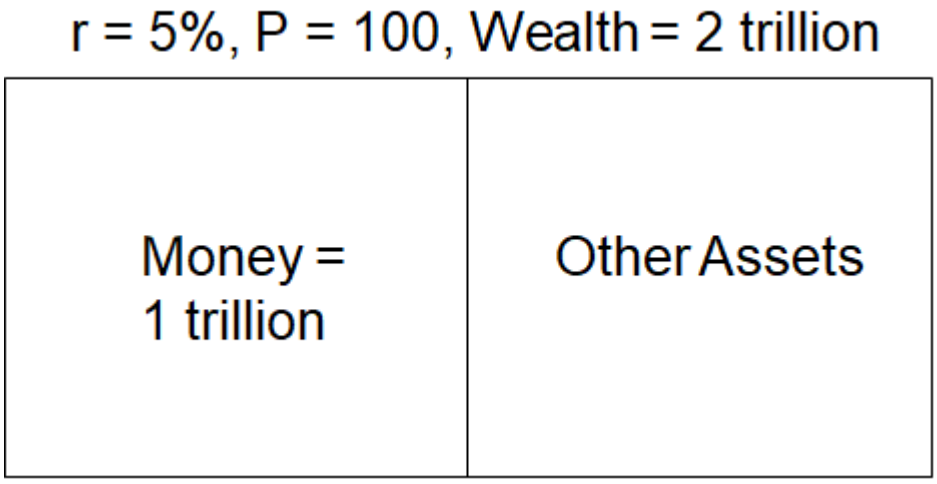


Figure 6.2.08

Now assume that the level of wealth decreases from $2 trillion to $1.5 trillion. The fraction of wealth held in the form of money may remain 50%, but the quantity of money demanded falls, as now, there is only $0.75 trillion in money demanded at a 5% interest rate and price level of 100.

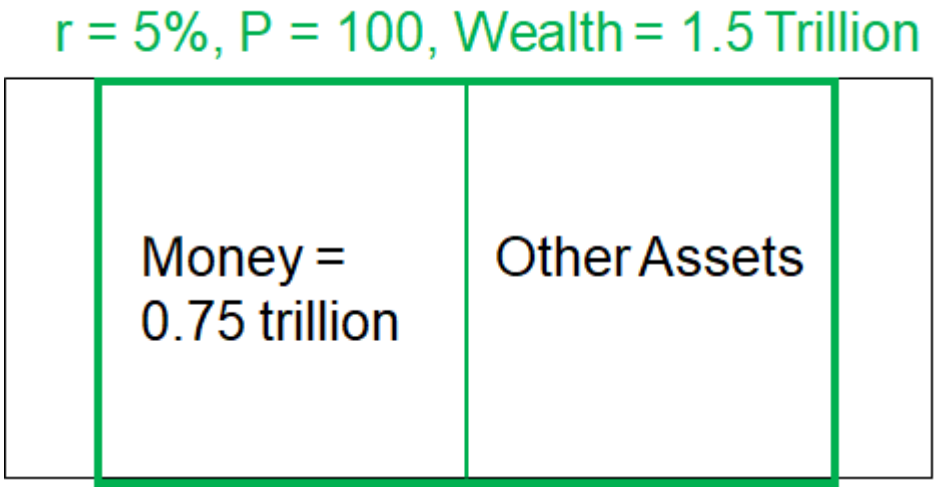


Figure 6.2.09

The green box above represents the reduction in wealth and the green rectangle on the left is the amount of money demanded after the decrease in wealth. The quantity of money demanded decreased, but it was caused by something other than a change in the interest rate. This means that the money demand curve has shifted. Specifically, money demand decreases, which is associated with a shift to the left.

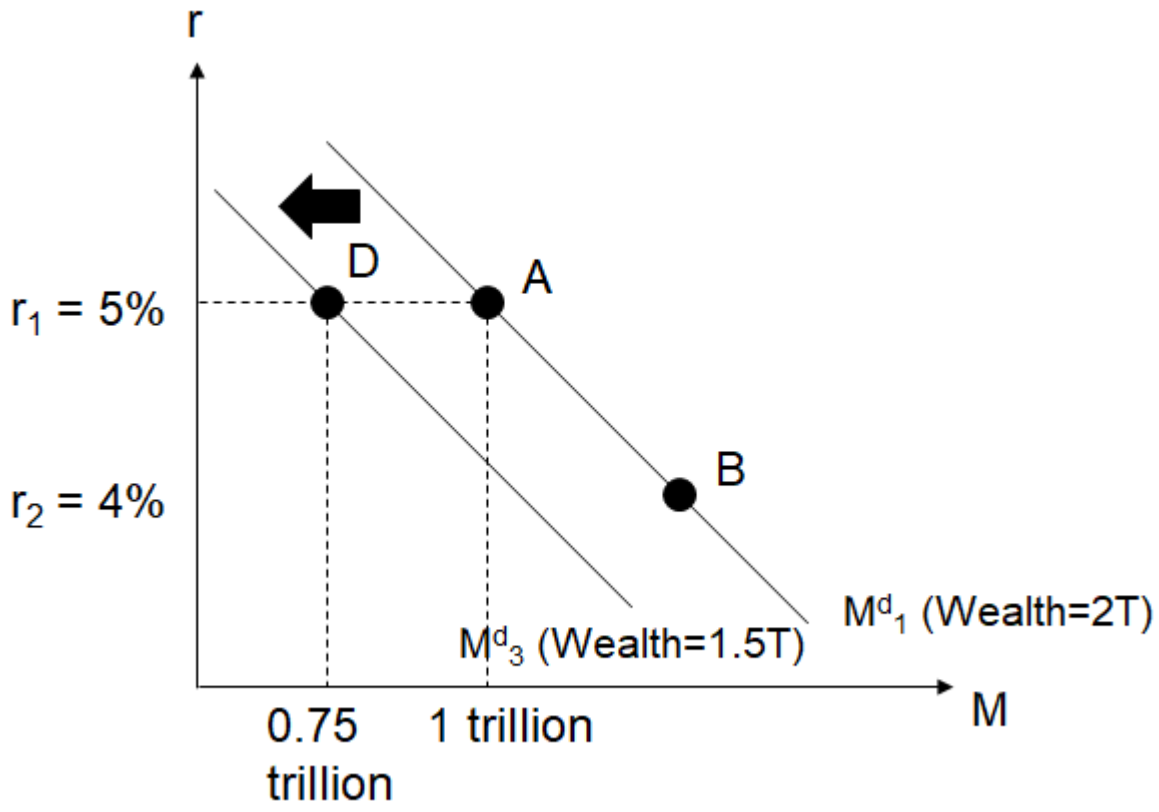


Figure 6.2.10

The graph above shows the change in money demand when wealth decreases. The original money demand curve, M^d_1, now has a wealth of $2 trillion noted in parentheses. As the level of wealth decreases, the money demand curve shifts left and stops at at M^d_3, which is the money demand curve associated with $1.5 trillion dollars. Point D represents the green box above, where there is $0.75 trillion in money demanded when the interest rate is 5% and the price level is 100.

Question 6.3: Changes in Money Demand

You are trying to predict what will happen to the money demand curve. The wealth level in the economy increases at the same time the price level decreases. What will happen to the money demand curve.

A

The money demand curve will increase.

B

The money demand curve will decrease.

C

The money demand curve may increase, decrease or stay the same.

D

The changes will not alter the money demand curve.

Chapter 6.4: Changes in Money Demand

You are interested in whether changes in the economy will lead to a change in the quantity of money demanded and the money demand curve. There is an increase in the interest rate at the same time that prices increase. Which of the following is most likely to occur?

A

The money demand curve will increase, but the change in the interest rate could lead to a decrease in the quantity of money demanded.

B

The money demand curve will increase and the quantity of money demanded will definitely increase.

C

The money demand curve will decrease, but the change in the interest rate could lead to a decrease in the quantity of money demanded.

D

The money demand curve will decrease and the quantity of money demanded will also decrease.

It may help to draw out some money demand curves in order to answer the questions above, as there is a lot going on. In question 6.3, there are two events that take place: wealth increases and prices decrease. An increase in

wealth leads to an increase in the size of our wealth box, which is associated with an increase in money demand. However, prices decreased at the same time, which means that a smaller fraction of wealth needs to be dedicated to money, suggesting that money demand will decrease.

Because money demand has pressure to both increase and decrease, it is unclear how the money demand curve will change. If there is a large increase in wealth, but a relatively small reduction in prices, it is likely that the money demand curve will shift right. However, if the wealth increase is relatively small, but prices decrease significantly, we can expect the money demand curve to shift left. In the rare case that the size of the shifts are equal, there may be no change in the money demand curve.

Question 6.4 is more difficult. Again, two events take place, but the question requires you to simultaneously understand movements along the money demand curve and shifts in money demand. The increase in prices will cause an increase in money demand. If the interest rate were to remain the unchanged, the quantity of money demanded would increase. However, the interest rate also increases, which decrease the quantity of money demanded. In other words, the interest rate change moves us along the curve to a lower quantity of money demanded.

