

PROFESSIONAL DEVELOPMENT

AP[®] Macroeconomics
Monetary Policy

Curriculum Module

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Introduction

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The central bank (Federal Reserve) can manipulate the economy's output, price level, employment and rate of growth by taking steps to change interest rates. While the central bank can do little to influence the demand for money, it controls the supply of money and therefore, in turn, can impact interest rates. Interest rates affect business investment spending and interest-sensitive consumer spending (for example, houses, cars, etc.). In recognition of this important role of the central bank, the AP[®] Economics Development Committee has frequently included questions about money creation/destruction on the annual AP Macroeconomics Exam.

Generally, students have responded very well to questions about money creation/destruction as well as the related numerical calculations of the theoretical maximum expansion/contraction of the money supply using the deposit multiplier. However, on the 2007 test, the committee decided to ask a more detailed question about money creation and the concomitant issuance of loans. The students generally did not perform as well on this question. Many students could not distinguish between the amount of money created and the loans issued. The concern of the AP Economics Development Committee is that students may just be memorizing the deposit multiplier equation and not fully understanding the process of money creation/destruction.

The purpose of this curriculum module is to provide teachers with a well-written article on money and banking as well as two exercises/lessons to help them teach their students about this important role of the central bank. You will find Margaret Ray's piece both informative and thorough. I believe you will recognize and appreciate her experience of working at the Federal Reserve Bank of Richmond. The lessons and exercises provided by Wayne McCaffery and Matt Pedlow can be used to augment and reinforce the textbook readings on this important topic.

The Federal Reserve and Monetary Policy: Making It Happen

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Every six weeks or so, the Federal Open Market Committee (FOMC) meets to determine U.S. monetary policy. The committee members discuss and vote on whether and/or how much interest rates in the economy should change. They issue their decision and “VOILA!” interest rates in the economy mysteriously change as directed. At least, that’s how it can seem to students studying introductory macroeconomics. However, understanding the mechanisms used to conduct monetary policy is crucial for understanding the banking and financial systems and the structure of the macroeconomy. The purpose of this article is to add the “how” to the “who, what, when, where and why” of monetary policy.

The Who, What, When, Where and Why of Monetary Policy

Most students come away from their first course in macroeconomics with a good understanding of the structure and functions of the Federal Reserve System, the goals of monetary policy and the causal relationship between the macroeconomic variables involved (e.g., money supply→interest rates→investment→aggregate demand→GDP). An outline of the answer to these basic questions is reviewed below.

Who?

The Federal Reserve System (commonly called the Fed) conducts U.S. monetary policy. More specifically, monetary policy is the role of the FOMC. The 12 voting members of the FOMC include the seven members of the Federal Reserve Board of Governors (BOG) and five of the 12 Federal Reserve Bank presidents (The New York Fed president always votes, the remaining 11 presidents rotate as voting members). All Federal Reserve Bank presidents participate in every FOMC meeting, but they only vote when it is their turn in the rotation. Members of the BOG are appointed by the president of the United States

and approved by the U.S. Senate to serve 14-year terms (the lengthy term is designed to insulate them from political pressure). Governors must each come from a different Federal Reserve district (there are 12), to spread representation across the country. A governor may serve the remainder of another governor's term (e.g., if the other governor resigns) and then serve his or her own full 14-year term.

The chairman of the Board of Governors is chosen from the seven governors to serve a four-year, renewable term. The chairman wields great power on the FOMC by serving as its spokesperson and setting its agenda. It is expected that, if a new chairman is chosen, the old chairman will resign as a governor, even if there are many years of his or her term remaining. Governors and Fed Bank presidents are often professional economists.

What?

Monetary policy refers to the FOMC's management of the money supply and interest rates in the United States. In recent years, the FOMC has focused on setting interest rates (as opposed to their past focus on changes to the money supply). The Federal Reserve System manages the money supply in the economy to attain the desired level for interest rates, set by the FOMC.

Lowering interest rates will increase investment and interest-sensitive consumption in the economy, leading to an expansion of GDP. Raising interest rates will decrease investment and interest-sensitive consumption, leading to a decrease in investment, a lower GDP and ultimately a slowing of economic growth (thereby limiting inflationary pressures in the economy).

Introductory courses generally present the "three tools" the Fed may use to affect the money supply and interest rates: the reserve requirement, the discount rate and open market operations. However, open market operations are by far the most frequently used tool of the Fed.

Reserve requirements are set by the Fed and require banks to keep a percentage of their deposits on hand at the bank or on deposit with the Federal Reserve District Bank in their region. Reserve requirements are generally used to serve the supervision and regulation function of the Fed. They are set to maintain safety and soundness in the banking system.

The discount rate is the rate the Fed charges commercial banks for short-term loans. Discount rates are most often set above the federal funds rate (the rate banks charge each other for short-term loans). This ensures relatively little borrowing through the discount window, because commercial banks would rather borrow from one another at the lower federal funds rate.

