Chapter 11
Money and Monetary Policy

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Chapter 11: Money and Monetary Policy

Everybody would like to have more money, right? Well, maybe not. In 2004 it was pretty easy to be a millionaire in Turkey—many times over. With a million Turkish Lira being worth about $.75 in United States dollars, a 20,000,000-lira bill was worth about US $15. People routinely just put their thumb over the last six digits when looking at a value expressed in liras. The Turkish lira was named by Guinness World Records as the world's least valuable currency. But you could have lots of it!

1. Why Money?

So far, this book has said very little about money, finance, or interest rates. Yet many people consider these to be the quintessential economic issues. What is the relation of money and finance to macroeconomic behavior? Before we get into the details of how money and credit work in a sophisticated contemporary economy, let's get a few simpler—and dramatically different—pictures in our minds. These scenarios, drawn from real world situations and events, inform how economists have come to think about money and the macroeconomy.

1.1 Money and Aggregate Demand

Let's start with a case of an economy in which inflation is running at only a low to moderate rate. Suppose further that this economy has a banking system that is sophisticated and in reasonably good shape. You are a business person, who has a great idea about how to expand your business. Or, in your role as a household member, you are interested in buying a home for your family. But you don't have the cash. You go to a bank and ask for a loan. The bank will evaluate your trustworthiness as a borrower, see how much it currently has available to lend, and then either deny you a loan or offer you a loan on particular terms. If you receive a loan offer and accept the terms, you will take out the loan and go out and spend. If you are denied the loan, or if you think the terms are too harsh, you will forgo expanding your business or buying the house.

To the extent the government of a country can affect the volume and terms of loans made by banks, it can thus affect the level of spending in the economy. We've seen in the last two chapters how the level of spending (or aggregate demand) in an economy is related to levels of employment and output. Monetary policy that affects the behavior of banks, then, may also be a significant factor in achieving the goals of macroeconomic stabilization and low unemployment.

But not all economies enjoy low inflation rates and stable banking systems. Our next two touchstone cases illustrate these issues.

1.2 "Running the Printing Press"

Consider a country with a very simple government and banking system. The country's government is housed in a single building and pays its employees and its bills in
cash. In the basement of the building is a printing press that prints paper money. The government finds it very difficult to collect enough taxes to pay its operating expenses, so it just runs the printing press every time an employee needs to be paid or a bill comes due.

What would be the effect of this on the economy? If the national economy is very large and growing, relative to the size of government expenditures, the fresh bills may just be absorbed into circulation without much effect. But if the economy is stagnant or staggering, and expenditures are large, there will soon be a classical situation of inflation caused by "too much money chasing too few goods."

If this goes on for long, a situation of hyperinflation can result. Germany after World War I, Hungary after World War II, Bolivia in the mid-1980s, Argentina during various periods, and the Ukraine in the early 1990s experienced famous hyperinflations. In Germany, for example, the economy was in tatters after the war and the government found it impossible to collect taxes in order to support its operations—and pay the reparations demanded by the victors in the war. So it resorted to running the printing presses. Inflation reached a high of 41%—per day! Stories were told of people taking stacks and stacks of Deutsch marks to town in a wheelbarrow in order to make a modest purchase, and—after leaving it for a moment—returning to find the wheelbarrow stolen and the bills stacked on the ground. Or of people in a bar ordering their beers two at a time, because the price of beer was rising faster than the beer would get warm. In 1920 a German postage stamp cost 4 marks; in 1923 the same stamp cost 50 billion marks.

In such a situation, it obviously becomes very difficult to keep a sophisticated economy going. People tend to resort to barter—exchanging goods directly for other goods—to try to avoid having to deal with a rapidly inflating currency. It becomes impossible to think about making a deposit in a bank, or to work out reasonable terms for a loan, and so normal patterns of saving and lending are disrupted. If they can, people may try to get a hold of—or at least keep their accounts in—a "hard," non-inflating currency issued by foreign country. Hyperinflation is obviously not a good situation, and production tends to be lowered and unemployment raised by the chaos that hyperinflation causes in an economy.

| barter: exchange of goods, services, or assets directly for other goods, services, or assets, without the use of money. |

Usually, what eventually ends a hyperinflation is that the now nearly valueless currency is abandoned, and people exchange very large denominations of the old currency for small denominations of a new currency. If this is accompanied by a credible government promise to stop "running the printing press," it draws the episode of hyperinflation to a close.

Even if inflation does not reach astronomically high hyperinflation levels, high inflation can be disruptive to an economy. Ongoing high inflation tends to wipe out the value of people's savings, and hurts people who are on fixed incomes (such as non-indexed pensions). It redistributes wealth from creditors to debtors, since people now
repay debts in money that is worth less than the money they originally borrowed. It creates "menu costs"—literally, the cost of time and effort made to update printed menus and other sorts of price lists. Rising and/or variable inflation rates create a great deal of uncertainty, which can make it very difficult for households and businesses to make sensible plans regarding savings, retirement, investment, etc. For these reasons, stabilization of a country's price level is among the important goals of macroeconomic policy.

1.3 Deflation and Financial Crises

Finally, consider an economy in the opposite situation, in which there is too little money in circulation. In this case, prices must be bid down. This is the case of deflation. Why would deflation be a problem? While deflation makes people's savings more valuable and helps people on fixed incomes, it is still disruptive. In this case, wealth is redistributed from debtors to creditors. You borrow "cheap" money, but later have to pay back with money that is "dear." It creates menu costs. It creates uncertainty. When people come to expect deflation, it may also cause them to cut back on spending. Why buy a big item like a car or computer now, if you believe you will be able to get the same item cheaper next year?

| deflation: when the aggregate price level falls

Deflation is often touched off by a financial crisis in which many people lose access to the opportunity to obtain loans, and perhaps access to their own deposits at banks as well. If you can't withdraw money from your account at a bank, and you can't get a loan, then you can't pay for things. If many people are in this situation, the economy grinds to a halt—or at least slows down considerably. With less money being spent, prices fall. The Great Depression in the United States was accompanied by just such a collapse in the banking system. The "bank runs" or "banking panics" of 1930-33, in which people all rushed to try to withdraw their deposits all at once, caused many banks to fail. Since deposit insurance didn't exist yet back in those days, people's accounts at those banks were wiped out. The price level dropped 25% over the span of a few years.

But deflation isn't just "ancient history." Japan's has also recently experienced deflation touched off by a financial crisis. In late 1989 a speculative bubble in real estate and stocks came to a sudden end. Japanese banks had, it turned out, racked up huge amounts of bad loans—loans they would never be able to collect. Some banks were ordered shut down, while others teetered. People became justifiably leering of depositing funds—or of spending, with the future so uncertain. With deposits shrinking, banks were unable to lend as much and with spending shrinking, the Japanese economy slid into recession. Over the next several years, prices gently but steadily fell at a rate of about 1% per year.

These situations can be very frustrating, when looked at from the perspective of the real potential productivity of an economy. People may want to work and spend, and businesses might have great ideas for expansion, but they are constrained by the lack of spendable assets to grease the wheels of the economy. For this reason, stability of the
financial system is an important policy goal for governments, and closely related to both
the goal of price stability and the goal of raising living standards.

Discussion Questions

1. Which of the three states just described—low inflation, high inflation, or deflation--
best characterizes the U.S. economy right now? Do you know of any country currently in
one of the other states?

2. Unemployment and inflation are usually considered to be the "bads" that come with
business cycles. Compare the costs to society of unemployment to the costs to society of
inflation.

2. What is Money?

You have no doubt that the bills and coins you have in your wallet are "money." Economists
would agree with you on that. But in other ways, the way economists use the
term is very different from the way it is used in popular speech. Money, to an economist,
is something that plays three specific roles in an economy, and the cash in your pocket is
only one form.

2.1 The Roles of Money

One way money can be understood is by the roles it plays in an economy. It is a
very special kind of financial asset (form of financial capital) that has three important
functions.

First, it is as a medium of exchange. That is, when you sell something, you accept
money in return. When you buy something, you give over money to get the good or
service you want. Without a decent medium of exchange, an economy would have to run
as a barter system, as mentioned earlier. You would have to directly trade a tangible
object or service in order to get a good or service in exchange. This could be quite
inconvenient—there would have to be what is called a "double coincidence of wants." For
example, if you want pizza and can offer web design services, you would need to
hunt around for pizza makers in need of web design. Such merchants may or may not
exist, and even if they do, you would certainly have to spend some considerable time
finding them. With money, on the other hand, you can sell your services to anyone who
wants them, and use the money you get to buy pizza from anyone who supplies it.

Secondly, money is also a store of value. That means that, even if you hold onto
it for a while, it will still be good for transactions when you are ready to use it. This is
obviously a necessary property, since the pizza makers are unlikely to accept your money
in exchange unless they know that, a month from now, their landlord will also accept the
same money in exchange. In serving as a store of value, money serves as a way of
holding wealth—just like any other form of financial or real capital that is held because it
is worth something. The thing that makes money distinct from other assets is its
liquidity, that is, the ease with which it can be used in exchange. Money is highly liquid—you can take it to the store and use it immediately. If you own a car, shares in a business, or a valuable piece of jewelry, these are also ways of storing your wealth, but they are not liquid. You would need to convert the value you've stored in them to money before you could buy something else.

liquidity: the ease of use of an asset as a medium of exchange

The third role of money is that it is a unit of account. Sometimes things are assigned money values even if they are not actually being bought and sold. When a firm values unsold inventories in its warehouses in order to calculate its profits or losses, for example, or a town assesses the dollar value of a house even though there are no plans for it to be sold, they are using money as a unit of account.

Money has three roles: as a medium of exchange, a store of value, and a unit of account.

Some things that are commonly called "money" are not money in the way that economists use this term. For example, we might commonly say that someone "makes a lot of money" because he has a high annual income. Income, however, is a flow variable, measured (as described in Chapter 3) over a period of time. Money is a stock variable—a particular kind of asset. A person who makes a lot of income over a year may acquire a large stock of money—or he may not. If he quickly spends his income on goods and services he may have high income (over the year) but accumulate little money (measured at a point in time). We also may say that someone "has a lot of money" if she has accumulated a lot of wealth. But this is also not technically correct. A wealthy person may hold a lot of her assets in the form of corporate shares, real estate, or Renaissance paintings, rather than as spendable, liquid money. Middle class families are sometimes described as "house poor" exactly for this reason. If they attempt to hold a high proportion of their assets as home equity, they may end up with very little in the way of funds they can actually spend—that is, money.