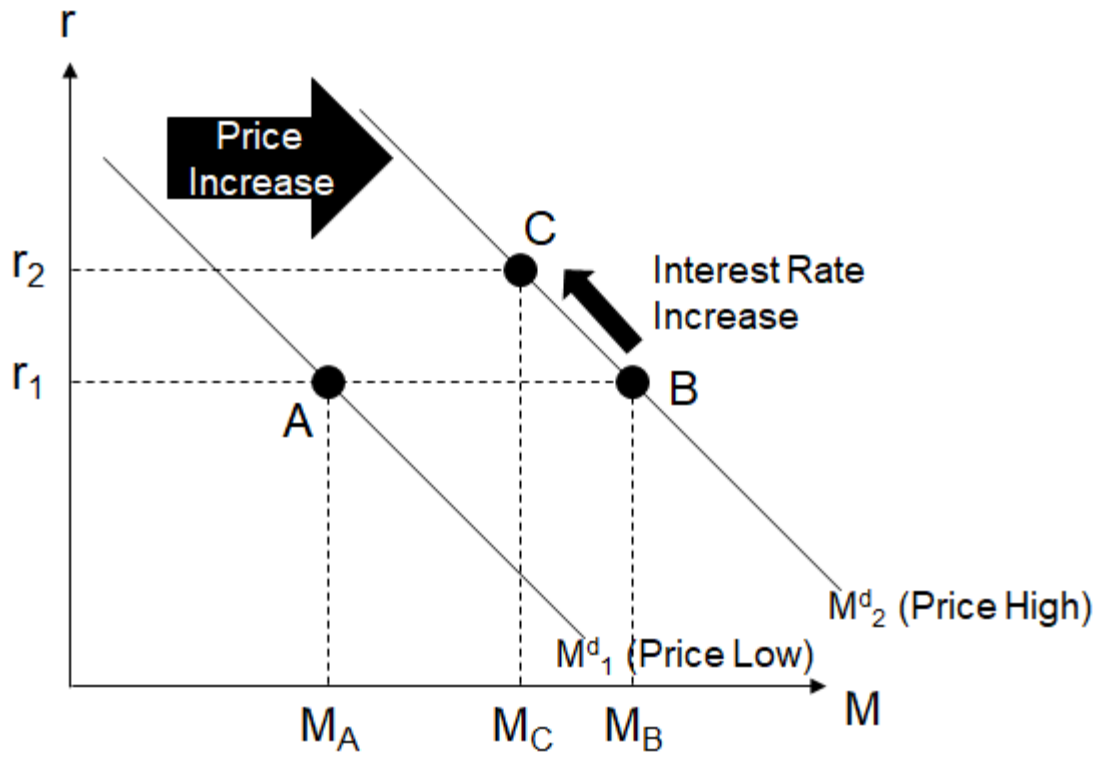


Figure 6.2.10

In the graph above, the large arrow is showing the increase in money demand from M^d_1 to M^d_2, resulting from a price increase. At the original interest rate, r_1, the quantity of money demanded increases from M_A to M_B. This step moves us from point A to point B. The second event that occurs is that the interest rate increases. A change in the interest rate moves us along the demand curve. In this case, we move from point B to point C, which is a decrease in the quantity of money demanded since $M_C < M_B$. If the interest rate continues to rise, it is possible that $M_C < M_A$ and the total quantity of money demanded will decrease.

If you did not get question 6.4 correct (or if you guessed correctly), take another look at it. From the figure above, it is clear that the scenario will lead to an increase in the money demand curve, but the rising interest rate makes it possible for the quantity of money demanded to decrease overall.

Supply of Money

The demand for money is a new twist on a (hopefully) comfortable topic of consumer demand. The supply of money is also a new twist, but it is less complicated than the demand for money. At the start of this chapter, we mentioned that the Fed is responsible for determining the money supply. Later in the chapter, we learned that the Fed changes the money supply through open market operations, which is the buying and selling of Treasury bonds. We can think of the Treasury bonds as being equivalent to the "other assets" category of our wealth box in the previous section.

Question 6.5: Open Market Operations

The Federal Reserve wants to increase the money supply. They should:

A

Sell Bonds to the Public

B

Buy Bonds from the Public

C

Do nothing

D

Why are bonds important? (Hint: Review some of the earlier sections in this chapter.)

Hopefully you remember from earlier in the chapter that when the Fed carries out open market purchases, they are buying bonds from the public. When the Fed buys bonds (which is the same thing as the public selling bonds), households shift more of their wealth into money and reduce their holdings of "other assets". In order to decrease the money supply, the Fed will sell bonds to the public, causing the public to reduce their existing holdings of money in order to buy bonds from the Fed.

Be careful and think about what is going on in these transactions. It is easy to get backwards when thinking about who is selling and who is buying.

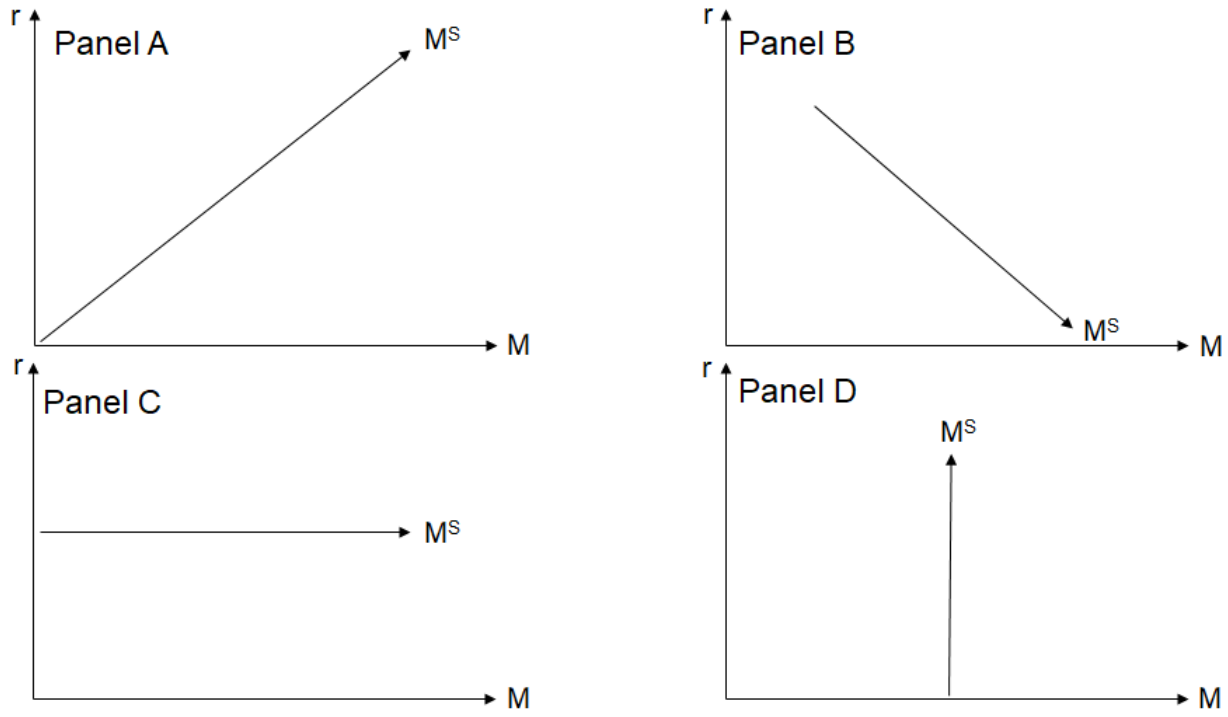
Remember that when we are interested in the amount of money in circulation, we are referring to M1 money, which comes primarily from households. When a bond transaction takes place, there is a seller and a buyer. Whenever the Fed is a buyer of a bond, the public is the seller and converts bonds to cash. Conversely, when the Fed is the seller of a bond, the public is the buyer and converts cash to bonds.

Let's figure out how the money supply is determined. The supply curve of any good or service tells us the quantity of the good supplied at various price levels. When discussing gasoline in chapter 2, we saw that increases in the price level of gasoline meant that more firms were willing and able to produce gasoline, increasing the quantity supplied.

The supply of money is different since it is not produced in the same way as a good or service. Who determines how much money in circulation? In the United States, it is the Federal Reserve that determines the quantity of money supplied. They alter the amount of money in circulation by those open market operations that we just reviewed.

6.6: Money Supply

The Federal Reserve sets the money supply curve at a constant level. Which of the following panel depicts the money supply curve?



A

Panel A

B

Panel B

C

Panel C

D

Panel D

When the Fed decides on what the money supply should be, they carry out open market operations until they reach their desired level of money in circulation. This means that the interest rate itself does not change the level of money in circulation, which is consistent with the idea that money is different than a typical good or service. The only way that the money supply will change is if the Fed decides to change it. Consequently, the money supply is fixed at whatever level the Fed decides on. The money supply curve (M^S) is a

vertical curve and moving along the curve says, the interest rate can change, but the supply of money in circulation does not.