Open market operations refer to the Fed's action of buying and selling government securities (e.g., Treasury bonds) on the open market. Government securities represent loans to the U.S. government and include Treasury bills, Treasury notes and Treasury bonds. Banks or individuals purchase securities (loan money to the government) and

are paid back the amount of the loan plus interest. Treasury bonds are issued in terms of 30 years and pay interest every six months until they mature. When a Treasury bond matures, the owner is paid the bond's face value. The price and yield of a Treasury bond are determined at auction (e.g., in the open market). The price may be greater than, less than, or equal to the face value of the bond. Changes in the price paid reflect changes in interest rates in the economy. Treasury bonds are sold by the U.S. Treasury, banks, brokers and dealers. Owners may sell Treasury bills, notes or bonds before they mature. If the owner chooses to sell a Treasury bond through the U.S. Treasury, the request is sent to the Federal Reserve Bank of Chicago, which offers the security to different brokers, selling it to the highest bidder. The sale proceeds, minus a \$45 fee, are deposited into the bank account designated by the seller. Bond owners may also sell their bonds through brokers.¹

When the Fed buys bonds, bonds are taken out of the economy and money is injected into the economy as a result of the Fed's paying bondholders for their bonds. When the Fed sells bonds, bonds enter the economy and money is removed from the economy as the buyer makes payment for the bonds. Through buying and selling bonds, the Fed can increase or decrease the money supply. When anything is scarce, its price goes up. Thus, when the money supply decreases, interest rates (the price of money) rise. As money becomes more available, its price falls — just as anything becomes cheaper as it becomes more available (*ceteris paribus*).

When?

The FOMC usually meets eight times a year (about every six weeks). Most meetings are scheduled well in advance, and the schedule is available on the website of the Board of Governors. The committee generally meets on a Tuesday between 9 a.m. and 2 p.m. Around 2:15 p.m. that day, there is a widely anticipated and closely watched public announcement about the outcome of the meeting. Individuals and businesses often make decisions based on the FOMC announcement, and there will frequently be an effect on the stock market when the FOMC issues its press release announcing a change, if any, and its “thinking” that was part of the discussion among members.

The FOMC will take action and change interest rates when it believes there is potential for the economy to experience a problem with inflation or recession. When the FOMC believes that action is needed to prevent inflation, the committee will pursue contractionary monetary policy by raising interest rates. When the committee is concerned about the potential for recession in the economy, it will pursue expansionary policy by lowering interest rates.

Where?

The FOMC meets in Washington, D.C., at the Federal Reserve Bank there. Once the committee issues its decision, it is the Federal Reserve Bank of New York's job to carry out the policy change. The New York Fed conducts open market operations (OMOs) to achieve and maintain the interest rate set by the FOMC. It is important to note that

1. See: <http://www.treasurydirect.gov/>

open market operations are conducted continuously, not just in response to FOMC meetings every six weeks. At any time, market forces in the economy can push interest rates up or down. When the New York Fed conducts open market operations to offset the effects of other factors in the economy and keep interest rates where they were set by the FOMC, these actions are called “defensive OMOs.” “Dynamic OMOs” are undertaken to increase or decrease the money supply and change interest rates as directed by the FOMC. Monetary policy, whether through dynamic or defensive OMOs, has its effect on the economy through the banking and financial system throughout the economy. The banking and financial system is central to the “how” of monetary policy.

Why?

The goal of monetary policy is to manage money and interest rates to keep the economy healthy. According to the Fed, “Experience has shown us that the economy performs well when inflation is low. When inflation is low — and is expected to remain low — interest rates are usually low as well. Such an environment fosters low unemployment and allows the economy to achieve its growth potential.”²

The Fed conducts monetary policy in pursuit of the key macroeconomic goals: stable prices, low unemployment and economic growth. Contractionary policy is needed to control inflation in the economy, and expansionary policy can be used to increase employment and economic growth.

Monetary Policy: Teaching the “How”

Interest Rates: The Federal Funds Rate

Instruction on modern monetary policy focuses on teaching that the Fed determines “interest rates.” However, there are many different interest rates throughout the economy (e.g., federal funds rate, discount rate, prime rate, mortgage rates, credit card rates). But all of these different interest rates tend to rise and fall together. This is sometimes discussed as the “web of interest rates” in the economy. The specific interest rate the FOMC targets is the **federal funds rate** (also known as the fed funds rate). This is the rate that commercial banks charge each other for overnight loans. For example, if one bank has more than necessary on deposit at the Fed and another bank needs to have more on deposit at the Fed (for example to maintain required reserves), the two banks can arrange an overnight loan. The bank borrowing the funds will pay the lending bank the fed funds rate of interest for the loan. If the fed funds rate changes, it means that the cost of borrowing changes for banks that borrow from another. The change in bank borrowing cost will eventually lead to a change in other interest rates in the economy. When banks have to pay higher rates to borrow funds, they will, in turn, charge higher rates for loans that they make to customers.