Money is not the same thing as wealth or income.

2.2 Types of Money

Throughout much of history, commodity money was the most common type of money. Commodity money is made up of something that is valuable in itself, and also used in exchange. Coins made of gold or silver are probably the most familiar example. Decorative beads, shells, fish hooks, and cattle have served the purpose in some cultures. In prisons and prisoner of war camps, cigarettes have often developed into a medium of exchange. "Prices" for chocolate or other goods and services are then quoted in terms of numbers of cigarettes required in exchange.

commodity money: a good used as money that is also valuable in itself
To be used as money, a commodity must be generally acceptable, standardized, durable, portable, scarce, and, preferably, easily divisible. Cigarettes have been used as money even by non-smokers, for example, because they know that because cigarettes are generally accepted in trade, they can use them to get what they actually want. Standardization is important, so that disputes don't arise about the quality and value of the money. Coins stamped by the government are a popular sort of money because the stamp is a sign that they are of equal weight and purity of mineral content. Gold and silver have historically been popular because coins made from them are durable. The scarcity of gold and silver was also an important factor. Coins made of, say, wood, in an area with many forests would rapidly lose value as everyone could just make their own. Divisibility is also important. Heavy gold ingots might be useful for buying expensive real estate, but are not very useful for buying pasta for dinner. Smaller coins, and coins made of less valuable minerals, were historically minted to provide a medium of exchange for smaller purchases.

Gold and silver coins, while fairly portable, can still be pretty inconvenient to carry around in large quantities. Individual banks, state governments, and national governments have at various times issued paper monies that represent claims on actual commodities, usually gold or silver. For many years, starting in the late 1880s, government-issued silver certificates were the main form of domestic paper money in the United States. International transactions were, for many years, based on gold reserves. When people carried such a piece of paper, they could think of it as a certificate showing that they owned a bit of an ingot in Fort Knox.

In the 1960s, however, due to an increase in the price of silver, the government eliminated silver certificates and replaced them with what you probably have in your pocket today. What is commonly called a "dollar bill" is, if you look at it, officially called a Federal Reserve Note. About the same time, the United States government also removed silver coins from circulation, replacing them with look-alike coins made from cheaper nickel-clad copper. In 1971, President Richard Nixon took the U.S. economy off the international gold standard.

So what is the basis of value of the coins and dollar bills we use today? The basis of value is--precisely and no more than--the expectation that the dollar bill will be acceptable in exchange. The currency and coins we use now are what are called fiat money. "Fiat" in Latin means "let it be done," and a legal authority does something "by fiat" when it just declares something to be so. A dollar bill is money because the government declares it to be money. Fiat money is what some people call a "social construction"—something that works in society because of how people think and act toward it, not because of something it intrinsically "is." Fiat money works fine as long as people are generally in agreement that it has value. Latter in this chapter, we will examine some cases in which people have stopped agreeing—when people have lost confidence in the value of their money.

**Fiat money:** a medium of exchange used as money because a government says it has value, and people accept it
As economies get more and more sophisticated, however, even carrying around paper money gets inconvenient. These days, you are likely to take care of many of your transactions by other means, such as making electronic funds transfers from your bank. Understanding what types of transactions are said to involve "money" requires understanding how various assets differ in their liquidity and also understanding the distinction between money and credit.

### 2.3 Measures of Money

Because different assets have different degrees of liquidity, it can be difficult to draw distinct lines between which assets are "money," which are ambiguous "near money," and which are "not money." As a result, economists have devised various ways to define and measure the volume of money that is circulating in a given economy.

Coins and bills are obviously "money." In the United States today, coins are manufactured by the U.S. Mint at four locations around the country, while bills are created by the Bureau of Engraving and Printing. When economists measure a country's "money supply," only currency that is in circulation is included—not currency that is for example, sitting in a vault at the Mint or at a bank. On January 30, 2006, for example, currency in circulation in the United States totaled $733 billion.

But checking accounts are also extremely liquid. People can pay for many things using paper checks and, increasingly, debit cards and electronic transfers that take funds directly from their checking accounts. The most commonly used measure of the amount of money in an economy at a given point in time, then, includes not only currency in circulation but also the value of checkable deposits, as well as the value of traveler's checks. It is called M1. On January 30, 2006, checkable deposits totaled $642 billion, and travelers checks were $7 billion, so that total was M1 measured at 1.38 trillion.

| M1: a measure of the money supply equal to currency, checkable deposits, and traveler's checks |

But many people can now move funds from their savings accounts to their checking accounts with the click of a mouse, or make electronic payments directly from their savings accounts. So shouldn't savings accounts also be considered "money"? A measure called M2 includes everything in M1, plus savings deposits and some other funds such as small certificates of deposit and retail money market funds. M2 is now over four times the size of M1. Another measure, called M3, includes everything in M2 plus a number of funds more often held by institutions than individuals, such as certificates of deposit over $100,000. While these other definitions also have their uses, you should know that when economists talk about "the money supply" they most often mean M1, or perhaps M2.

What about if you use a credit card to make a purchase? From the user's point of view, using a credit card often seems to be very much like using a debit card or cash from one's pocket. In economists' terms, however, one does not use "money" when one uses a credit card. This is because when you use a credit card, you are, technically speaking,
taking out a temporary loan from the credit card company. Only one day a month, when you send a check or electronic transfer to your credit card company from your checking account, do you make a "money" transaction.

Discussion Questions

1. Suppose you asked someone who has not taken an economics class what makes a dollar bill have value. What do you think they would say? Would they be correct?

2. What do you commonly use to make payments? Cash? Credit cards? On-line payments? In which of these cases are you using "money"?

3. The Banking System

It is pretty easy to understand how the United States Mint and the Bureau of Engraving and Printing create currency, and how they could create more or less of it. But how does currency make its way into people's wallets? How are bank deposits such as checking accounts created? How can the volume of currency and deposits be increased or decreased over time, as a matter of macroeconomic policy? To understand the answer to these questions, we need to know more about how a contemporary banking system works.

In the United States, The Federal Reserve System (or "Fed," for short) determines how much currency should be produced, and puts it into circulation. In addition, the actions of the Federal Reserve together with actions of private banks create the economy's volume of checkable deposits. For much of Europe, now that many countries have joined together using the Euro as their currency, the equivalent institution to the Fed is the European Central Bank (ECB). Most countries have combined systems of private and central banking, which work at least roughly like the system described here. We will start by looking at private banks.

3.1 Private Banks

In the discussion of the Classical market for loanable funds in Chapter 9, we assumed that some agents lend and others borrow, but we paid no attention to how borrowers and lenders would find each other. An individual might go to a relative for a loan. When the borrower is operating in a more impersonal way – perhaps because it is a business, not an individual, or because the would-be borrower does not have personal contacts with individuals who can make the needed loan – then there is need for an intermediary that can put together would-be lenders with would-be borrowers. A private bank is a type of institution called a **financial intermediary**. Individuals and organizations deposit funds with financial intermediaries, for safekeeping, or to provide the convenience of writing checks, or to earn interest. The financial intermediaries use the funds deposited with them make loans to individuals and organizations that seek to borrow funds. Besides banks, financial intermediaries include savings and loan associations, credit unions, and life insurance companies.
financial intermediary: an institution such as a bank, savings and loan association, or life insurance company that accepts funds from savers and makes loans to borrowers

A private bank is a for-profit business, meaning that it seeks to make earnings on its activities. It does this by charging interest (and perhaps other fees) on the loans it makes. One of its functions is to screen the parties seeking loans, in order to determine their credit-worthiness. Loaning is a risky business—not all loans made will be paid back in full. Some of the risk can be alleviated by demanding physical assets as collateral. For example, mortgages and home equity loans are collateralized by the value of a house, which the bank may take possession of if the owner defaults on the loan. Many educational loans are backed up by government guarantees. Other loans are made on the basis of an evaluation of, say, the strength of a business plan and a business's record in paying back past loans. Banks may charge different interest rates depending on the riskiness of a loan, or deny a loan request entirely.

To understand what happens in a banking system, we will start with a private bank's simplified balance sheet, shown in Table 11.1. A balance sheet is a standard double-entry accounting representation of a private bank's assets and liabilities. It must "balance" in that assets and liabilities must add up the same amount. The right side of a balance sheet, as shown in Table 11.1, lists an organization's liabilities. An economic liability is anything that one economic actor is owes to another. The funds you deposit in a bank are listed among the bank’s liabilities, because it has an obligation to repay these funds to you.

### Table 11.1 A Simplified Balance Sheet of a Private Bank

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loans</td>
<td>$ 70 million</td>
</tr>
<tr>
<td>Government Bonds</td>
<td>$ 20 million</td>
</tr>
<tr>
<td>Reserves</td>
<td>$ 10 million</td>
</tr>
<tr>
<td></td>
<td>Deposits $ 100 million</td>
</tr>
</tbody>
</table>

Except in the case of banking panics, depositors are not likely to all show up at the same time, demanding their funds in cash. While the bank needs to keep some funds around to meet depositors’ withdrawal needs, it normally can use most of the deposits it holds to obtain earnings.

Assets of an organization are listed on the left side of a balance sheet, as shown in Table 11.1 Bank reserves, shown as an asset in Table 11.1, include vault cash that the bank keeps around to meet likely short term calls, such as depositors’ withdrawals. Reserves also include deposits that the private bank has in an account at the Federal Reserve (which will be discussed further, below). These are things that the bank owns.

| bank reserves: funds not loaned out by a private bank, but kept as vault cash or on deposit at the Federal Reserve |
One quite safe way the bank can earn some interest is to loan money to the federal government. Recall from Chapter 10 that the United States Treasury borrows from the public when it needs to finance a government deficit or refinance part of the debt. It does this by issuing government bonds, which give the buyer the right to specific payments in the future. Depending on the duration of the loan, these securities may be called "bills" (you may have read about "T-Bills" in the financial pages of the newspaper), "bonds," or "notes." We will continue to use the term "government bonds" to represent any federal government security. Very active markets exist for trading federal bonds, and a particular bond may change hands many times before it is paid off. Banks tend to keep some of their assets—about one-quarter, on average—in government bonds, because bonds earn interest but are also relatively liquid. If it looks like depositors will be wanting more cash back than a bank has in its vault, the private bank can quickly sell some of its Treasury bonds on the open bond market.