This may seem a bit awkward, but things will clear up as we move towards money market equilibrium. It may help to think back to our conversations about independent and dependent variables. In most relationships, one variable clearly "depends" on another. When modeling goods and services using supply and demand, the price is placed on the vertical axis, which is where the dependent variable is depicted. However, it is possible to argue that price determines quantity and the labels on axes should be flipped when examining a typical household good.

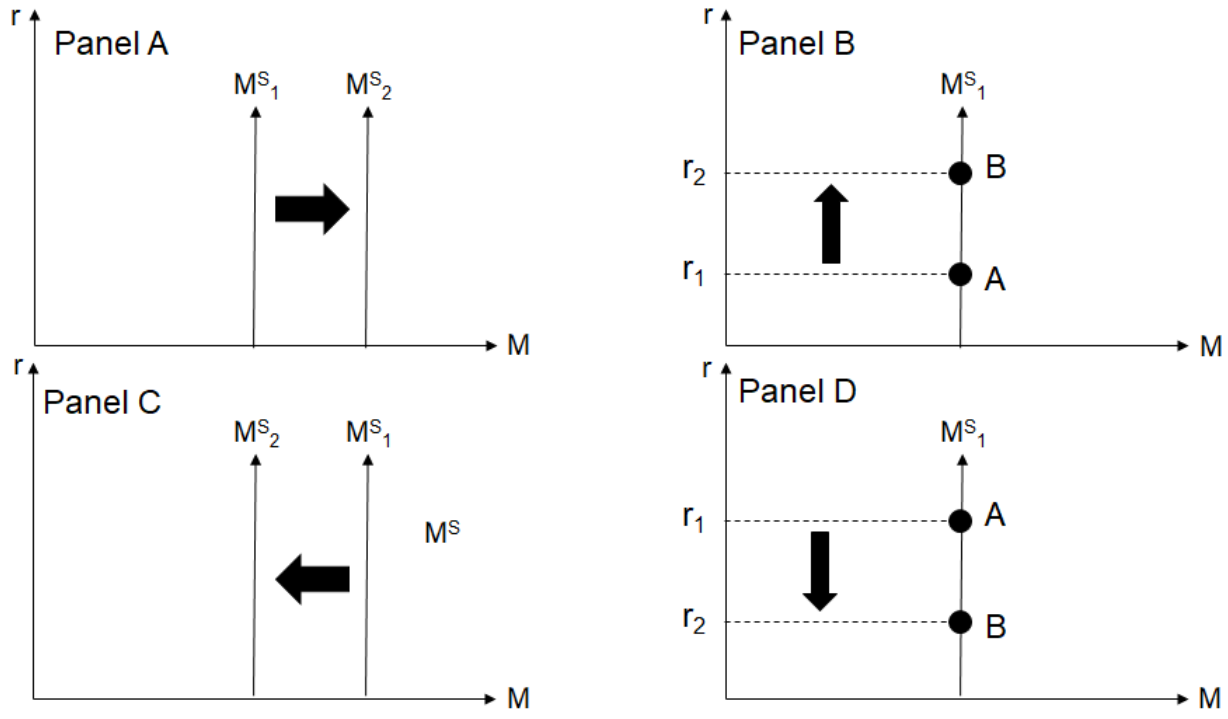
There is less ambiguity about what the dependent and independent variables are in the market for money. The Federal Reserve does not look at the interest rate (the price of money) and then decide whether or not to increase or decrease the money supply. Instead, they recognize that the equilibrium interest rate will change in response to changes in money supply. Using open market operations, the Fed is able to change the money supply, with the intention of adjusting the interest rate. This is monetary policy in action.

Shifts in Money Supply

Before combining money demand and money supply on a single graph, let's drive home the point that money supply can only be changed by the Federal Reserve.

Question 6.7: Money Supply

The four graphs below depict four different scenarios. Choose the scenario that corresponds with the appropriate panel.



Premise

Response

1

The interest rate increases

A

Panel A

2

The interest rate decreases

B

Panel B

3

The Fed buys bonds

C

Panel D

4

The Fed sells bonds

D

Panel C

In the question above, two important points about the money supply curve are highlighted. First, changes in the interest rate do not change the money supply curve, similar to any change in the price of a good and the supply curve. What is different in the market for money is that a change in the interest rate does not change the quantity of money supplied at all, we are just at a different height on the supply curve. For example, when the interest rate increases, panel B shows us that we move up the money supply curve from point A to point B. However, the actual amount of money in circulation does not change.

A second point to takeaway from question 6.7 is understanding what shifts money supply. The Federal Reserve has control of the money supply curve, however, they change the M^s curve through the buying and selling of bonds. Buying bonds will cause an increase in the money supply curve, shifting the

M^s curve to right. Selling bonds has the opposite effect. Make sure you understand question 6.7 fully before moving on to the next section.

Chapter 6.3: Money Market Equilibrium and Monetary Policy

With money demand and money supply defined, we can now show equilibrium in the money market. This will give us a visual framework that allows us to understand how monetary policy is used. The graph below overlays the money demand and money supply curves, using similar numbers as the examples above.

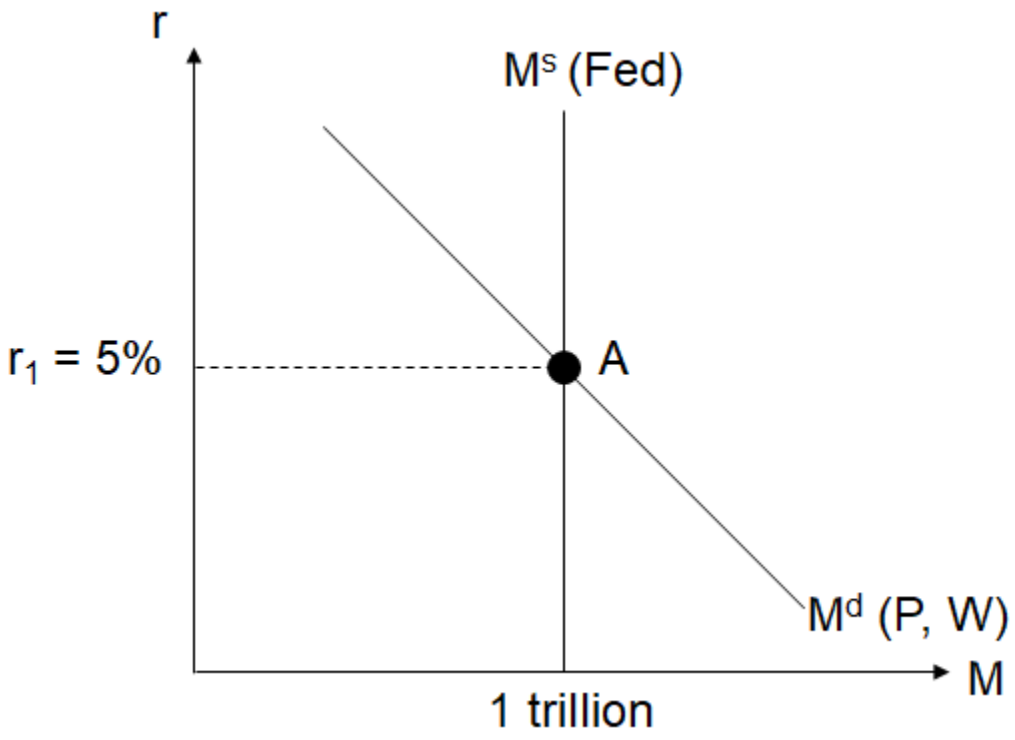


Figure 6.3.01

The money supply in the economy is set by the Federal Reserve and the money demand is assuming a particular price level and wealth in the economy. In the graph, the Fed has set the money supply at $1 trillion. The quantity of money demanded is $1 trillion when the interest rate is 5%.

The 5% interest rate at point A is the equilibrium interest rate. At a 5% interest rate the quantity of money demanded is exactly equal to the quantity of money supplied. There is no pressure for the quantity or price of money to change.

If you are comfortable with supply and demand from chapter 2, analyzing the market for money will have some similarities. The vertical supply curve is somewhat unique, but in the end, we are still analyzing a market using supply and demand and much of what we learned in chapter 2 applies here. Because money is different than a typical good or service, things get a little complicated when we think about being out-of-equilibrium.