2. “In Plain English: Making Sense of the Federal Reserve,” The Federal Reserve System.

Another important interest rate, the discount rate, is the interest rate Federal Reserve Banks charge commercial banks for short-term loans. Since each Federal Reserve Bank controls the discount rate in its district (subject to approval by the BOG), students often mistakenly think that the interest rate targeted by the FOMC (i.e., the interest rate reported as being raised or lowered by the Fed) is the discount rate. While the discount rate can be used as a monetary policy tool, it generally is not used by the FOMC. The fed funds rate is generally below the discount rate, and therefore, banks prefer to borrow in the fed funds market. The discount rate is more often used by the Fed in serving its bank supervision and regulation function than in the conduct of monetary policy.

In August 2007 the Fed took the very unusual step of lowering the discount rate in all districts to 5.75 percent from 6.25 percent. The move was made to narrow the gap between the discount rate and the fed funds rate (which was at 5.25 percent). The Fed lowered the discount rate in response to increased risk of a slowdown in economic growth and to address uncertainty in global markets. Along with the potential slowdown and uncertainty, there was a decrease in commercial banks' willingness to lend. To increase banks' willingness to lend, the Fed cut its discount rate to make loans to commercial banks from the Fed cheaper and provide liquidity to the financial system. This made credit easier for businesses and consumers to obtain, and helped reduce uncertainty and prevent an economic slowdown. This was a very unusual use of the discount rate as a monetary policy tool (it was also a move to maintain the safety and soundness of the banking system).

After each meeting, the FOMC issues a directive to the New York Fed's domestic trading desk, informing them of the FOMC's objective for monetary policy (e.g., raising or lowering the fed funds rate and by how much). The fed funds rate is generally increased or decreased by 25 or 50 basis points. There are 100 basis points in a percentage, so 25 basis points is one-quarter percent and 50 basis points is one-half percent. The committee also releases a statement describing the reason for the decision and its assessment of economic conditions. The committee statement gives the public an idea of what the Fed anticipates as the direction for future monetary policy and the key factors it is watching to determine changes the FOMC may make in the future.

How Interest Rate Changes Affect the Economy

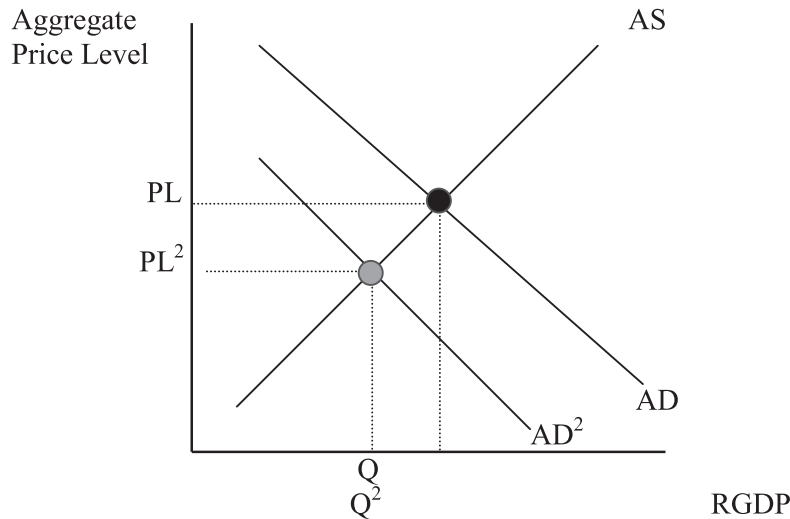
Changes in interest rates that result from the FOMC's adjusting the federal funds rate affect the economy through the chain of events described in the following paragraphs. This shorthand is fairly common and can be very helpful to students learning the causal "chain of events" set in motion by monetary policy. It can help students learn the relationships between variables and help them organize concise explanations (i.e., save them time on the AP Exam, while providing clearer answers).

- 1) $\downarrow i\% \rightarrow \uparrow I/C^* \rightarrow \uparrow AD \rightarrow \uparrow GDP \rightarrow \uparrow PL$
- 2) $\uparrow i\% \rightarrow \downarrow I/C^* \rightarrow \downarrow AD \rightarrow \downarrow GDP \rightarrow \downarrow PL$

C^* = interest-sensitive consumption³

When interest rates change, it affects the level of investment in the economy. Higher interest rates make investment purchases by businesses more expensive. Either businesses will have to pay higher interest rates to borrow money for investment projects or, if they have the funds for the investment project, the opportunity cost of spending for the project rather than loaning the money to someone else, will be higher. Therefore, higher interest rates decrease the level of investment, as fewer investment projects have a rate of return that is greater than the increased cost of the investment. This is called contractionary policy.