The major asset of a private bank—and the major way it makes its earnings—is its portfolio of (other) loans. These are funds that are owed to the bank by businesses, households, nonprofits, or non-federal levels of government. Unlike T-bills which can be liquidated quickly if necessary, some of these loans may be business loans, home mortgages, or consumer loans that won't be repaid for years. These assets are generally far less liquid than vault cash or T-bills. The health of a private banking system depends on depositors remaining confident in the safety of the funds they have entrusted to the banking system, and not trying to withdraw their funds faster than such loans are repaid.

3.2 The Federal Reserve System

In 1907, the U.S. economy experienced a banking panic, in which depositors lost trust in banks, tried to withdraw their deposits all at once, and as a result caused many banks to fail. In response, Congress enacted legislation creating the Federal Reserve system in 1913. The Fed is a rather odd organization in that it is not exactly part of the government, yet not entirely separate from it, either. It is overseen by a Board of Governors whose seven members are nominated by the President and approved by the Senate, and who serve 14-year terms. One member of the Board is named as Chair, and serves in that capacity for a four year term (though many have served consecutive terms). The long terms of service are intended to help insulate the Fed from short-term political pressures.

The Fed performs a number of important functions. As we have already noted, it serves as a "banker's bank" by holding deposits made by private banks. One of the Fed's important day-to-day functions involves using these deposits to clear checks drawn on one bank and deposited in another. When a check is drawn on a bank, the piece of paper goes to a Fed clearinghouse. The bank's account at the Fed is debited by the amount of the check. When a check is deposited, that bank's account at the Fed is credited with the funds. If a bank is in need of vault cash, it can also buy currency from the Fed, using the funds in its Fed account as payment. The Fed orders banks to keep a certain percentage of their deposits as required reserves, in the form of either vault cash or in such deposit as the Fed. Currently, banks are required to keep an amount equal to 10% of their
checkable deposits as reserves. A bank may keep reserves in excess of the required amount, if it wishes, although if it does it may forgo profitable earnings opportunities.

**required reserves**: reserves that banks are required to hold by the Fed

Another of the Fed's important tasks is to attempt to stabilize the rate of exchange between domestic and foreign currencies. And the Fed, along with other organizations such as the Federal Deposit Insurance Corporation (FDIC), regulates banks, attempting to make sure that banks operate as much as possible without error or fraud. Because the FDIC guarantees the value of many accounts, and the Fed is willing to make emergency loans to banks that get into a liquidity crunch, the sorts of crises in depositor confidence that led to bank runs in the past are now far less likely.

In terms of structure, the Fed System consists of the Board of Governors based in Washington DC and twelve regional Federal Reserve Banks based in cities including New York, San Francisco, St. Louis and Chicago. The structure of the European Central Bank is somewhat similar, in that while it has headquarters in Frankfurt, Germany, each of the twelve member countries also retains its own national central bank.

The Fed keeps close track of the economy, and tries to sense whether some adjustment in the money supply might be necessary in order to support aggregate demand (as discussed in section 1.1 above) or counteract undesirable changes in the inflation rate (as were discussed in sections 1.2 and 1.3). We will examine the macroeconomic consequences of Fed actions later in this chapter, but for right now we will concentrate on the mechanics of how the Fed influences the money supply.

### 3.3 The Creation of Money and Credit

The Fed has various means of changing the volume of money and credit in the economy, all of which involve changing the level of bank reserves. The most commonly used tool is **open market operations**. In open market operations, the New York Federal Reserve bank changes the level of bank reserves by buying or selling government bonds. Such operations are directed by the Federal Open Market Committee (FOMC). Let's see what happens when the FOMC undertakes a purchase of government bonds on the open market.

**open market operations**: sales or purchases of government bonds by the Fed

A simplified balance sheet for the Federal Reserve is shown in Table 11.2. Because currency is issued by the Fed, currency in circulation is the Fed's major liability. Its other major liability is the reserves held by private banks. Recall that these consist of vault cash and deposits the banks have at the Fed. Just as deposits made by individuals at banks are the liabilities of the banks, deposits made by banks at the Fed are liabilities of the Fed. The Fed holds various assets, but the most important one for our story is its stock of government bonds.
Table 11.2 A Simplified Balance Sheet of the Federal Reserve

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government Bonds</td>
<td>Currency in Circulation</td>
</tr>
<tr>
<td>$ 750 billion</td>
<td>$ 700 billion</td>
</tr>
<tr>
<td>Bank reserves</td>
<td>$ 50 billion</td>
</tr>
</tbody>
</table>

When the Fed makes an open market purchase of bonds, its holdings of bonds increase. It generally makes such purchases from a commercial bank, so it pays for the purchase by crediting the bank's account with the Federal Reserve System by the amount of the purchase. What does it pay with? Unlike any other actor in the economy, the Fed can create funds with the proverbial "stroke of a pen," or, these days, alteration of a computer database at the New York office. It simply declares that the banks reserves are now higher. Remember how we explained above that dollar bills are "fiat" money, whose value depends on a government declaration that they are money? Bank reserves are similar: Odd as it may seem, the Fed can create reserves by simply declaring that the balance in a bank's account is now higher.

When the Fed makes an open market purchase, it increases something called the monetary base (or high-powered money). This is defined as the sum of currency in circulation and bank reserves. The monetary base is the sort of "money" that the Fed directly controls.

**monetary base (or high-powered money):** currency plus bank reserves (directly controlled by the Fed)

Suppose the Fed buys $11 million worth of government bonds from ABCbank. The changes in the Feds' balance sheet and the balance sheet of a ABCBank are shown in Table 11.3. The Fed increases its holdings of bonds, an asset, and bank reserves, a liability. ABCBank changes the mix of assets it holds, now holding less in bonds and more in reserves. Notice that both balance sheets still balance—if total assets equaled total liabilities before the change, they will still be equal after the open market purchase.

Table 11.3 An Open Market Purchase of Government Bonds by the Fed

(a) Change in the Fed Balance Sheet

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government Bonds</td>
<td>+ 11 million</td>
</tr>
<tr>
<td>Bank reserves</td>
<td>+$ 11 million</td>
</tr>
</tbody>
</table>

(b) Change in ABCBank's Balance Sheet

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government Bonds</td>
<td>−$ 11 million</td>
</tr>
<tr>
<td>Reserves</td>
<td>+$ 11 million</td>
</tr>
</tbody>
</table>

So far in our story, reserves have risen by $11 million, but the supply of money in circulation (as measured by M1 or other measures) has not changed. But if ABCBank sees opportunities to make profitable loans, it will not let its new $11 million in reserves just sit at the Fed. If it just met its reserve requirement before the bond purchase, then
much of this new $11 million is excess reserves. With a reserve requirement of 10%, it can use this $11 million to make $10 million of new loans, keeping only $1 million (10% of 10 million) of the new funds in reserves. This movement of $10 million from reserves to new loans is shown in Table 11.4(a).

Suppose it makes a $10 million loan to Jane's Construction, and that, after obtaining the loan in the form of a check, Jane's Construction deposits the entire amount of the funds at XYZBank. (We assume a different bank, so we can keep track of changes in balance sheets more easily.) The changes in the balance sheets of XYZBank are shown in Table 11.4(b). Since the way that the Fed clears checks is by increasing or decreasing the deposits it holds for banks, the initial impact on XYZBank of the deposit of the check by Jane's Construction is a $10 million increase in both its checkable deposits and its reserves at the Fed.

**Table 11.4 A Loan by ABCBank Becomes a Deposit in XYZBank**

(a) Next Change in the ABCBank's Balance Sheet

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loans</td>
<td>+$ 10 million</td>
</tr>
<tr>
<td>Reserves</td>
<td>−$ 10 million</td>
</tr>
</tbody>
</table>

(b) Change in XYZBank's Balance Sheet

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reserves</td>
<td>+$ 10 million</td>
</tr>
<tr>
<td>Deposits</td>
<td>+$ 10 million</td>
</tr>
</tbody>
</table>

Note, first of all, that the money supply has now increased. Checkable deposits are part of M1, and there are now $10 million more of checkable deposits in the economy than there were before. Through an open market purchase of bonds paid for by a "stroke of the pen," the Fed has brought new money into being.

Second, note that XYZBank now has excess reserves, so this is not the end of the story. It can loan out much of the $10 million of new funds it has received—about $9 million--while keeping only 10% (about $1 million) as reserves. These new loans will, in turn, become new deposits in one of these banks or elsewhere. Then M1 will have increased by the initial 10 million, plus the second-round $9 million—already an increase totaling $19 million, which is quite a bit larger than the initial $11 million increase in high-powered money. Of course, the bank that receives the $9 million in deposits resulting from XYZBank's loans will find that it has excess reserves, and will also be able to make new loans, and the process will continue. Where will it all end?

The story is actually somewhat more complicated than this, because sometimes banks hold excess reserves and often people who take out loans want to hold some of the funds in cash or in types of deposits that are not part of M1. So not all high-powered money creation will translate directly into new deposits and loans, and monetary

---

1 To be more precise, you can find the amount it can loan out by solving the equation $\text{Loan} + (.10)(\text{Loan}) = \text{New Reserves}$. XYZBank can loan out $9.09 million and keep $.91 million in reserves, from its new reserves of $10 million.
expansion will not be quite as dramatic as in the example above. Economists define the money multiplier as the ratio of the money supply to the monetary base,

\[
\text{money multiplier} = \frac{\text{money supply}}{\text{monetary base}}
\]

Using M1 as the measure of money, empirical studies have shown the money multiplier in the United States to currently very close to two. That is, if the Fed acts to increase reserves and currency by $11 million, the total increase in the money supply would be expected to be around double that:

\[
\Delta \text{money supply} = \text{money multiplier} \times \Delta \text{monetary base}
\]

\[
$22 \text{ million} = 2 \times 11 \text{ million}
\]

With "the stroke of a pen," the Fed open market purchase of government bonds increases the money supply by about twice the value of the initial bond purchase.