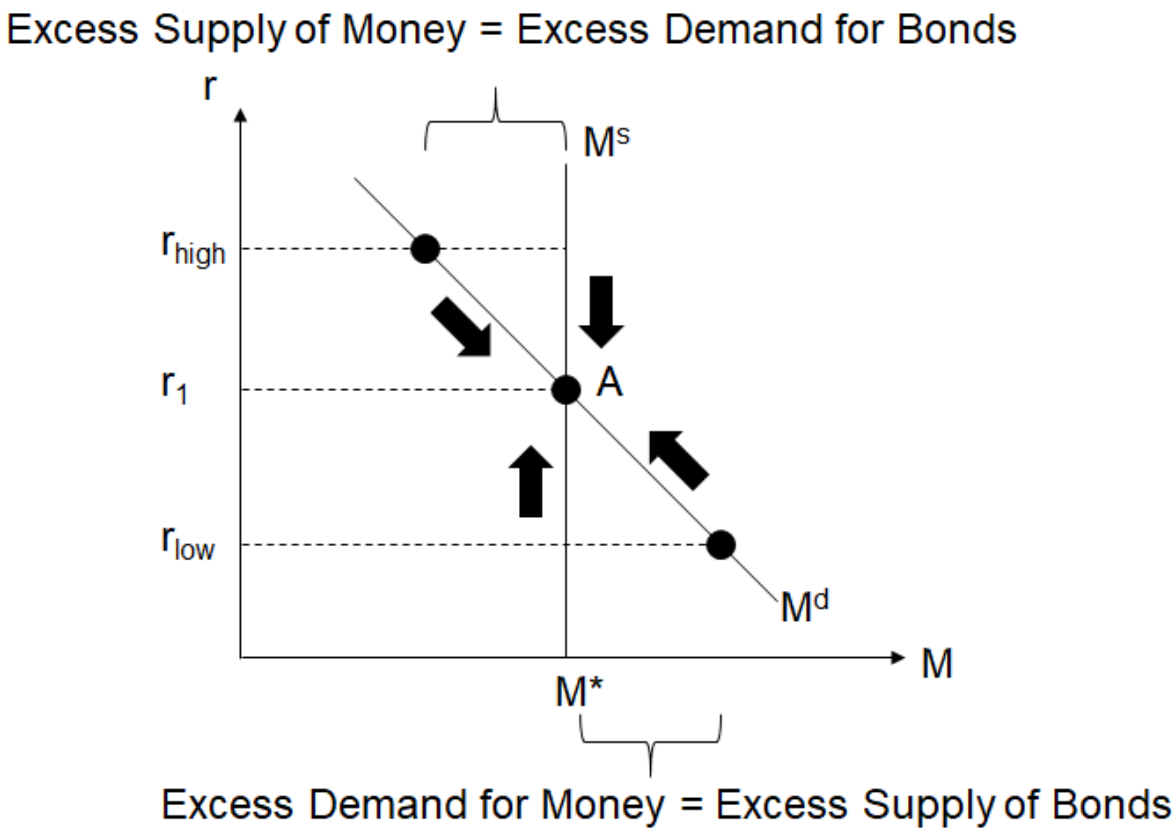


Figure 6.3.02

When the interest rate is too high, r_{high}, there is excess supply of money, as the quantity of money supplied is greater than the quantity of money demanded. In this setting, households want to move their wealth into other assets (bonds) and receive the interest on those less liquid forms of wealth. The excess supply of money causes the price of money to fall. As the public moves their wealth out of bonds and into wealth, they move down the money demand curve towards point A.

If the interest rate is too low, r_{low}, the quantity of money demanded is greater than the quantity of money supplied. In practice, this means that the public wants to hold more of their wealth in the form of cash and have fewer bond holdings, but there is not enough money in circulation. As a result, the price of money (the interest rate) increases, causing a movement along the money demand curve towards point A.

If this discussion feels like it is missing a big piece, you are following right along. The money market and the bond market are intertwined. Changes in the money market have a direct effect on the bond market and we need to better understand the bond market in order to fully grasp money market equilibrium.

The Market for Bonds

Let's take a formal detour into the market for bonds. First, define a simple bond as a promise to pay $100 in one-year. Bonds can take on a number of different values and expiration dates, but they all follow a similar pattern.

When a household uses money to purchase a bond, they are giving up $100 worth of liquidity for the next year. That means that the price of the bond needs to be less than $100. Why would you pay $101 in order to get $100 back next year?

Imagine that the price of this $100 bond is $80. We can derive a lot of information from these two characteristics. The value of the bond is $100 and the price of the bond is $80. This means that the nominal return on the bond is $20. The nominal return is the amount of money you make by purchasing the bond.

Nominal Return on Bond = Value of Bond - Price of Bond

From the return on the bond, we can calculate the interest rate, which is the return on the bond divided by the price of the bond, times 100.

Interest Rate = Nominal Return on Bond/Price of Bond x 100

This means that the interest rate on the bond when the price is $80 is the $20 return divided by the $80 price, times 100. The interest rate is 25%. This means that for every dollar spent on the bond, the buyer gets back 0.25, or 25%.

Remember that a bond that is backed by a solvent government is guaranteed (unless there is a geopolitical event unlike we have ever seen) and there is very little risk. An interest rate of 25% is much higher than historical annual stock market returns and there is significantly more risk associated with stocks compared to bonds.

A 25% interest rate is similar to the r_{high} rate in the example above. The excessively high interest rate will cause people to move as much of their wealth as possible out of money and into bonds. There is excess supply of money, which is the same thing as having excess demand for bonds.

Because there are so many people that want to purchase bonds, the price of bonds will be bid up. Imagine that the price of the bond increases from $80 to $90. Now the return on the $100 bond is $10, which is derived from the nominal return equation above: $100 - $90 = $10.

The interest rate on the bond when the price is $90 is $10/$90 x 100 = 11.1%. As the price of the bond increases, the interest rate decreases. The interplay between the money market and the bond market ties our equilibrium story together.

When the interest rate is too high, there is an excess supply of money, which means that there is an excess demand for bonds. Excess demand for any product will drive the price up. In this case, the price of a bond rises, which directly causes a decrease in the interest rate. The increase in bond prices will occur until we reach equilibrium. In our example above, this was at point A and the interest rate was 5%.

Question 6.8: The Bond Market

The current price of a $100 bond that expires in one year is $97. What is the interest rate on the bond?

A

2.74%

B

3.00%

C

3.09%

D

3.97%

Question 6.9: The Bond Market

Assume that the equilibrium interest rate in the money market is 5% and the price of a $100 bond is $97. Which of the following is true?

A

The money market is in equilibrium.

B

The interest rate is too low and the price of bonds need to rise in order for the money market to be in equilibrium.

C

The interest rate is too low and the price of bonds need to fall in order for the money market to be in equilibrium.

D

The interest rate is too high and the price of bonds need to rise in order for the money market to be in equilibrium.

When the price of a $100 bond is $97, the return on the bond is $3. Because $97 is spent in order to make $3, the interest rate is $3/$97 x 100, which is 3.09%. This is below our equilibrium interest rate of 5% in the example above. This means that households want to hold more of their wealth in the form of money and there is not enough money supplied to meet that demand.

The excess demand for money means that there is an excess supply of bonds. Because there are more bonds on the market than buyers, the price of bonds will decrease. As the price of bonds fall, the interest rates increase. Eventually,

the price of the bond will decrease to $95.25, at which point there is a nominal return of $4.75 and an interest rate of approximately 5%.

Learning about the bond market helps us fully understand how we reach equilibrium in the money market. The following graph is more detailed version of the movement towards equilibrium in the market for money. Now the descriptions are more complete and the channel through which out-of-equilibrium interest rates are adjusted and move towards the equilibrium interest rate are seen.