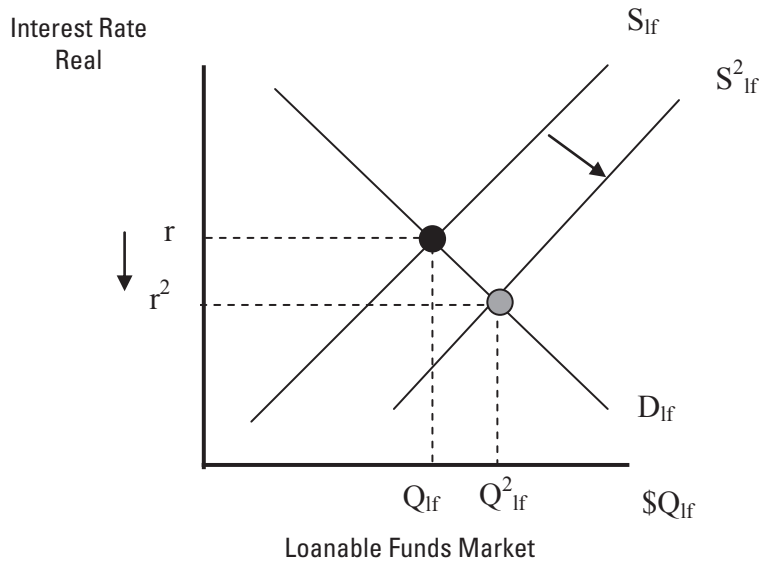
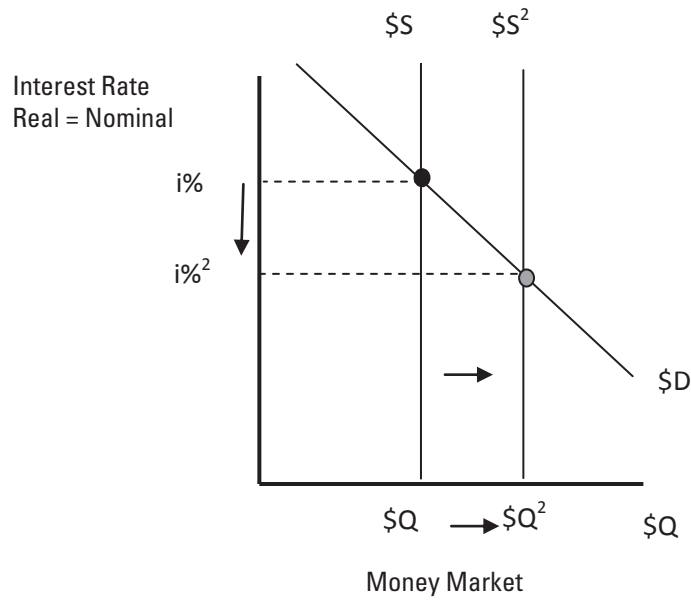
Investment is a component of aggregate demand, so if investment decreases, aggregate demand will decrease. As shown in the graph below, the decrease in aggregate demand will put downward pressure on prices in the event the economy is experiencing inflationary pressures. This chain of events also works in the opposite direction, when expansionary policy (decreased interest rates leading to increased aggregate demand) is used to combat recessionary pressures.



This explanation of how interest rate changes translate to effects on the macroeconomy does not help students understand *how* the Fed controls interest rates. Exactly what happens that leads to the decrease in interest rates? Students frequently know that buying bonds increases the money supply and therefore decreases the interest rate (while selling bonds decreases the money supply and increases interest rates), as shown in the following graphs.

3. Interest rates only affect consumption that is a function of the interest rates. That is, only consumption for which consumers borrow money is directly affected by the interest rate. The major examples are the purchase of real estate and automobiles. If students discuss consumption as a function of interest rates, they should be clear that it is only interest-sensitive consumption that is affected (as well as investment).

Differences Between the Money Market and the Loanable Funds Market



That there are two different (but related) graphs can be confusing for students. The money market graph comes from the liquidity preference model of interest rates, and illustrates how actions by the Fed (and other central banks) lead to changes in interest rates in the economy in the short run. The loanable funds market is a hypothetical market that illustrates how the demand for loanable funds (generated by those who want to borrow funds) and the

supply of loanable funds (provided by lenders through saving) interact to determine the equilibrium price of loanable funds — the interest rate. In the short run, a change in the supply of money will lead to a change in the supply of loanable funds, and the equilibrium interest rate in the two markets is the same. Notice that, because it refers to the short run, the real and nominal interest rates in the money market are the same. However, in the long run, aggregate output will be equal to potential output. A change in the money supply and interest rates will not affect output or saving in the long run. In the long run, it is the market for loanable funds that determines the equilibrium real interest rate.

However, even if students master the difference and relationship between the money market and loanable funds market, they often still don't have an understanding of what goes on in the banking and financial system that sets all these effects in motion.