- **money multiplier:** defined as the ratio of the money supply to the monetary base, it tells by how much the money supply will change for a given change in high-powered money.

Notice, that, looking at the same story in a slightly different way, the action of the Fed can also be seen as increasing the amount of credit extended to private actors in the economy. The Fed, in making an open market purchase of government bonds, in essence takes that portion of the public debt out of circulation. (Recall from Chapter 10 that government bonds are issued by the Treasury to finance federal budget deficits.) The new bank reserves created by the purchase of government bonds allow banks to extend more credit—new loans—to private actors in the economy. Traditionally macroeconomists have tended to look at the assets side of the banks' balance sheets and perceive the story outlined above as a matter of increasing deposits and hence increasing the money supply. More recently, some macroeconomists have focused more on the liabilities side of the banks' balance sheets, and see this as a story of an expansion of credit. While in some sense, the two views are just "two sides of the same coin," looking at the money face of monetary policy tends to draw more attention to people's need for liquidity, while looking at the credit face draws more attention to issues of how financial capital is created and distributed within the economy.

### 3.4 Other Monetary Policy Tools

So, if the Fed wants to increase the volume of money and private credit circulating in an economy, it can use open market operations. Open market purchases of government bonds increase reserves. Banks will generally then increase their loans, which increases deposits and hence the money supply.

While this is, in fact, what the Fed usually does when it wants to expand the money supply, it also has other tools at its disposal. Another thing it can do is lower the
required reserve ratio. This would expand the money supply by allowing banks to make more loans on a smaller base of reserves. It uses this tool rather rarely, however.

If a bank falls short of having the required amount of reserves on hand, it can borrow funds from the Fed at what is called the "discount window" at a rate of interest traditionally called the **discount rate**. In theory, a reduction in the discount rate should increase the money supply, because this would lower the cost to a bank of being found to be below its required level of reserves. A bank could then be somewhat more aggressive about making loans. In fact, however, since the Fed frowns on (and penalizes) banks who are found to be low on reserves too often, banks tend to prefer to borrow from each other if they look like they will come up short.

**discount rate**: the interest rate at which banks can borrow reserves from the Fed discount window

The Fed can cause the money supply (and credit) to contract, as well. If instead of making an open market purchase of government bonds, it makes an open market sale, everything in the story we've just told happens in reverse order. Private banks will now hold more in government bonds and less in reserves. If they hold less in reserves, then they have to tighten up on loans. If they tighten up on loans, then there will be fewer deposits. The money multiplier also works in reverse.

The Fed can increase the money supply by making an open market purchase of bonds, lowering the required reserve ratio, or lowering the discount rate. It can decrease the money supply by making an open market sale of bonds, raising the required reserve ratio, or raising the discount rate.

In a growing economy, however, a central bank would rarely want to shrink the money supply in absolute terms. A growing economy, as measured by GDP, means ever more transactions need to be facilitated by a readily available liquid asset, and a generally growing demand by private economic actors for loans. "Loose" monetary policy, in the case of a real-world growing economy, then, usually means making the money supply grow faster than it has been growing. "Tight" policy means making the money supply grow slower, rather than actually making M1 fall. While we assume a no-growth economy for simplicity in many of our models, this reality should be kept in mind.

In this section, we've discussed the technical question of how the Fed or another economy's central bank can change the volume of money and credit in an economy. Now we can move onto the more interesting questions of why it may—or may not—want to do so. We will introduce these issues by taking two extreme cases first.

- The first case is where inflation can be assumed to be fairly stable, and the main thing policymakers are worried about is output.
- The second case is where policymakers are primarily worried about inflation.
These important base cases are useful for analyzing the situation of certain economies at particular times. The last section of this chapter looks at the more complicated case where nothing is assumed to be stable, and delves into controversies about monetary policies.

**Discussion Questions**

1. From the description of the Fed and the earlier discussion of money, can you name some things that private banks had to do for themselves before the Federal Reserve System was created? What were some of problems that resulted?

2. Describe in words how a Fed open market operation can increase the volume of money in the economy.

**4. The Theory of Money, Interest Rates, and Aggregate Demand**

Our discussion up to this point has focused on the volume of money and credit in the economy. Up through the 1960s, the Fed generally formulated its goals in terms of raising, lowering, or keeping steady the growth rate of measures of money such as M1 or M2. Economists still, conventionally, talk about monetary policy in terms of expanding or contracting the money supply. The Appendix to this chapter develops a model of money supply and money demand that can be helpful in understanding how academic economists commonly address these issues.

In an economy that is experiencing fairly low inflation, and which has a healthy banking system, however, most of the concern with the money supply is really a concern about interest rates, the availability of credit, and the consequences of these for aggregate demand. In contemporary discussions of the Fed's monetary policy, the focus is almost always on interest rates. How does the Fed affect interest rates, and how do changing interest rates affect the macroeconomy? The following explanation will help you understand how monetary policy is commonly discussed in the media.

**4.1 The Federal Funds Rate and Other Interest Rates**

In recent years, when changes in monetary policy are announced by leaders of the Fed or discussed in the financial pages of the newspaper, attention usually focuses on what is called the **federal funds rate**. This is the going rate of interest determined on a private market of bank-to-bank loans. If a bank finds it has more reserves than it needs to meet its reserve requirements, it offers funds on the "federal funds" market, usually just for overnight. If another bank is short on reserves, it borrows on that market, and pays back the next day. Although a quick reading of reports in the media often make it sound as though the Fed directly controls the federal funds rate (for example, headlines may read, "Fed Announces Cut in Federal Funds Rate of 0.25%"), this in not, in fact, the case. The Fed announces desired *target or benchmark levels* for the federal funds rate, and then acts on bank reserves in order to try to achieve that target. Because the Fed is generally quite effective at this, the difference between the (official) target federal funds rate and the (market-determined) actual federal funds rate often seems blurred.
**federal funds rate**: the interest rate determined in the private market for overnight loans of reserves among banks

A simplified model of the federal funds market is portrayed in Figure 11.1(a). The quantity of funds is on the horizontal axis, and the federal funds rate—the price of borrowing on this market—is on the vertical axis. (Note that this is just a specific variant of the sort of "market for loanable funds" discussed in Chapter 9). The actors on both sides of this market are banks. The supply curve for federal funds is upward sloping, since higher returns on this market will mean that banks with excess reserves will be more likely to lend them here, rather find other ways to lend them out. The demand curve for federal funds is downward sloping, since the lower the interest rate, the more willing banks are to borrow. In Figure 11.1(a), the Federal Funds rate at which the market clears is 6%.

![Figure 11.1 The Market for Federal Funds and an Open Market Purchase](image)

*When the Fed makes an open market purchase of government bonds, it increases the supply of reserves that can be lent on the federal funds market, lowering the federal funds rate.*

The Fed undertakes open market operations with the goal of pushing the going rate for loans in that market to the level it chooses. Recall that when the Fed makes an open market purchase, it increases the quantity of reserves that banks hold. All else equal, this increases the amount of reserves available for private lending in the federal funds market. In Figure 11.1(b), this is shown as the supply curve for federal funds shifting to the right. The federal funds rate falls.

Since 1995, the Fed has explicitly announced its targets for the Federal Funds Rate, and then taken the necessary steps to keep the actual rate as close to the target rate as possible. Figure 11.2 shows how the Fed reacts to a shift in the demand for federal

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2 Because banks can also borrow at the discount window, there are many ways of graphically characterizing this market. We've chosen the simplest representation.

3 Interest rates are generally stated in annualized terms—what the borrower would pay if they held the loan for a year—no matter how long the loan is actually held.
funds. A rise in demand for federal funds is shown by shift A. If the Fed took no action in response to this shift, the increase in demand would cause the interest rate to rise. The Fed counteracts this upwards pressure by putting more reserves into the system via open market purchases, shifting the supply curve outwards (shift B). The effect is to virtually fix this important interest rate. Conversely, the Fed would meet a decrease in the demand for federal funds with open market sales.

![Figure 11.2 Maintaining the Federal Funds Target Rate](image)

**Figure 11.2 Maintaining the Federal Funds Target Rate**

If the Fed sees the demand for reserves rising (shift A), it supplies more reserves to banks and thus to the federal funds market (shift B). It does the opposite if it sees demand falling. The result is a rate that is virtually fixed at the level targeted by the Fed.

Because financial markets in a sophisticated economy tend to be very interlinked a drop in the interest rate in one major market will tend to carry over into other markets. When banks have to pay more to borrow reserves, they will tend to charge more to their own customers. Figure 11.3 shows how the prime bank rate—the rate banks charge their most credit-worthy commercial customers—closely follows the federal funds rate. Banks have generally kept their prime rate at the federal funds rate plus 3 percentage points. The rate you, as an individual, will be charged by a bank on a loans will generally be higher than the prime rate, and the interest rate you receive on your deposits will always be lower than the prime rate (so the bank can make a profit). But you may notice that consumer rates also often go up or down with changes in the federal funds rate.

| prime bank rate: the interest rate that banks charge their most trusted commercial borrowers |

As a stylized fact, then, economists tend to say that an expansionary monetary policy expands credit and lowers interest rates economy-wide. Conversely,
contractionary monetary policy tends to shrink the volume of credit and raise interest rates, economy-wide.4

![Figure 11.3 The Federal Fund and Prime Rates, 1994-2005](image)

A number of other interest rates in the economy, including the prime rate charged by banks to commercial borrowers, tend to follow the Federal Funds Rate.

Source: Federal Reserve Board. Monthly data.

4.2 Interest Rates and Investment

Economists are particularly interested in interest rates because of their effect on investment. To the extent that agents make investments using borrowed funds, higher interest rates make investing more expensive, and, hence, less attractive. Residential investment, in particular, has historically been especially sensitive to variations in interest rates. Traditionally, investment in homes has been financed by 15- or 30-year mortgages. A small change in the interest rate can add up, over time, to a very big difference in the total cost of buying a house.