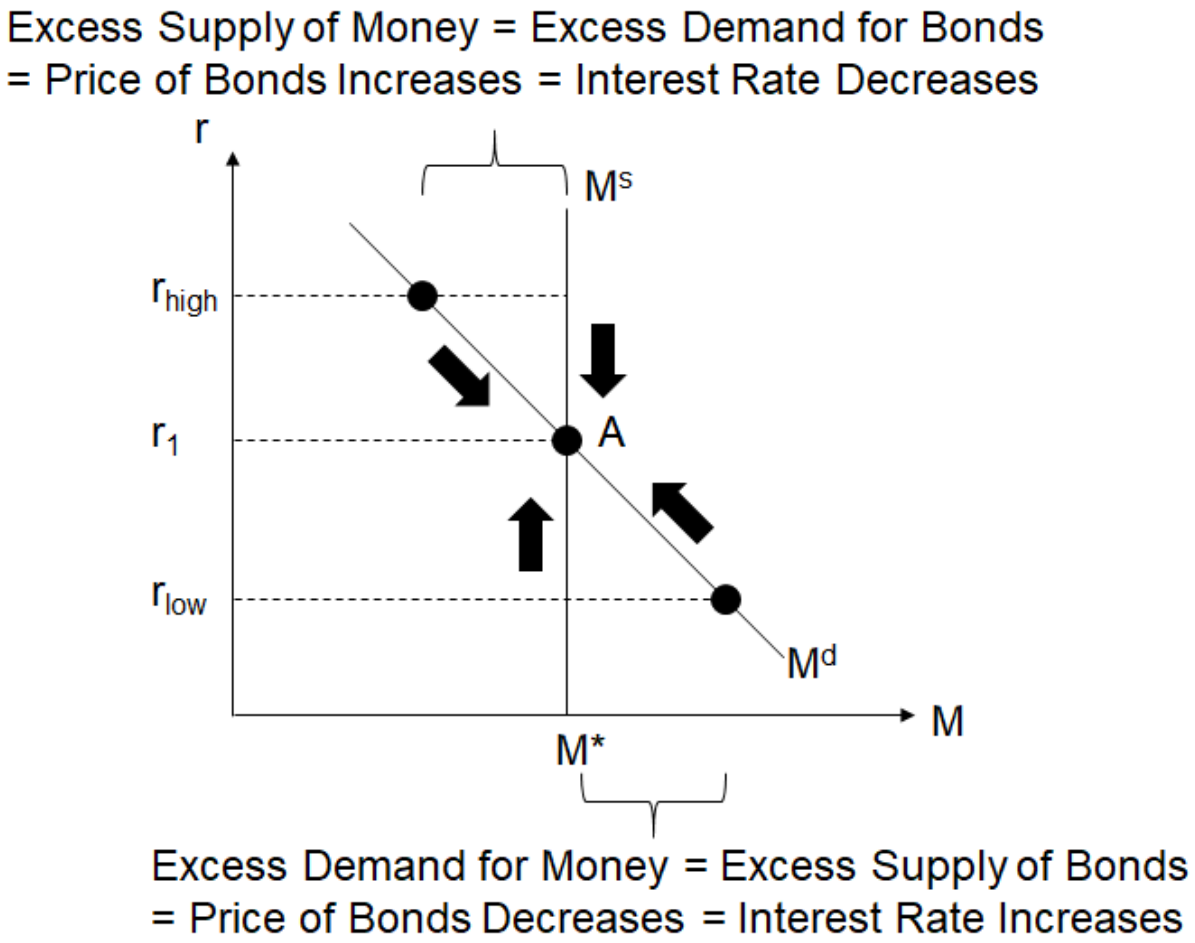


Figure 6.3.03

Enacting Monetary Policy

The goal of this chapter is to depict monetary policy and show how enacting monetary policy can help bring the economy closer to full-employment and price stability.

Question 6.10: Monetary Policy

Which of the following is considered monetary policy?

A

The Federal Reserve carrying out open market operations.

B

The Federal Reserve directly changing the Federal Funds Rate.

C

The Federal Reserve changing the money supply.

D

The Federal Reserve purchasing more pizza at the annual summer picnic.

There are two potential answers to question 6.9. Monetary policy is when the Federal Reserve alters the money supply through open market operations with the goal of changing the Federal Funds Rate. The final outcome from monetary policy is a change in the Federal Funds Rate, but the Federal Reserve does not unilaterally change the Federal Funds Rate. Instead, they enter the bond market, causing excess demand or excess supply in the bond market, which alters the money supply and interest rate simultaneously.

Because monetary policy is the act of changing the money supply, the actual depiction of monetary policy in our money market is straightforward.

Question 6.11: Monetary Policy

The current interest rate is at 5%, but the Federal Reserve believes the interest rate should be 4%. The Fed should:

A

Buy bonds

B

Sell bonds

C

Do nothing

D

Ask for help from Congress

In order to answer this question, let's look at the market for money. We are starting at the comfortable interest rate of $r_1 = 5\%$. This is labeled as point A on the graph below.

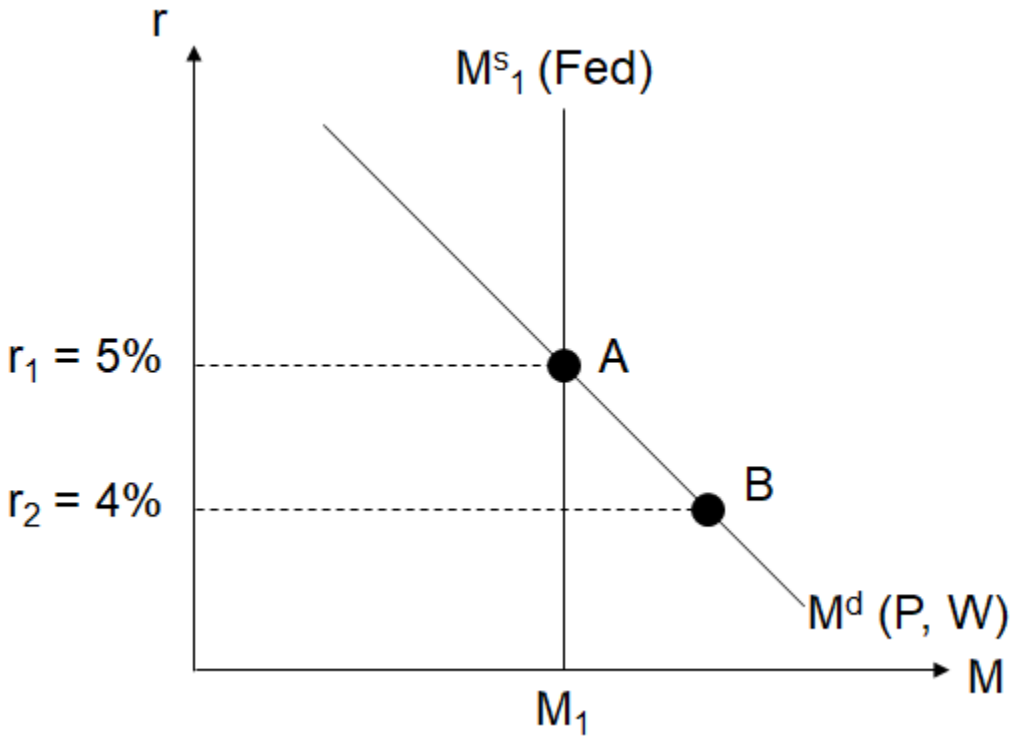


Figure 6.3.04

The Fed has decided that the equilibrium interest rate should be $r_2 = 4\%$. Assuming there is not a change in prices or wealth, this means that the new equilibrium should be at point B. This tells us that we need to increase the

money supply. In order to increase the money supply, the Federal Reserve needs to buy bonds.

When the Fed buys bonds, they are essentially increasing the demand for bonds. This drives the price of bonds up, which makes the bonds less desirable for households since the return on the bond is lower. A higher bond price is associated with a reduction in the interest rate.

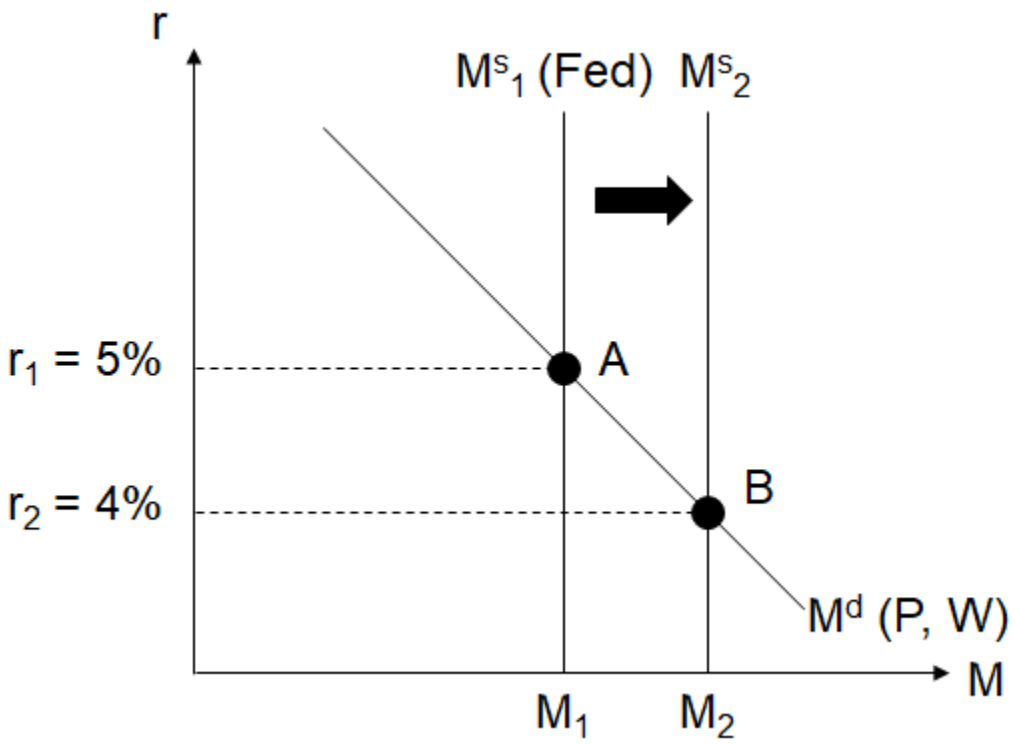


Figure 6.3.05

In our money market, the buying of bonds by the Fed increases the money supply from M^s_1 to M^s_2. The excess demand of money created by the increase in money drives the price of money down through the bond market. Our final equilibrium is at point B, where the interest rate is at 4%.