How the Fed Achieves the Targeted Fed Funds Rate

The Fed controls interest rates through commercial bank reserves. This is why students need to understand the role of the banking system to fully understand the conduct of monetary policy. Bank reserves are currency held by banks either in their vault (this is sometimes called vault cash) or deposited in an account with one of the 12 Federal Reserve Banks. Reserves are divided into two types: required reserves (a percent of commercial bank deposits that the Fed requires banks to keep on hand or in reserve) and excess reserves (any reserves held by banks above the required amount).

The Fed affects bank reserves through open market operations. Open market operations involve the Fed policy action of buying and selling U.S. government securities (e.g., Treasury bonds). This action is called “open market” operations because the Fed does not decide on its own which securities dealers to deal with. Various securities dealers compete in the open market to buy/sell securities based on the price. When prices are high, dealers buy fewer bonds; when prices are low, they buy more bonds.

When the Fed purchases bonds, it takes bonds out of the economy as bondholders submit their bonds for sale. The Fed pays for them with a check. This action puts more money into the economy. When the Fed sells bonds, it puts more bonds into the hands of banks and individuals and takes money out of the economy as payment. By changing the amount of money in the economy, the Fed changes the supply of funds available for loans. When there is plenty of money available for loans, the price of loans (the interest rate) will be low. When there are few funds available for loans, borrowers will compete for the limited funds, driving up the price.

$\uparrow \$s \rightarrow \uparrow S^{lf} \rightarrow \downarrow i\%$

$\downarrow \$s \rightarrow \uparrow S^{lf} \rightarrow \uparrow i\%$

How the Effect of a Policy Change Multiplies

For any initial change in bank reserves, the money supply will change by some multiple of that amount. In introductory economics courses, students are first introduced to the simple money multiplier, equal to 1 over required reserve ratio. Using the simple money multiplier:

$$\Delta \text{ in checkable deposits} = 1/r * \Delta \text{ in excess reserves}$$

An injection of new deposits into the banking system will have a “multiplier” effect on bank deposits. When a bank receives a new deposit, it must keep a certain percentage of the new deposit either as vault cash or on deposit with the Fed (these are the required reserves dictated by the Fed). The remainder of the deposit becomes excess reserves and may be loaned out by the bank. Because banks are profit-maximizing firms that earn profits from making loans, they will generally loan out as much of their excess reserves as possible. Thus, the excess reserves from the new deposit become loans. When the loan check is deposited into the borrower’s account (either at the same bank or another bank) the loan amount becomes another new deposit. Because the required reserves are held at each stage, the amount becomes smaller as it multiplies through the banking system. The bank must hold the required amount of reserves from the new deposit, and the remainder become excess reserves that can be loaned out. This process continues until there are no further new deposits/loans to be made.

However, the size of the effect of an open market purchase of bonds on the economy depends on whether or not the funds from the Fed’s purchase end up in the banking system. There are two important ways in which the amount of the bond purchase could “leak out” of the multiplier process. If the proceeds of the purchase are held by the seller as cash (rather than deposited in a bank account), the injection of money into the economy will not multiply. This is sometimes called “currency drain.” The payment also will not multiply if the bank into which the proceeds of a bond purchase are deposited holds the payment as excess reserves (rather than loaning it out). This may be the case if banks cannot locate “creditworthy” borrowers.

The actual money multiplier will be smaller if the open market purchase is held as currency or excess reserves and is not allowed to “multiply” through the banking system. The actual money multiplier is

$$1/(r + e + c)$$

Where:

r = the percentage of deposits banks are required to hold

e = the percentage of deposits banks hold as excess reserves

c = the percentage of deposits borrowers hold as cash

Depositors’ decisions about holding currency, banks’ decisions about holding excess

reserves, and the Fed's decision about the reserve requirement all impact the size of the multiplier effect on changes in open market operations.

As can be seen using the actual money multiplier, the ultimate effect of the Fed's open market purchase (or sale) of bonds is different depending on whether the purchase (or sale) is from a bank or from the nonbank public.

If the Fed purchases \$1,000 of bonds from a bank, the securities held by the bank decrease by \$1,000 and the Fed pays the bank with a \$1,000 check. The check represents a \$1,000 increase in the bank's excess reserves (the entire amount is excess reserves, because the check does not represent a deposit into an individual's bank account — so no required reserves must be held). The bank has merely changed from holding a bond to holding excess reserves. The bank may then loan out the excess reserves. The change in excess reserves that can be multiplied is \$1,000. The maximum increase in the money supply is \$1,000 times the multiplier ($1/r$).