The case for interest rate effects on intended business investment on nonresidential structures, equipment, and inventories, however, is a bit more mixed. We saw in Chapter 9 that Keynes did not think that changes in the interest rate would be sufficient to get the economy out of the Great Depression. Investor pessimism, during that period, was very deep. Trying to encourage businesses to invest when they see no prospect of selling more of their goods is like the proverbial problem of pushing on a string.

The idea that business fixed investment primarily responds to changes in sales, much more than to changes in interest rates, has been called the **accelerator principle**. If businesses see their sales rising, they may need to expand their capacity—that is, invest in new equipment and structures—in order to keep up with demand for their product.

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4 Things get more complicated when we consider the duration of loans, and the willingness of banks to lend in various parts of the business cycle. We address these issues in the Appendix.
Since the best overall indicator of expanded sales is a rising GDP, this principle says that the best predictor of investment growth is GDP growth. Conversely, a small decline—or even just slowing down—of demand, may lead to a disproportionate drying up of intended investment, as firms come to fear being caught with too much capacity. To the extent the accelerator principle is in force, changes in the interest rate may have only a relatively minor effect on levels of investment.

**accelerator principle:** the idea that high GDP growth leads to high investment growth

Given a particular level of optimism or pessimism, however, firms can be expected to pay at least some attention to interest rates in deciding how much to invest. Combining this logical assumption with the empirically observed sensitivity of residential investment to interest rates, our simple model of macroeconomic stabilization says that, *all else equal*, lower interest rates will lead to higher intended investment spending (and vice versa for higher interest rates). Intended investment will be inversely related to the interest rate, $r$, as shown in Figure 11.4.

![Figure 11.4 The Intended Investment Schedule](image)

*Figure 11.4 The Intended Investment Schedule*

*All else equal, if the interest rate falls (from $r_0$ to $r_1$), intended investment should rise (from $I_0$ to $I_1$).*

Changes in investor confidence, related to actual (via the accelerator principle) or expected levels of spending, can be portrayed as shifting this intended investment curve. An increase in investor confidence, for example, shifts the curve to the right as shown in Figure 11.5. At any given interest rate, firms now want to invest more. A decrease in investor confidence would shift the curve to the left.
4.3 Monetary Policy and Aggregate Demand

Our basic model of aggregate demand, developed in Chapters 9 and 10, can now be expanded to include the effect of monetary policy. In an economy with low inflation and a stable banking system, expansionary monetary policy should tend to lower interest rates (Figures 11.1(b) and 11.3) and raise intended investment (Figure 11.4). Since intended investment spending, $II$, is part of $AD = C + II + G + NX$, this should shift the AD schedule upwards, and raise the equilibrium levels of aggregate demand, income, and output, as shown in Figure 11.6.
The chain of causation can be summarized as:

Expansionary monetary policy ➔ Lowers interest rates ➔ Investment is encouraged ➔ Aggregate demand rises ➔ Equilibrium GDP rises

If the economy is headed towards a recession, then, monetary policy that is relatively loose, increasing the money supply in order to help maintain output, can have a desirable stabilizing effect. Sometimes such an expansionary monetary policy is called an accommodating monetary policy, especially (though, these days, not exclusively) when the Fed is reacting to a specific economic event that might otherwise tend to send the economy towards a recession.

**expansionary monetary policy:** the use of monetary policy tools to increase the money supply, lower interest rates, and stimulate a higher level of economic activity

**accommodating monetary policy:** loose or expansionary monetary policy intended to counteract recessionary tendencies in the economy

**Contractionary monetary policy**, on the other hand, would be prescribed if the economy seems to be heading towards a boom and possible inflation. In that case, the Fed seeks to slow growth and "cool down" the economy. In the aggregate demand model, a decrease in the money supply will raise interest rates, lower intended investment, shift the AD schedule downwards, and lower the equilibrium levels of aggregate demand, income, and output.5

**contractionary monetary policy:** the use of monetary policy tools to limit the money supply, raise interest rates, and encourage a leveling-off or reduction in economic activity

### 4.4 The Fed and Investment, 2000-2005

The effect of Fed policy on investment can be illustrated with a recent historical example. In late 2000, the Federal Funds rate stood at 6.5%. But there were signs that the economy might be heading towards recession. The "dot.com" stock market bubble had burst, and policymakers were worried that the pattern of enthusiastic investment and consumer spending that had fueled GDP growth in the 1990s might be coming to an end. Orders for goods had slowed down. Inventories had built up. In January 2001 the Fed, publicly expressing concern about the weakness of the economy, took the dramatic action of lowering the Federal Funds rate by .5%. Then, the next month, it lowered it again. All through the 2001-2003, it steadily pushed interest rates down, as shown in Figure 11.7. The Federal Funds rate reached a low of 1% in early 2004.

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5 In Chapter 13, we will look at how monetary policy may also change AD by affecting international capital flows, the relative values of national currencies, and net exports. If exchange rates are flexible, the effects of a loose monetary policy on \( NX \) should be in the same direction as the effect on \( II \), making the change in \( AD \) larger.
The Federal Reserve pushed down the Federal Funds rate from 6.5% to a low of 1% over 2001-2003, and many other interest rates followed suit. Nonresidential investment fell until late 2002, but residential investment grew steadily.

What was the consequence for investment and aggregate demand? The bottom half of Figure 11.7 shows the data for residential and nonresidential private fixed (that is, noninventory) investment. Nonresidential fixed investment—business investment in equipment and structures—might seem to move in the direction opposite to that predicted by the theory of investment presented earlier (Figure 11.4). As interest rates steadily fell through 2001 and most of 2002, this kind of investment fell. But recall that the theory said that "all else equal" a lower interest rate should lead to higher intended investment—and all else was not equal during this period. Businesses had too much capacity and inventory, and were pessimistic about sales. In terms of the model, Figure 11.8 shows this pessimism shifting the intended investment schedule to the left. The lowered interest rates due to Fed action may have kept investors from cutting back even more, but the lower rates were not enough to entirely prevent the downturn in nonresidential (and overall) investment.
Residential investment, on the other hand, shows what many consider to be a success story for monetary policy. While fixed business investment fell markedly, Figure 11.7 shows that investment in housing did not fall, but in fact steadily increased. Even though the economy in general was in a recession for much of 2001, and investment overall was in a slump, housing investment grew steadily.

By November of 2002, nonresidential investment started growing again. By May 2004, the Fed felt that the recovery was well underway and self-sustaining. It returned to focusing on its other main macroeconomic goal: the control of inflation.

Discussion Questions

1. What sorts of interest rates do you deal with in your own life? Do you think Fed policies affect their levels?

2. Is it always true that an increase in the money supply leads to an increase in investment and aggregate demand? Why or why not?

5. The Theory of Money, Prices, and Inflation

Throughout the preceding section, we have largely assumed that we are in an economy in which inflation is low and steady, the banking system is stable, and the main thing the Fed has to worry about is helping to stabilize the levels of investment, aggregate demand, and output. Now let's switch to the opposite extreme. Suppose the central bank's main worry is controlling inflation. For understanding this case, a different approach will be helpful.
5.1 The Quantity Equation

Some very different theories of money from that which we've discussed up to now are based on the quantity equation:

\[ M \times V = P \times Y \]

In this equation, \( Y \) is, as usual, real output or GDP. \( P \) indicates the price level as measured by, for example, the GDP deflator. The multiplication of these two variables means that the right hand side of the equation represents nominal output. On the left-hand side, \( M \) measures the level of money balances, such as the M1 measure discussed above. \( V \), the only really new variable here, represents the velocity of money.

The velocity of money is the number of times a dollar has to change hands in a year, in order to support the level of output and exchange represented by nominal GDP. Since nominal GDP and M1 are observable, velocity can be calculated as the ratio of the two,

\[ V = \frac{P \times Y}{M} \]

For the quantity equation to become the basis for a theory, rather than merely represent definitions of variables, an assumption needs to be made about velocity. Two theories we will discuss below—Classical and Monetarist—assume that velocity is constant—changing very little if at all with changing conditions in the economy. If this is true, then the level of the money supply and the level of nominal GDP should be tightly related. We will denote this assumption that velocity is constant by putting bar over the top of \( V \). The quantity theory of money, then, is characterized by the relation,

\[ M \times \bar{V} = P \times Y \]

where \( \bar{V} \) is read "V-bar." More Keynesian-oriented theories, on the other hand, while they may make use of the quantity equation, do not assume that velocity is constant. They are not based on the quantity theory.

5.2 Classical Monetary Theory

Classical monetary theory is based on the quantity theory of money, plus the assumption that output is always constant at its full employment level. That is,
where $Y^*$, as usual, denotes full employment output. In this case—in contrast to the aggregate demand model described in the previous section, changes in the money supply can have no effect on the level of output. The inability of changes in the money supply to affect real output is called monetary neutrality. The only variable on the left side that is not constant is the money supply, while the only variable on the right side that is not constant is the price level. Thus, all that a change in the money supply can do is change prices. Rather than an increase in the money supply increasing output, in this model the only thing an increase in the money supply does is cause inflation.

**monetary neutrality**: the idea that changes in the money supply may affect only prices, while leaving output unchanged

Classical economists, then, tend to see no need for discretionary monetary policy. In the case of a non-growing economy classical theory would prescribe a stable money supply level in order to avoid unnecessary changes in the price level. In a growing economy, classical theory says that the money supply should grow at the same rate as real GDP in order to keep prices stable.\(^6\) If we assume that the rate of real GDP growth is fairly constant, then money supply should just grow at a fixed percentage rate per year. A central bank which does this is said to be following a money supply rule.

**money supply rule**: committing to letting the money supply grow at a fixed percentage rate per year

### 5.3 Monetarism

Another famous theory based on the quantity equation is monetarism, propounded by Milton Friedman and Anna Jacobson Schwartz in their book, *A Monetary History of the United States, 1867-1960*, published in 1963. While Keynes had argued that insufficient investment and aggregate demand caused the Great Depression, Friedman and Schwartz argued that it was caused by a drastic contraction in the money supply.