6.12: Targeting the Interest Rate

The Federal Reserve has determined that they want the interest rate to be 4%. The interest rate is initially at 4%. Then there is a decrease in the general level of prices. How should the Federal Reserve respond?

A

Buy Bonds

B

Sell Bonds

C

Do Nothing

D

Flip a coin

Question 6.11 extends our example. The Federal Reserve wants the interest rate to stay at 4%, which is point B. A decrease in the general prices from "high" to "low" leads to a decrease in money demand from M^d_2 to M^d_3. If the Federal Reserve does not respond to this reduction in money demand, the interest rate will fall below their 4% target. The new equilibrium would be at point F in the absence of any changes by the Fed.

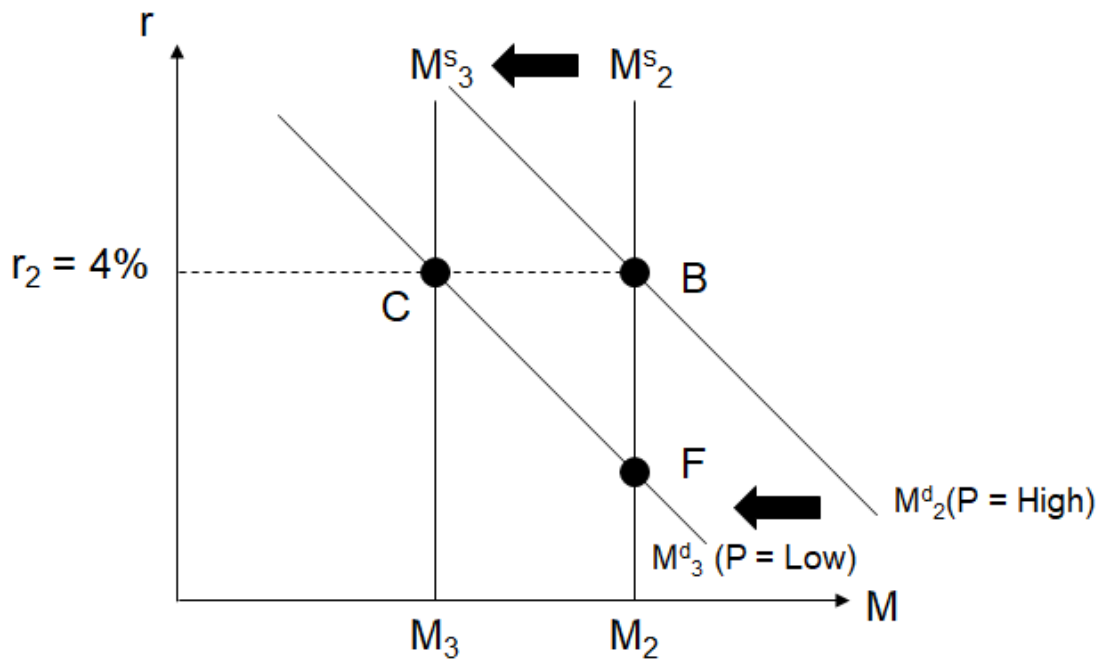


Figure 6.3.06

Because the Fed wants the interest rate to remain at 4%, we say they are "targeting an interest rate" of 4%. After the decrease in the money demand,

the Fed knows that the interest rate will fall if they do not respond. Instead of ending up at point F, they would prefer to end up at point C, where the new money demand curve, M^d_3, is associated with a 4% interest rate. This means that the Fed needs to decrease the money supply from M^s_2 to M^s_3. This is done by selling bonds to the public, reducing the amount of money in circulation.

Overall, the market for money allows us to see monetary policy in action. In our model, the Fed's movement of the money supply curve is what is meant by monetary policy. Think a bit about how this makes the Fed one of the more powerful "policy makers" in an economy. They have complete control over the money supply curve. This is in contrast to fiscal policy where the government can increase G, which is meant to increase the AE curve. However, any potential increase in AE can be washed out by a decrease in Autonomous Consumption (AC).

By increasing or decreasing the money supply, the Federal Reserve can influence the interest rate in the economy. Even when forces alter the demand for money, the Federal Reserve can respond to those forces and continue to move the interest rate in their preferred direction.

The Consequences of Changing Interest Rates

The eventual goal of monetary policy is to change the interest rate and in particular, the Federal Funds Rate. We have assumed that the Federal Funds Rate represents the interest rates in the rest of the economy. While this has been the case historically, there has been a divergence between the Federal Funds Rate and the interest rate that households face when taking out a loan for a mortgage or car. Nonetheless, the Federal Funds Rate continues to represent flexibility in the lending market.

What we have not covered directly is why the interest rate is important to consumers? In a different light, we discussed the interest rate when talking about the consumption function, but that may seem like a lifetime ago.

Interest Rate Importance

When the interest rate decreases, what will consumers purchase more of?

We made a joke in the previous section about how households will not change where they are going to dinner because of the interest rate. This still holds true. The announcement of the Federal Reserve buying bonds does not even register on the news feed for the average household. So who does respond?

Big Ticket Items: When the interest rate decreases, goods that require loans in order to be purchased suddenly become cheaper. Cars are a common response to the discussion question above. A lower interest rate on a car means that a car bought with a loan becomes cheaper. Often, furniture stores will have signs offering low-interest loans on their products. Appliances can also be financed with a loan. The products that respond to changes in the interest rate are often big ticket items, which we can think of as **durable goods**, from our discussion of GDP in chapter 3.

How is an increase in durable good consumption resulting from a decrease in the interest rate depicted in our existing models? The lower interest rate causes there to be more consumption spending, but the additional consumption spending is not because of a change in income. This means it is captured by an increase in autonomous consumption (AC). As the interest rate decreases, autonomous consumption increases. Increases in the interest rate have the opposite effect and AC decreases.

Capital Spending: As we discussed way back in chapter 3, firms often borrow money in order to purchase new capital and machines. When the interest rate is low, firms can borrow money "cheaply" making it easier to profit from capital purchases. An increase in the interest rate makes firms hesitant to borrow in order to finance capital purchases, as they will need to increase their production by a larger amount in order to make profit.

Changes in the interest rate directly influence capital spending. Capital spending is part of planned investment spending (I^P). This means that a

reduction in the interest rate will lead to an increase in I^P, which increases aggregate expenditures. The opposite effect will occur if the interest rate increases.

Housing Market: Another topic we discussed earlier in the book is the housing market. Decisions by housing developers and home buyers are influenced by the interest rate. A lower interest rate makes borrowing for a new home effectively cheaper. Developers can take out a loan and make more profit when the interest rate is low, compared to when the interest rate is high. Additional spending on new homes is also captured by planned investment spending (I^P). A reduction in the interest rate increases I^P because more capital is bought and more new homes are built and sold.

The interest rate directly impacts autonomous consumption (AC) and planned investment spending (I^P). Changes in either one of these components will shift the aggregate expenditure curve (AE). An increase in the interest rate will cause a decrease in AC and I^P, which decrease the AE curve. When the interest rate decreases, the AC and I^P increase, increasing the AE curve.

Monetary Policy and Aggregate Expenditures

Because changing the interest rate moves the aggregate expenditures curve and the Federal Reserve enacts monetary policy with the intention of changing the interest rate, monetary policy eventually moves the AE curve. It turns out that our two previous markets, the AE model and the money market, are directly related. Let's connect them now!

Imagine that the equilibrium level of output in the economy is $Y_1 = 8{,}000$. The equilibrium interest rate is 6% and the money supply is $1 trillion. From this information, we can construct two graphs: one depicting equilibrium with the AE curve and a money market equilibrium.

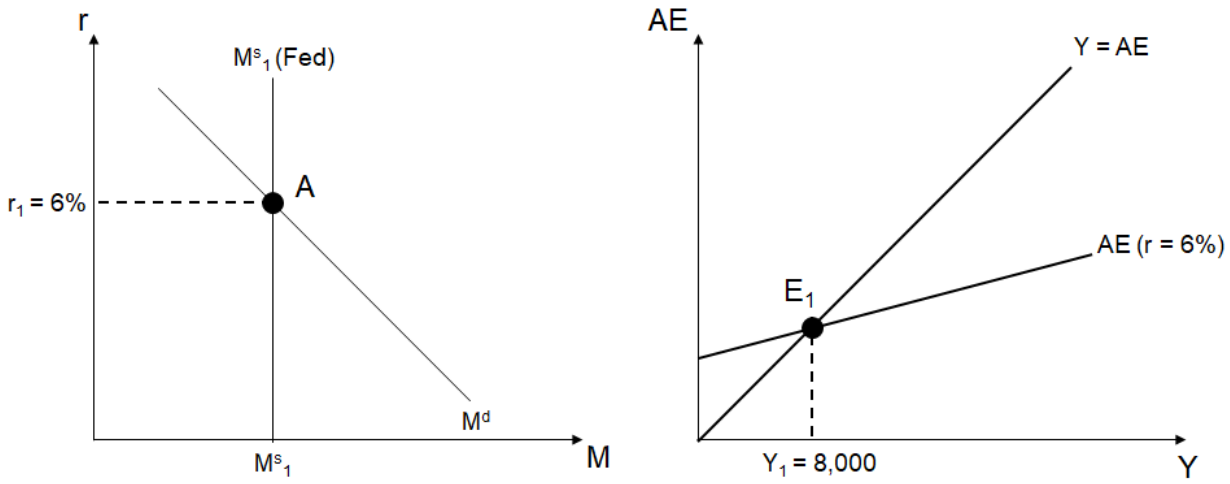


Figure 6.3.07

The money market is seen on the left side of the figure above. The Fed has set the money supply at M^s_1 and the equilibrium interest rate is 6% (point A). The 6% interest rate leads to a certain level of autonomous consumption (AC) and planned investment spending (I^P), which are directly related to AE. The AE curve notes that the aggregate expenditures curve is associated with a 6% interest rate.