If, however, the Fed purchases bonds from the nonbank public, the result is different. The securities held by the nonbank public will decrease by \$1,000 and the Fed pays the nonbank public with a \$1,000 check. The person receiving the check MAY deposit the \$1,000 in a bank account but may also cash the check and hold currency. If the person holds the \$1,000 as currency, reserves are unchanged. But if the person deposits the \$1,000 in a bank account, reserves increase by \$1,000, but the reserves are NOT all excess reserves. The bank accepting the deposit must hold the required percentage of the deposit as required reserves. Therefore, the *maximum* increase in the money supply is

$$[\$1,000 - (\$1,000 \times r)] * 1/r$$

For example, if the reserve requirement is 10 percent, the bank must hold \$100 as required reserves and only has an additional \$900 to loan. Thus the multiplier process starts with \$900 rather than the full \$1,000 (as when the Fed purchased the bonds directly from the bank).

Conclusion

For students to fully understand monetary policy, it is important to teach them about the real-world mechanisms through which Fed policy affects the economy. If you take the time to teach about the reality of banking and financial systems in addition to the theory of monetary policy, you will find that “VOILA!” students have a more thorough understanding of how the macroeconomy works.

Bank Expansion of Money Supply

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Topic:

How the Fed uses the banking system to regulate the money supply.

Objectives:

After completing these activity sets, students should be able to:

1. Identify the three motivators of a commercial bank
2. Define liquidity, solvency and profitability as they relate to a bank
3. Explain how the interaction of these motivates a bank to be fully loaned out
4. Identify the reserve requirement by looking at a simple balance sheet of a bank
5. Separate a new demand deposit into required and excess reserves
6. Recognize that loans, bonds and securities are all possible interest-earning assets of a bank
7. Explain the difference between the Fed's buying a bond from a bank and the effects of a new demand deposit by individual bank customers
8. See that when a bank makes a loan, the money supply expands by the amount of the loan
9. Calculate that deposits create a loan through three lending processes using a simple reserve requirement

Activity Sets

Activity One

Given the following situations, answer the questions. Assume that all banks have proper required reserves.

rr = required reserves

er = excess reserves

dd = demand deposit (checking account)

1.

Assets	Liabilities
\$5 rr \$5 loans	\$10 dd

a. What is the reserve requirement ratio? _____%

2.

Assets	Liabilities
\$5 rr \$5 er \$10 loans	\$20 dd

a. What is the reserve requirement ratio? _____%

b. Why is this bank less profitable than it could be?

c. Why would *this bank* be considered more secure than required?

3.

Assets	Liabilities
\$8 rr \$32 bonds	\$40 dd

a. What is the reserve requirement ratio? _____%

b. The \$40 of deposits enables *the banking system* to increase the total money supply by how much?

c. A withdrawal of \$5 in cash or check from this bank would do what to the amount that should by Federal Reserve requirements be in the reserves?

4.

Assets	Liabilities
\$10 rr \$90 bonds	\$100 dd

- a. A deposit of \$50 into this bank would do what to reserves, both required and excess?
- b. The \$50 deposit would enable *this bank* to make a maximum loan of how much?
- c. This deposit of \$50 would enable *the banking system* to increase loans by how much?
- d. What happens to the money supply when a loan is repaid?

5.

Assets	Liabilities
\$10 at Fed \$10 in vault \$30 bonds \$50 loans	\$100 dd

- a. What is the reserve requirement ratio? _____%
 - b. What is the maximum amount the *nation's* money supply could achieve using the numbers provided? (A \$100 deposit is shown.)
 - c. If the Fed made the reserve requirement 25%, how large could the money supply become?
 - d. If the Fed changed the reserve requirement to 10%, how much would the *nation's* money supply expand to?
6. A \$600 demand deposit is shown, as the cash was deposited into the Bank of Astoria. The Fed reserve requirement is **20%**. Fill in the rest of the Bank of Astoria's balance sheet with the assumption that it loans out the maximum allowable, and that each of the bank's lendings is used to make a purchase at a store that has its checking account at the next bank. Again make the assumption that each bank will become "fully loaned out."

Bank of Astoria		Bank of Botox		Bank of Cale	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
	\$600 dd				

- a. What would be the total money supply increase *in the nation* because of the original \$600 deposit? What is the impact on the Bank of Botox balance sheet?
- b. What would be the maximum deposit at the Bank of Cale?

7. Using the three accounts below, do the same project as in Question 6 but with a 10% required reserve ratio.

Bank of A		Bank of B		Bank of C	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities

- a. What would be the total increase in the *nation's* money supply due to the \$600 deposit? What does the balance sheet of Bank of B look like?
- b. What would be the maximum loan possible from the Bank of C?
- c. What generalization can you make about the size of the money supply and changes to the reserve requirement?