**monetarism**: a theory associated with Milton Friedman, which claims that macroeconomic objectives are best met by having the money supply grow at a steady rate

Friedman had earlier propounded the quantity theory of money, and has become known for his saying that "inflation is always and everywhere a monetary phenomenon." But unlike the pure Classical theorists, he thought that bad monetary policy could have, at least temporarily, bad effects on the real economy. During the early years of the Great Depression, he and Schwartz pointed out, both the money supply and the level of nominal

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\(^6\) In keeping with the general no-growth assumption of Part III of this book, we concentrate on the quantity theory written in terms of levels of money supply, prices, and GDP. In growth terms, it can be written as $m = \pi + y$ where $m$ is the growth rate of money, $\pi$ is the inflation rate, and $y$ is the growth rate of GDP.
GDP fell sharply. This empirical observation can be seen as consistent with the quantity theory of money:

\[ M \times V = P \times Y \]

They argued that the contraction in the money supply caused the reductions in both the price level and real GDP—an assertion that remains controversial. Because of his belief in the potential for bad monetary policy to cause harm, Friedman has been one of the most vocal proponents of the idea that central banks should simply follow a money supply rule.

5.4 Money and Hyperinflation

The quantity equation can also be used to shed light on the problem of very high inflation, described early in this chapter. Suppose that the level of output in an economy is stagnant or staggering. Suppose that the central bank is causing the money supply to grow very quickly. If people come to expect high inflation, money may tend to become a "hot potato"—people want to hold it for as short a time as possible, since it loses value so quickly. They will try to turn money into non-inflating assets—real estate, hard currency, jewelry, or barter-able goods—as quickly as they can. This means that the velocity of money also rises. A situation of hyperinflation in a stagnant economy can be illustrated as:

\[ M \times V = P \times \overline{Y} \]

where the bar over \( Y \) indicates that output is stuck at a level below full employment. With output stagnant, and both money supply and velocity rising, inflation must result.

While we imagined a printing press in the government's basement in our earlier story about hyperinflation, a sophisticated economy can also essentially "run the printing presses" if the agency that issues government debt and the central bank work together. For example, suppose the United States Treasury issues new debt, and the Fed immediately buys the same amount of new debt and injects new money into the economy. The effect is the same as if the Fed had just printed new currency, except that the increase in bank reserves is in the form of "a stroke of the pen" instead of freshly printed paper. This is called monetizing the deficit. In the United States, however, the Fed does not automatically buy new government debt. It may, as an accommodating move, monetize some deficit spending by the government in order to help the economy out of a recession, but it is not obliged to do so.

**monetizing the deficit:** when a central bank buys government debt as it is issued (equivalent to "running the printing presses")

Even in less extreme cases, loose money can lead to inflation. For example, suppose the economy is functioning relatively normally but output has reached its full employment level \( (Y^*) \). If monetary policy continues to be expansionary, inflation is likely to result. (This will be discussed more in Chapter 12).
5.5 Importing Inflation

Inflation can also be triggered by international economic developments. An increase in the price of imports can lead to upward pressure on prices. This might occur because of a devaluation or depreciation of the domestic currency (as will be discussed further in Chapter 13). In that case, more dollars are required to buy foreign currency, making foreign goods more expensive in general. Or it may be that only the price of some particular imported goods rise—as in the important case of the oil price shocks of the 1970s. This can be portrayed in the quantity equation as:

\[ M \times V = P \times Y \]

What happens to the other variables in the quantity equation depends on the reactions of actors in the economy. Changes in the relative prices of goods can generally be expected to cause some disruptions in production. If the Fed takes a strictly anti-inflationary stance, it could make such adjustments especially difficult. Keeping the average price level steady in the presence of imported inflation would mean that the prices of non-imported goods and services would have to go down. Since wages and prices tend to be "sticky" downwards (as discussed in Chapter 7), a strict anti-inflationary stance may contribute to a deeper recession. On the other hand, monetary policy that is accommodating—that is, that tends to be relatively loose, increasing the money supply in order to facilitate relative price adjustments—may lead to somewhat increased upward pressure on prices, but less downward pressure on output.

If the dollar increases in value, or the prices of important imports fall, of course, then this chain of causality works in the opposite direction. Downwards pressure on prices, as well as upwards pressure, can originate in the foreign sector.

Discussion Questions

1. What is the difference between the quantity theory of money and the quantity equation?

2. Have there been any reports in the news lately about inflation and its causes? If so, can you tell from news reports whether the cause is a quickly growing money supply, a peak in the business cycle, "imported" inflation or some combination (or yet some other phenomenon)?

6. Complications and Policy Controversies

In the real world, central banks generally have to be concerned about both output and inflation—as well as banking regulation and stability—all at the same time. When the goals include both stabilization of prices and of output, how does this complicate the analysis, and what does this mean for policy?
6.1 The Fed’s Dilemma

The Fed can use expansionary monetary policy—policies that increase the money supply, lower interest rates, stimulate investment and thus increase aggregate demand—to try to get the economy out of a recession (as we saw in Section 4). But if it goes about increasing the money supply too vigorously, or at the wrong time (such as when the economy is already nearing full employment), then it can cause inflation to rise (as we saw in Section 5). If inflation is "heating up," then the Fed should use contractionary monetary policy—reining in the money supply, raising interest rates, and discouraging investment in the interest of "cooling off" aggregate demand and economic activity. (See News in Context.)

This may seem very straightforward, but there are actually many complications in policy making. For one thing, there is the controversial question of what exactly the "full employment" level of employment is, at any given time. Suppose, for example, that the Fed starts to get nervous about inflation too early in an economic upswing. Perhaps the unemployment rate could have fallen to, say, 4%, with little increase in inflation, if the recovery had been allowed to continue, but the Fed switches into inflation-fighting mode at an unemployment rate of, say, 6%. By halting the recovery too early, the Fed may end up being blamed for causing unnecessary suffering. But if conditions in the economy are such that letting unemployment fall to 4% would cause a large rise in inflation, then if the Fed lets the recovery keep running it will end up being blamed for inflation, instead.

There is also considerable controversy about what rates of inflation can be considered acceptable. Some economists find only inflation rates from 0% to 2% to be acceptable; others do not see an urgent need for monetary control unless inflation is 5% or 10% or even higher. Debate among economists and policy-makers about the proper weight to give to GDP stabilization goals versus price stabilization goals is intense.

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**News in Context: Fed Panel Raises Rate to 4.75%**

Eduardo Porter


WASHINGTON--As expected, the Federal Open Market Committee raised the benchmark federal funds rate on Tuesday by a quarter of a percentage point, to 4.75 percent, and suggested that at least one more increase was in the cards.

The Fed's statement…said that "some further policy firming may be needed" to keep inflation under wraps.

It pointed out that the economy was growing robustly after a slowdown in the fourth quarter of last year. It noted that core inflation, beyond food and energy, had ticked up only modestly, but it warned that the rising prices of energy and other commodities could add to inflation pressures in the future.

(Is this an example of an expansionary or contractionary Fed policy action? What did the Fed, at this time, see as the major problem facing the economy?)
Another practical problem is that monetary authorities have to pay attention to issues of timing. Remember from Chapter 10 that, in the case of fiscal policy, the "inside lags" of decision-making and implementation tend to be rather long, but the "outside lag" of an enacted policy having an effect on aggregate demand is rather short. For monetary policy, the case tends to be reversed. The Federal Open Market Committee is scheduled to meet eight times a year, and may schedule extra meetings. A monetary policy decision only requires discussion and agreement among the FOMC's 12 members, unlike the much longer and larger discussions required to get a tax or spending change through Congress. Hence decisions about monetary policy can generally be made more quickly than decisions about fiscal policy. On the other hand, monetary policy only has an effect on aggregate demand as people change their plans—often their very long term plans—about spending. So the "outside lag" is generally thought to be longer. There is a danger that the effects of a policy intended to counteract a recession may not be felt until during the next boom, or the effects of policies intended to counteract a boom might not be felt until the next recession, exacerbating the business cycle instead of flattening it out.

Lastly, it is not always the case that an economy suffers from either recession or high inflation. Sometimes it suffers from both at the same time. Since one problem would seem to require expansionary policies while the other calls for contractionary ones, in this case the dilemma facing the Fed is especially sharp. We will take up this topic in Chapter 12.

6.2 Rules Versus Activism

Given all these caveats about monetary policy, you might think that the Fed would do better to just follow a money supply growth rule as suggested by the quantity theory of money. Indeed, a number of classically-oriented macroeconomists make just this argument.

But the quantity theory has its problems. For one thing, the velocity of money is not as constant as the theory assumes. Because financial markets have many interlinkages, people's desire to hold some of their assets as money, as opposed to in some other asset, can cause velocity to make wide swings. For example, when interest-bearing checking accounts became very popular in the late 1980s, M1 grew quickly as people shifted assets from other forms into this new, highly liquid and interest-bearing form. Since $V$ is the ratio of nominal GDP to money balances, the sudden rise in the denominator of this ratio caused the velocity of M1 to fall sharply. Likewise, when the stock market takes a dive, it is common for many people to seek the relative security of money and near-money assets, hence also driving M1 up and velocity down.

Other changes in velocity are harder to explain. Partly this is because people need liquidity not only to facilitate transactions related to GDP—that is, domestic newly produced goods and services—but also to facilitate transactions related to used goods, purchases and sales of assets, and foreign dealings. Financial market innovations, shocks to asset markets, and many other developments in the economy can affect velocity. The
more unpredictable velocity is, the harder it is to make policy based on the assumption of a stable relationship between money supply and nominal GDP.

Nor is it the case that output is always at its full employment level, as we saw looking at unemployment rates in Chapter 7 and at business cycles in Chapter 9. Nor is it the case that changes in the prices are only caused by changes in monetary policy. We discussed one example of this under the heading "importing inflation" above.

As a result, many macroeconomists argue for a more flexible and activist monetary policy stance. Rather than the Fed locking onto a particular rule, they suggest that the Fed keep an eye on inflation but also remain flexible, so it can respond to new developments including financial market changes, price shocks, and threats of recession.

In the next chapter, we will bring together monetary policy, fiscal policy, and the twin goals of output and price stabilization. What effects have world events, and policy responses to them, had on the United States economy over the last several decades?