At an output level of Y_1 = 8,000, spending (AE) and production (Y) are equal, which is our spending equilibrium in the economy (point E_1). You may be digesting a lot right now, but do not get overwhelmed. We have spent the entire chapter building up the money market. Just make sure you did not forget the aggregate expenditures model from chapter 4. (There was a point in time where the AE curve felt comfortable, just get back to that happy place!)

6.13: Monetary Policy and Aggregate Expenditures

Show Correct Answer

Show Responses

The current equilibrium level of output is at Y = 8,000 and equilibrium interest rate is 6%. The full-employment level of output is Y-bar = 10,000. How should the Federal Reserve react?

A

Buy Bonds

B

Sell Bonds

C

Do Nothing

D

Try to buy lunch using Monopoly money

Question 6.12 is what we have been building towards this entire chapter. In the question, the situation above is described, but we are told that the full-employment level of output (Y-bar) is 10,000. This means we are in a recession and the question is asking how can monetary policy be used to bring the economy back to full-employment.

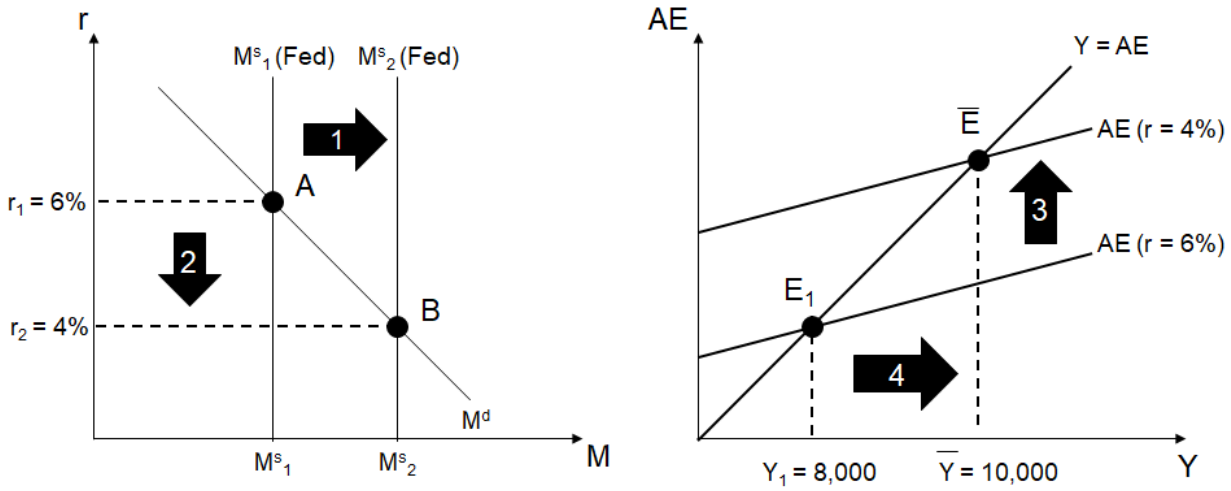


Figure 6.3.08

The figures above show the steps that use monetary policy to move the economy to full-employment.

- Step 1: The Federal Reserve increases the money supply through the purchase of bonds.
- Step 2: The increase in the money supply leads to a reduction in the interest rate from 6% to 4%.

- Step 3: A lower interest rate causes spending on durable goods, capital goods and new homes to increase. Autonomous consumption (AC) and planned investment spending (I^P) rise, causing AE to increase from AE (r = 6%) to AE (r = 4%).
- Step 4: Equilibrium output increases from Y_1 = 8,000 to Y-bar = 10,000, which is the full-employment level of output.

There is a lot going on in the figure above, but if you take each step one-at-a-time, the process will start to come naturally. Had the question just asked how the Federal Reserve increases the money supply (step 1), it would have seemed like a redundant question since we just covered it earlier in the chapter. We also showed what happens to the interest rate when the Federal Reserve changes the money supply (step 2).

Step 3 is similar to the questions we covered in chapter 4. There is an increase in AC, which increases AE and equilibrium output. Planned investment spending (I^P) also increases and that has the same effect on AE and equilibrium output (step 4). The only difference now is that monetary policy is being used to change the components of AE and eventually equilibrium output.

Monetary Policy and the Housing Market Crash

The housing market crash that spurred the Great Recession in 2008 led to a number of responses by policy makers. We covered the fiscal policy response in chapter 5. How did the Federal Reserve respond and was their response consistent with what our model above would recommend?

Because the numbers we have been using in our examples are not equal to the actual values in our economy, let's depict the economy in a full-employment equilibrium without using specific values of Y, r or M^s. Assume that in 2007, the economy was in a full-employment equilibrium. This means that the equilibrium interest rate, r_1, yielded an AE curve, AE_1 (r_1), that caused equilibrium output to be at Y-bar.

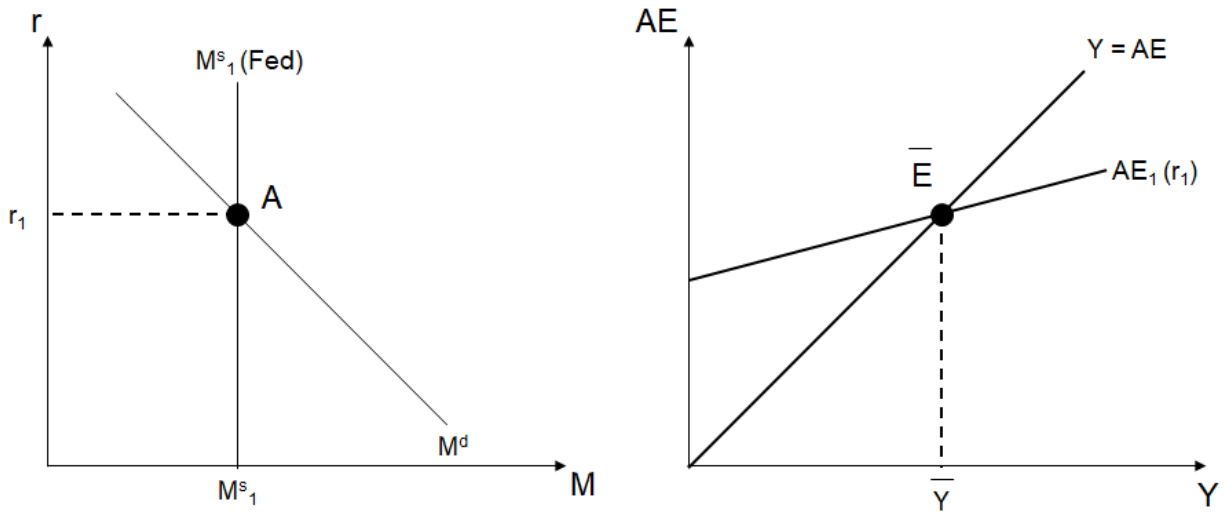


Figure 6.3.09

By 2009, the housing market had crashed. As we discussed in earlier chapters, this led to a significant decline in wealth, causing autonomous consumption (AC) to fall. Because the new homes are a component of planned investment spending (I^P), I^P also decreased. These shocks led to a decrease in the aggregate expenditures curve. In the graph below, AE_1 (r_1) moves to AE_2 (r_1) since the Federal Reserve did not respond on the exact day that the AE curve decreased.