Activity Two

There is a significant difference between individuals such as you and I making a deposit at a bank and the Federal Reserve's injecting money into the system by purchasing a bond from a bank directly. The excess reserves created are what matters.

a. Deposits Made in Checking Accounts

When you and I deposit \$100 into a bank, the bank must first set aside the required reserves before it can make any loans. With a reserve requirement of 20%, a \$100 deposit creates only \$80 worth of excess reserves. \$80 times 5 (the 1/.20 multiplier) allows for a \$400 dollar expansion of the money supply. The total money supply is \$500, the \$100 deposit plus the \$400 of derived deposits created through excess reserves and the lending process. This difference between the total money supply and the increase in the money supply caused by lending is an important distinction.

b. Fed Buys Bonds from Commercial Banks

In contrast, when the Fed buys a bond for \$100 from a bank, the entire \$100 is new to the system. It is entirely excess reserves, so the lending process can start with a \$100 loan. \$100 times the 1/.20 multiplier = \$500 of new money to the system — a total money supply of \$500 and an increase of the money supply of \$500.

c. Fed Buys Bonds from Individuals

The same applies if the Fed buys the bond from us. That purchase potentially creates a deposit of \$100, which then must have required reserves set aside, leaving \$80 in excess reserves to start the lending process. But the \$100 of ours from the bond sale to the Fed is new to the money system, as is the \$400 worth of loans. The two added together is an increase in the money supply of \$500.

In the following three problems, keep these distinctions in mind.

1. The difference between the total money supply and the increase in the money supply.
2. Whether the change in reserves is caused by preexisting money or new money injected by the Fed.
3. How different reserve ratios affect the ability of banks to make loans.
4. Loan creation is money creation, paying off loans (loan destruction) shrinks money supply.

8.

Assets	Liabilities
\$20 rr \$80 bond	\$100 dd

- a. If the Fed buys the \$80 bond from the bank, what types of reserves change and by how much?
- b. This action by the Fed allows the *banking system* to create how much money at a maximum?

9.

Assets	Liabilities
\$50 rr \$100 bond \$350 loans	\$500 dd

- a. A business contractor makes a deposit into her checking account of \$200. How much does this change the bank's excess reserves? What is the maximum loan *this single bank* can now make?
- b. The *banking system* would utilize this initial deposit (\$200) to generate a total of how much in loans?
- c. What is the maximum increase in the money supply now?

10.

Assets	Liabilities
\$50 rr \$150 bond	\$200 dd

- a. A borrower comes into the bank and pays off \$100 of his loan. This was a cash payment by the borrower to the bank. What was the immediate effect to the *nation's* money supply?
- b. What happens to this bank's reserves?
- c. The bank will do what because of this loan repayment?

Activity Three

Our last exercise is to show how reserves, excess and required, change when the Fed uses open market operations to buy a bond, first from a bank and then from an individual. As always, assume that banks are fully loaned out.

11.

Assets	Liabilities
\$200 \$300 loan \$500 bond	\$1,000 dd

- a. What is the reserve requirement ratio? _____%
- b. If the Fed, as part of its open market operations, buys this bond from the bank, how much do its required and excess reserves change?
- c. With this Fed action and resulting change in excess reserves, how much can the *nation's* money supply change?

12. John Q. Public owns many bonds. As part of the Fed's open market operations, it makes John an offer he can't refuse, and he sells the Fed a \$500 bond. The Fed pays John with a \$500 deposit into his bank account (20% rr).

John's Bank	
Assets	Liabilities

- a. Fill in the balance sheet (right side) to record John's sale of his bond.
- b. The Fed's action of buying John's bond creates excess reserves of how much?
- c. The banking system can create a maximum of how much in loans?
- d. The change in the total money supply because of the Fed's action is how much?

Answers to Activity Sets

Activity One

1. a. 50% ($\$5/\10)
2. a. 25% ($\$5/\20)
b. It is not loaned out to the max.
c. It has excess reserves that provide added protection from unexpected withdrawals.
3. a. 20% ($\$8/\40)
b. By \$160 — the total money in the system is \$200 (started with \$40, and banks created an additional \$160 through loans).
c. The deposits would decline to \$35; 20% of \$35 is \$7.50, which is the reserve required by the Fed, but the bank would only have \$3, as \$5 just flowed out, so it would be \$2.50 short of rr.
4. a. Required reserves (rr) would increase by \$5 to \$15 (10% rr). With \$50 in dd, 10% must be set aside in required reserves, leaving \$45 in excess reserves.
b. The bank could make an additional loan of \$45 without exceeding reserve requirements.
c. The banking system could lend this money out over and over until the money supply had expanded by \$450. One over the reserve requirement ratio times the new deposit minus the legal reserve requirement is the maximum money that banks could create ($1/rr_{ratio} * [dd - rr]$). Remember to complete the operation in brackets first in the equation.
d. It decreases. When a bank makes a loan, it creates money. When a loan is repaid, money is destroyed. Money goes from “in circulation” or “in a demand deposit” to being held as reserves in a bank and reserves are not counted as part of the money supply.
5. a. 20% ($\$20/\100 , \$10 in vault and \$10 at Fed).
b. \$500 ($1/.20 = 5$; $5 \times \$100 =$ total MS of \$500; \$100 preexisted, and the lending by the banks created an extra \$400).
c. \$400 ($1/.25 = 4$; $4 \times \$100 =$ \$400, of which \$100 already was present in the system, so the banks in this case added \$300 to the money supply by making loans).
d. \$1,000 (a 10% res. req. creates a multiplier of $1/.10 = 10$, so the money supply could reach as high as $10 \times \$100 =$ \$1,000).