Discussion Questions

1. What are some arguments in favor of the Fed following a money supply rule? What are some arguments against it?

2. Does fiscal policy or monetary policy have a longer "lag"?

Review Questions

1. Describe three scenarios that could describe economies in very different situations, in regard to their banking systems and price (in)stability.
2. Describe the three roles of money.
3. Describe at least three very different types of money.
4. Describe at least two measures of money.
5. Draw up and explain the components of a balance sheet for a private bank.
6. Draw up and explain the components of the balance sheet of the Federal Reserve.
7. Show what happens to the Fed's balance sheet and the balance sheet of a bank, when the bank sells bonds to the Fed.
8. Describe how a Fed open market purchase leads to a sequence of loans and deposits, and thus a multiplier effect.
9. Describe two tools the Fed can use to affect the money supply, other than open market operations.
10. Describe how a Fed open market purchase changes the federal funds rate.
11. What are two important factors affecting investment? Show how they work using graphs.
12. Show the effects of an expansionary monetary policy in a Keynesian Cross diagram.
14. What is the quantity equation?
15. What is the quantity theory of money?
16. Describe Classical monetary theory.
17. What is monetarism?
18. Discuss how monetary expansion can lead to high inflation, using the quantity equation.
19. Describe how inflation can be "imported."
20. What are some of the problems the Fed faces in trying to enact good policies?
21. What are some of the problems with using a monetary rule?

Exercises

1. Suppose the Fed makes an open market purchase of $220,000 in bonds from QRSBank.
   a. Show how this affects the Fed balance sheet.
   b. Show how this affects the balance sheet of the QRSBank.
   c. Assume that the required reserve ratio is 10% and that QRSBank loans out as much as it can based on this changed situation. What does its balance sheet look like after it makes the loans?
   d. Assume that all the proceeds from those loans are deposited in TUVBank. What is the effect on TUV Bank's balance sheet?
   e. What new opportunity does TUVBank now face? What is it likely to do?

2. Suppose the Fed makes an open market sale of $15 million in bonds to HIJBank.
   a. What is the effect on the Fed's balance sheet?
   b. What is the initial effect on HIJBank's balance sheet?
   c. Show in a graph the effect on the market for federal funds. (No numbers are necessary, for this or later sections of this exercise.)
   d. Assuming the level of business confidence remains unchanged, show on a graph how this open market sale will change the level of intended investment.
   e. What is the effect on aggregate demand and output? Show on a carefully labeled graph.
   f. What is the effect on equilibrium consumption and saving? (You may need to refer back to Chapter 9 to answer this.)

3. Suppose that investor confidence falls, and the Fed is alert to this fact. Using the model presented in this chapter, show (a)-(c) below graphically:
   a. How a fall in investor confidence affects the schedule for intended investment.
   b. What the fed could do, influencing the federal funds market, to try to counteract this fall in investor confidence.
   c. The effect on AD and output if the Fed is able to perfectly counteract the fall in business confidence.
   d. Is the Fed likely to be as accurate as assumed in part (c)? Why or why not?

4. Suppose the level of nominal GDP in Estilvania is $30 billion, and the level of the money supply is $10 billion.
   a. What is the velocity of money in Estilvania?
b. Suppose that the money supply increases to $15 billion and nominal GDP rises to $45 billion. Which theory is supported?
c. Suppose that the money supply increases to $15 billion and nominal GDP rises to $40 billion. Which theory is supported?
d. Suppose that the money supply decreases to $5 billion, and as a result both the price level and real GDP fall, so that nominal GDP falls to $15 billion. Which theory is supported?
e. Suppose that the money supply increases to $15 billion. Real GDP stays the same, at its full employment level, but the price level rises so that nominal GDP becomes $45 billion. Which theory is supported?

5. Match each concept in Column A with the best definition or example in Column B.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. expansionary monetary policy</td>
<td>i. the idea that changes in the money supply only affect prices, not output</td>
</tr>
<tr>
<td>b. fiat money</td>
<td>ii. residential investment</td>
</tr>
<tr>
<td>c. accelerator principle</td>
<td>iii. standardization</td>
</tr>
<tr>
<td>d. monetary neutrality</td>
<td>iv. a dollar coin made of minerals worth $.10</td>
</tr>
<tr>
<td>e. velocity</td>
<td>v. the ease with an asset can be used in trade</td>
</tr>
<tr>
<td>f. liquidity</td>
<td>vi. Fed open market sale of bonds</td>
</tr>
<tr>
<td>g. commodity money</td>
<td>vii. a silver coin</td>
</tr>
<tr>
<td>h. a good property for money to have</td>
<td>viii. a silver certificate</td>
</tr>
<tr>
<td>i. a piece of paper representing a claim on something of value</td>
<td>ix. vault cash and bank deposits at the Fed</td>
</tr>
<tr>
<td>j. bank reserves</td>
<td>x. currency in circulation, checkable deposits, and traveler's checks</td>
</tr>
<tr>
<td>k. M1</td>
<td>xi. the number of times a unit of money changes hands in a year</td>
</tr>
<tr>
<td>l. very sensitive to interest rates</td>
<td>xii. relates investment to GDP growth</td>
</tr>
<tr>
<td>m. contractionary monetary policy</td>
<td>xiii. Fed lowers the discount rate</td>
</tr>
</tbody>
</table>

6. The Chair of the Federal Reserve semiannually gives testimony before Congress about the state of monetary policy. Find the most recent such testimony at http://www.federalreserve.gov/newsevents.htm. What does the Fed Chair identify as the most significant issues facing the economy? How is the Fed proposing to deal with them?
7. (Appendix) Suppose you have a bond with a face value of $200 and coupon amount of $10 that matures one year from now.
   a. If the going interest rate is 3%, how much can you sell it for today?
   b. If the going interest rate is 8%, how much can you sell it for today?
   c. What does this illustrate about bond prices and interest rates?

8. (Appendix) Show, on a money supply and money demand graph, the effect on the interest rate of a decrease in the money supply.

9. (Appendix) Suppose the nominal prime interest rate for a one-year loan in an economy is currently 6%.
   a. If inflation is running at 1% per year, what is the current real interest rate?
   b. Suppose many people believe that the inflation rate is going to rise in the future—probably up to 2% to 3% or more within a few years. You want to borrow a sum of money for ten years, and are faced with deciding between
      (1) a series of short-term, one-year loans. The interest rate on this year's loan would be 6%, while future nominal interest rates are unknown. Or
      (2) a ten-year fixed-rate loan on which you would pay a constant 6.25% per year.
   If you agree with most people and expect inflation to rise, which borrowing strategy do you expect might give you the better deal? Why? Explain your reasoning.
   c. Could your reasoning in part (b) help explain the pattern of interest rates shown in Figure 11.12? Explain.
Appendix: More Models and Issues of Monetary Policy

Some economists prefer to think about monetary policy in terms of markets for bonds or money, rather than in terms of the Federal Funds rate. Also, in trying to keep the chapter relatively brief and comprehensible, we have glossed over issues of real versus nominal interest rates and special topics such as credit rationing and liquidity traps. These appendices remedy these omissions.

A1 Bond Prices and Interest Rates

The process by which monetary policy influences interest rates can be explained by examining the market for federal funds, as was seen in the body of this chapter. Alternatively, it can also be explained by looking at the market for government bonds.

A bond represents debt, but, as a particular kind of financial instrument, bonds have some characteristics worth mentioning. When the government (or a business) borrows by selling a bond, it makes promises. It promises to pay the bondholder a fixed amount of money each year for a period of time, and then, at the end of this time, to repay the principal of the loan. The fixed amount paid per year is called the coupon amount. The date that the principal will be repaid is called the maturity date. The amount of principal that will be repaid is called the face value of the bond.

A bond is a financial instrument that, in return for the loan of funds, commits its seller to pay a fixed amount every year (called the coupon amount), as well as to repay the amount of principal (called the bond’s face value) on a particular date in the future (called the maturity date).

So far it seems simple enough—a bond may specify, for example, that its issuer will pay you $5 a year for 10 years, and then pay you $100 at the end of 10 years. What makes bond markets more complicated, though, is that bonds are often sold and resold, changing hands many times before they mature. During the period to maturity, many factors affecting the value of the bond may change, and so the bond price—the price at which bondholders are willing to buy and sell existing bonds—may change.

Bond price: the price at which trades are made

For example, suppose you bought the bond just described at its face value of $100. The bond yield to maturity, or annual rate of return if you hold a bond until it matures, would obviously be 5% ($5 annually is 5% of the $100 bond price). Suppose that after a couple years you want to sell your bond (perhaps you need the cash), but meanwhile the rate of return on alternative (and equally safe) investments has risen to 10%. No one will be interested in buying your bond at a price of $100, because they would get only a 5% return on it, whereas they could get a 10% return by investing their $100 elsewhere. To sell your bond you will need to drop the price you demand, until
your bond looks as attractive as other investments—that is, until the $5 per year represents a 10% yield to maturity.7

Conversely, if the return on alternative investments has fallen, say to 2%, the $5 per year on your bond looks pretty good, and you will be able to sell it for more than $100.8 The higher is the bond yield, the lower is the bond price, and vice versa.

The bond yield to maturity is the amount a bond returns during a year, if held to maturity, expressed in percentage terms. The yield is determined by the coupon amount, the bond price, and the time to maturity.

Bond price and bond yield have an inverse relationship

The United States Treasury actually issues a variety of different kinds of bonds. Treasury "bills" have a zero coupon amount, and mature in one year or less. Because the holder receives no coupons, they are sold at a discount from their face value. Other Treasury bonds pay a coupon amount every six months, and have maturities that range from two to thirty years. In the real economy, then, there are a variety of "government bond" prices—and of interest rates. It is only for the sake of simplicity of modeling that we assume only one type of bond and one interest rate.

While many, many people and organizations buy and sell government bonds on what is called the "secondary market" (the "primary market" being the Treasury's initial offering of the bonds), the Fed is a major player. Its actions on the market for government bonds are large enough to have discernable effects on the whole market.