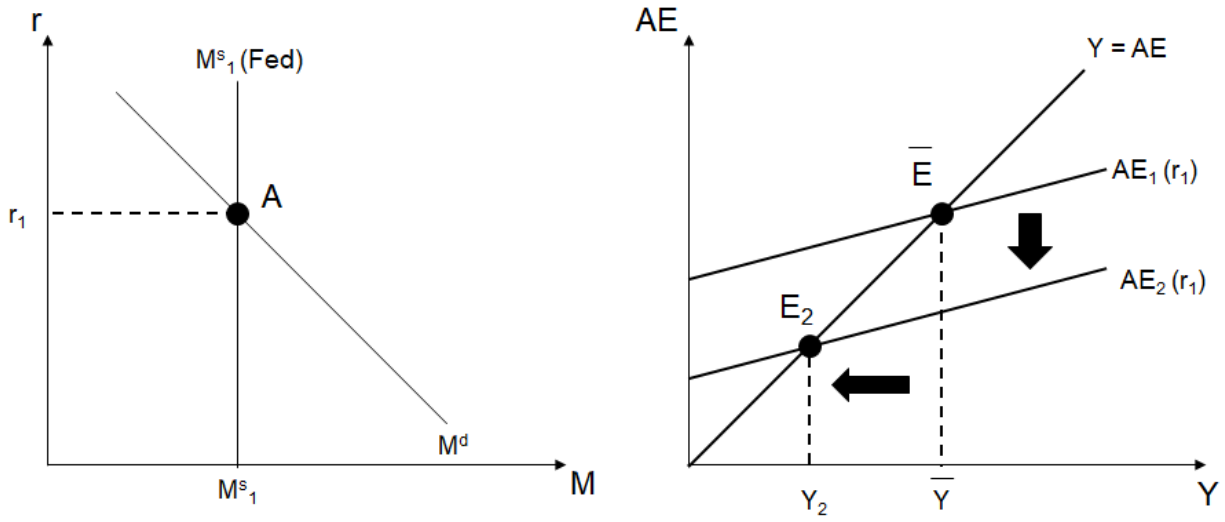


Figure 6.3.10

The graphs above show that the reduction in AE decreases the equilibrium from the full-employment level of output, Y-bar, to Y_2. Equilibrium moves from E-bar to E_2. This is a movement we have seen before when learning about the AE curve and equilibrium spending.

Now it is time to apply what we have learned. The economy is in a recession and output is below full-employment output. What should the Federal Reserve do? Carry out monetary policy.

The Fed needs to use their policy tools to increase the aggregate expenditures curve back to the original level. The only thing they can do is use open market operation to change the money supply, which changes the interest rate and eventually the AE curve. We know that a lower interest rate will increase AC and I_P, which suggests that the Fed needs to increase the money supply. In other words, they need to buy bonds from the public.

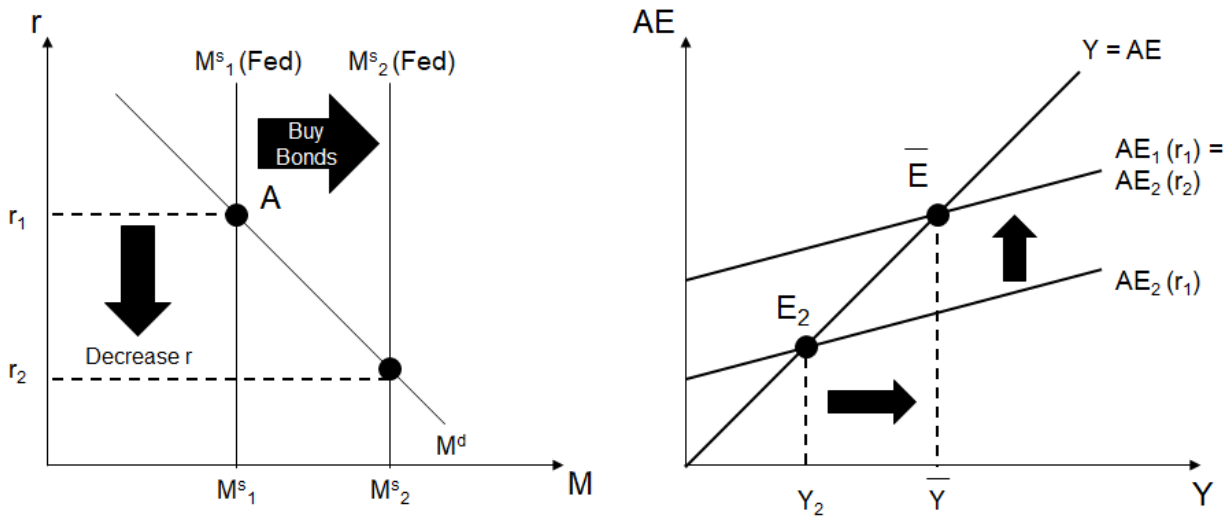


Figure 6.3.11

Buying bonds from the public will increase M^s_1 to M^s_2, which reduces the interest rate from r_1 to r_2. The lower interest rate increases AE_2 (r_1) to AE_2 (r_2). Assuming that the Fed knows exactly how much to change the interest rate in order to bring the economy back to the full-employment level of output, the new AE_2 (r_2) curve will be the exact same one as the original AE curve, AE_1 (r_1).

While this is a strong assumption, the analysis shows us that the Federal Reserve should aim to decrease interest rates in response to the housing market crash in 2008.

So did the Fed respond appropriately? Earlier in this chapter when discussing the Federal Funds Rate, the following graph was presented:

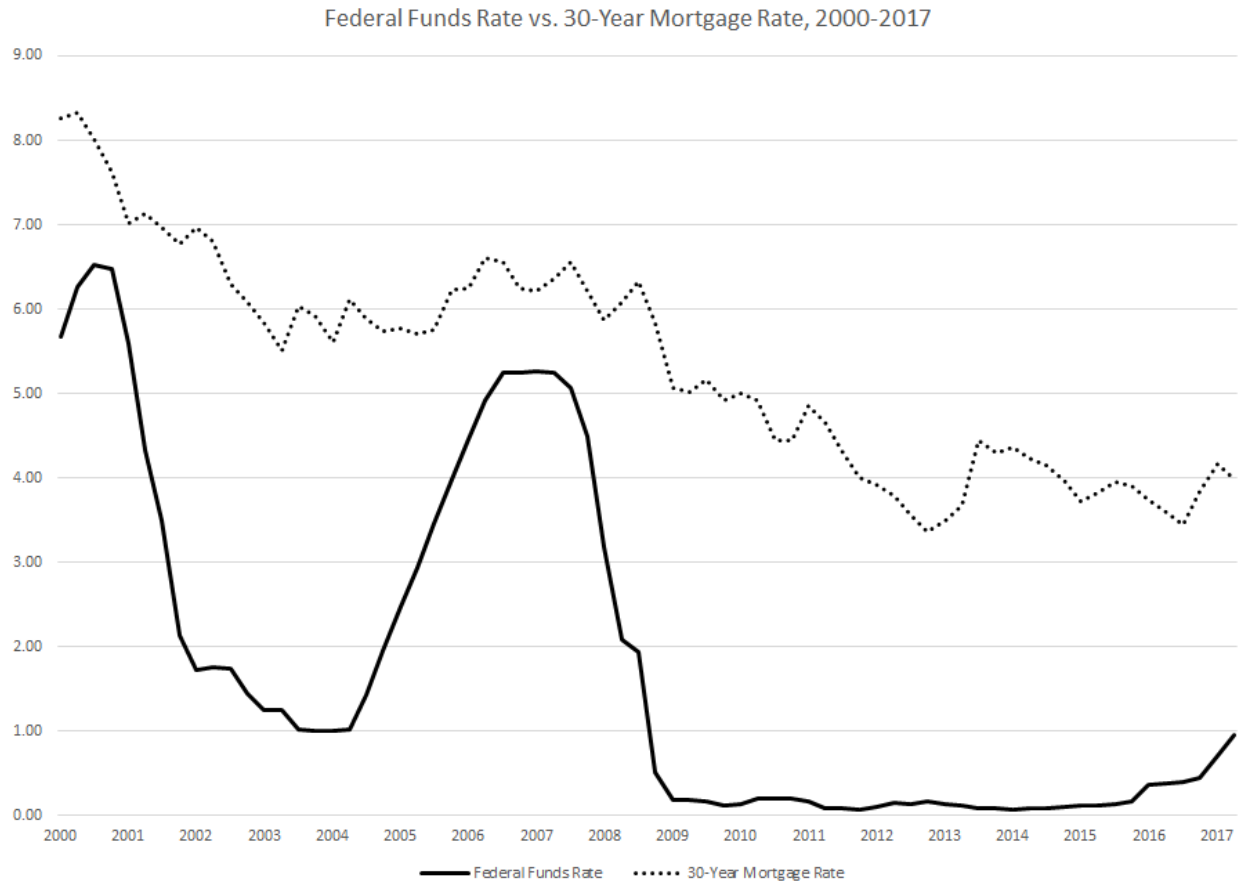


Figure 6.3.12

As soon as the housing market crashed, the Federal Reserve started to increase the money supply and decrease the Federal Funds Rate (solid black line). Even after the Federal Funds Rate essentially hit zero in 2009, they continued to try and reduce the mortgage rates (dotted black line) through quantitative easing.

Although buying mortgage-backed securities by the Federal Reserve was frowned on by some policy makers, their behavior was consistent with what we would recommend in our model above. Because the Fed had run out of conventional tools to decrease the interest rates faced by consumers, they decided to directly intervene in the hopes of raising aggregate expenditures and helping the economy return to full-employment equilibrium.