A simplified (secondary) bond market is shown in Figure 11.9(a). The price of bonds (and the corresponding nominal interest rate) is on the vertical axis, and the quantity on the horizontal. The supply curve, in this case, is determined by the willingness of people to sell bonds—that is, to stop lending to the government, exchanging their government debt for cash. The demand curve is determined by people's willingness to buy bonds—that is, to lend to the government. The effect of a Fed open market purchase of bonds is illustrated in Figure 11.9(b). A sizeable Fed purchase shifts the demand curve for government bonds to the right. As a result, the price of bonds rises. Because bond prices and interest rates are inversely related, the rise in the price of bonds means that the going interest rate on them falls.

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7 If the bond has one year left to maturity, for example, its value one year from now is $105. We can use the formula \[ \text{Value next year} / (1 + \text{interest rate}) = \text{Value now} \] to find out what you could get by selling the bond today. If the interest rate on alternative investments is 10%, then $105/(1 + .10) = $95.45.
8 Continuing from the previous footnote, if the interest rate is 2%, then $105/(1+.02) = $102.94.
Figure 11.9 The Market for Government Bonds

When the Fed undertakes an open market purchase, it shifts out the demand curve for government bonds. This raises the price of bonds, lowering their interest rate.

While this explanation focuses on the market for government bonds, it is actually parallel to the earlier discussion of the Fed and the market for federal funds. The interest rate for 3-month Treasury Bills and the federal funds rate are graphed together in Figure 11.10. As you can see, they track each other closely. Notice that the bottom line of this story is the same as that given by the model of federal funds used in this chapter: A Fed open market purchase drives down interest rates.

Figure 11.10


The market for federal funds and the market for short-term Treasury bills are closely related.

Source: Federal Reserve Board. Monthly data.
A2 Money Supply and Money Demand

The process by which monetary policy influences interest rates can be explained by examining the market for federal funds, as was seen in the body of this chapter, or by examining the market for government bonds (Appendix A1). A third alternative is to examine the market for money.

Assume that money is the only asset that can be used in exchange, and pays no interest. Assume that other assets cannot be used in transactions, but do pay interest. The transactions demand model for money assumes that people need money balances for transactions, but forgo earnings on the money balances they hold. For simplicity, we will call the alternative, interest-bearing asset "bonds."

transactions demand model: a model of the money market in which money is assumed to be liquid and pay no interest, while an alternative asset is assumed to be illiquid and pay interest

Money demand is shown as a curved, downward sloping line in Figure 11.11. The higher the (nominal) interest rate is on bonds (which we denote by \( i \)), the higher is the opportunity cost of holding money in terms of earnings forgone. So the higher the interest rate, the more people will try to economize on holding money balances. They may, for example, make transfers from interest bearing accounts into cash or non-interest bearing checking accounts several times a week. The money demand curve slopes up steeply as it approaches the vertical axis, since even with very high interest rates this model assumes that people need at least a minimal amount of money for transactions. On the other hand, if interest rates are low, there is not much cost to holding money, and people will hold larger money balances. When interest rates are low, people will keep a larger proportion of their assets in cash, or as balances in non-interest bearing checking accounts, and a smaller proportion of their assets in bonds.

Figure 11.11 The Demand and Supply of Money, with an Increase in Supply

The demand for money curve slopes downwards, since a higher interest rate increases the opportunity cost of holding money. The money supply curve is set by the Fed. If the Fed increases the money supply, it drives down the interest rate.
In this model the level of the money supply is assumed to be directly set by the Fed, largely through open market purchases and sales. The Fed can drive down interest rates by increasing the money supply through open market purchases of government bonds, as shown in Figure 11.11. If after the Fed shifts the money supply curve out, the interest rate were to remain at \( i_0 \), an excess supply of money would occur. People would be wanting to get rid of more of their money in exchange for bonds. In the process of trying to get more bonds, they would drive the price of bonds up, which would in turn (as explained in the previous section) drive the interest rate down. Conversely, if the Fed wanted to increase interest rates, it could reduce the money supply.

Notice that the bottom line of this story is the same as that given by the model of federal funds used in this chapter: A Fed open market purchase drives down interest rates. This model, while still widely taught, has fallen out of favor among some macroeconomists as financial innovations (such as interest-bearing checking accounts) have blurred the distinction between money and interest-bearing assets.

A3 Real Versus Nominal Interest Rates

In the model of interest rates and aggregate demand discussed in section 4 of the text, we assumed that the Fed, through open market operations, could change the interest rate that influences investment spending. In Figure 11.8 we used the symbol \( r \) to denote a generalized interest rate. In real life, however, there are a number of different interest rates that have to be taken into account. We will lay out some basic facts about short run vs. long run, and real vs. nominal interest rates. We will note the difference between the Fed’s focus on the short term, nominal interest rate, and the interest rates that investors often consider the most relevant: that is, the long-term, real interest rate.

In section 4.1 we discussed the federal funds rate, as the principal interest rate targeted by the Fed. This is a short term, nominal interest rate. It is short term, because while this rate is quoted in annualized terms (that is, what a borrower would pay if they kept the loan for a year), the loans are actually made one day and paid back the next. The Fed uses a portfolio of government securities with various maturity dates in its open market operations, but many of these have maturity dates of three years or less. The Federal Funds rate--like any interest rate you normally see quoted--is a nominal interest rate, not adjusted for inflation. The interest rates determined in markets for loanable funds are always nominal rates.

But if you are considering undertaking a substantial business investment project or buying a house, the interest rate you should be taking into account, if you are a rational decision maker, is the real interest rate over the life of the business loan or mortgage. The real interest rate is:

\[
r = i - \pi
\]

where \( r \) is the real interest rate, \( i \) is the nominal interest rate, and \( \pi \) is the rate of inflation. For example, suppose you borrow $100 for one year at a nominal rate of 6%. You will pay back $106 at the end of the year. If the inflation rate is zero, then the purchasing
power of the amount you pay back at the end of the year is actually $6 more than the amount you borrowed. On the other hand, if inflation runs at 4% during the year, the $106 you pay back is in "cheaper" dollars (dollars that can buy less) than the dollars that you borrowed. The real interest rate on your borrowing will be only 2%. The higher the inflation rate, the better the deal is for a borrower at any given nominal rate (and the worse it is for the lender).

**real interest rate**: nominal interest rate minus inflation, \( r = i - \pi \)

If inflation is fairly low and steady—as we assumed in the aggregate demand model—then this difference between real and nominal interest rates is not of crucial importance. If inflation is steady at, say, 2%, then both lenders and borrowers just mentally subtract 2% to calculate the real rate that corresponds to any nominal rate. If the Fed lowers the prime rate from 8% to 5%, for example, then it correspondingly lowers the real rate from 6% to 3%. Through much of the 1990s and into the first few years of the 21st century, for example, this wasn't such a bad assumption to make. Inflation varied only from about 1% to about 2.5% over those years.

But inflation is not always so predictable. When inflation is high and/or variable, it is very important to realize that investors' decisions are in reality influenced by the *expected real interest rate*, \( r^e \):

\[
r^e = i - \pi^e
\]

where \( i \) is the nominal rate the borrower agrees to pay and \( \pi^e \) is the *expected* inflation rate. The actual real interest rate (\( r \)) can only be known with hindsight. That is, after information on inflation has come for last month or last year, you can calculate what the real interest rate was in that period. But you never know with certainly what the real interest rate is right now, or what it will be next year. The more changeable inflation is, the harder it is to form reliable expectations about real interest rates. During the 1970s, unexpected bouts of high inflation meant that some real interest rates temporarily became *negative*. One of the authors of this book received government student loans carrying a 3% nominal interest rate during that period, while inflation was running at 6% per year or more. In real terms, it was as though for every $100 she borrowed for college she had to pay back only about $97!

**expected real interest rate**: the nominal interest rate minus expected inflation, \( r^e = i - \pi^e \)

Many loans are made for a number of years—even decades—into the future. In this case, an investor has to form expectations not only about real interest rates in the short term, but where real interest rates will be likely to be going. Expectations, or guesses, enter in when investors want to speed up their projects to take advantage of low rates that they think will disappear in the future, or postpone projects if they think the real rate will be coming down.

When considering issues of inflation and expectations about the future, economics has to turn from mechanical exercises in equations and curve-shifting into something more like social psychology. How do people form their expectations about a
truly unknowable future? What sorts of information do they gather, about the economy and about policymaking, in forming their decisions? What effect do these expectations, and variations in these expectations from person to person, have on economic behavior?

We can see some evidence about the importance of long-term expectations by comparing the behavior of the Federal Funds rate with an important long term interest rate, the average rate on 30-year fixed rate mortgages. As shown in Figure 11.12, while this long term rate dropped somewhat in both real and nominal terms during the loose monetary policy period of 2001-early 2004, it did not drop nearly as much as the Federal Funds rate. Moreover, it sometimes went up when the Federal Funds rate was dropping, and vice versa. The interest rate on 30-year mortgages is determined in a market in which people are paying attention to many things, including expectations of future inflation, business trends, and Fed policy actions.

![Figure 11.12 Federal Funds, Nominal and Real 30-Year Fixed Mortgage Rates, 1995-2005](image)

*Figure 11.12 Federal Funds, Nominal and Real 30-Year Fixed Mortgage Rates, 1995-2005*

*Long term interest rates and real interest rates do not always move in tandem with the Federal Funds rate.*

Source: Federal Reserve, Bureau of Labor Statistics and authors' calculations. Inflation is measured by 12-month changes in the CPI excluding food and energy.

We saw earlier that the loose Fed policy in the early 2000s *did* seem to encourage a continued expansion in residential investment, even during a recession. In Chapter 12 we will continue to use the aggregate demand model, assuming--as seems generally reasonable--that Fed policies can *influence* some important real interest rates in the macroeconomy, even if they cannot determine them precisely. As a student of economics, however, you should also be aware that this relationship is not quite as unambiguous as the simple model assumes.
The possibility of a liquidity trap, or of a reluctance on the part of bankers and investors to lend and borrow, means that the Fed faces limitations in its ability to stimulate a sluggish economy. The possibility of credit rationing means that Fed actions...
can have repercussions on the economy that go beyond the intended macroeconomic stabilization effects.