6. a. \$2,400 ($1/.2 * [600-120]$). The Bank of Astoria should end with \$120 in rr and \$480 in loans. The \$480 loan is spent, and the selling unit makes a deposit of \$480 at the Bank of Botox. Botox should have \$96 of rr and make a loan of \$384.
- b. The maximum deposit in the Bank of Cale is \$384, where \$76.80 is used for rr, allowing a loan of \$307.20.
7. a. \$5,400 ($1/.1 * [600-60]$) Bank of A should have a \$600 dd, \$60 in rr, and a loan on the books for \$540. The Bank of B should receive a demand deposit for \$540, and place \$54 into rr, while making the maximum loan amount of \$486.
- b. The Bank of C has a dd of \$486, rr of \$48.60 and a loan for the amount of \$437.40
- c. As the reserve requirement is increased, the size of the multiplier is smaller, so the money supply changes more slowly. As the reserve requirement is decreased, the size of the multiplier is larger, so the money supply increases more rapidly.

Activity Two

8. a. Excess reserves increase by \$80, because the Fed pays the funds directly into the excess reserves and it does not flow through a demand deposit.
- b. \$400. With a reserve ratio of 20%, the simple multiplier is 5. Five times the er = \$400 increase in the money supply.
9. a. With the reserve ratio at 10%, a \$200 deposit would create \$180 of excess reserves with which to make a loan.
- b. The banking system would use this \$200 deposit over and over to make \$1,800 of new loans (10 x \$180).
- c. Loan creation is money creation. \$1,800 of new loans means the money supply can be increased by \$1,800 at the maximum.
10. a. The money supply decreased by \$100. While the cash was in the borrower's possession, it was part of the nation's money supply. As a reserve in a bank it is not included in the money supply.
- b. The bank's excess reserves increase by \$100 because the money did not involve a demand deposit.
- c. In order to maximize profits, as quickly as possible the bank will make new loans totaling \$100, the amount of the excess reserves.

Activity Three

11.
 - a. 20% ($\$200/\$1,000$).
 - b. Required reserves do not change, as no deposits were made. Excess reserves of \$500 are created, as the bond was a loan based on excess reserves, and when it was changed back into “cash” it became a noninterest-earning reserve.
 - c. The excess reserves can all be lent out. So \$500 times the multiplier of 5 ($1/.20$) means \$2,500 is the total change in the money supply.
12. a. John makes a \$500 demand deposit; the bank immediately breaks this into \$100 of required and \$400 of excess reserves:

John's Bank	
Assets	Liabilities
\$100 rr \$400 er	\$500 dd

- b. The \$500 demand deposit creates only \$400 of excess reserves, as \$100 must be set aside as required reserves.
- c. The \$500 purchase of the bond created a demand deposit of \$500, of which \$400 became excess reserves. The excess reserves with a multiplier of 5 could create a maximum of \$2,000 worth of loans.
- d. Total change of the money supply is \$2,500. The original \$500 payment for John's bond by the Fed was new money, as was the \$2,000 in loans.

Open Market Operations and the Effect on GDP

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Objective:

To have students understand the mechanics of the Federal Reserve's open market operations and the effect on GDP.

Definitions:

Students will need to be familiar with the following terms:

FOMC

The Federal Open Market Committee is the committee that sets monetary policy in the United States. It typically meets eight times a year, and the committee is made up of the seven governors, plus five district bank presidents (on a rotating basis).

Open market operations

The FOMC policy of buying and selling bonds to alter the money supply. If the Fed wants to increase the money supply, it will buy bonds from banks and individuals holding bonds and willing to sell. This, in turn, increases the supply of money (the Fed puts money into the money supply and gets bonds in return). This is what economists refer to as "creating money." If the Fed wants to decrease the supply of money, it will sell bonds. This means that the Fed sells bonds in the market and gets money in return. Here is an easy way to remember buy and sell!

BB: Buy Bonds = Big Bucks

SB: Sell Bonds = Small Bucks

Discount rate

The interest rate that the Federal Reserve charges when it makes loans to commercial banks; this rate is higher than the federal funds rate.

Federal funds rate

The interest rate that banks charge each other on overnight loans. If the Federal Reserve wants to increase the supply of money, the federal funds rate will be lowered by the action of the FOMC. This makes it cheaper for banks to borrow money; therefore, they will borrow money more freely to loan out. If the Fed wants to decrease the supply of money, it will increase the federal funds rate. This will make it more expensive to borrow money; therefore, less money will be injected into the market, as it now is more expensive to borrow. In addition, the opportunity cost of borrowing money is now higher, as one could make a higher rate of return by saving the money in a bank with the higher interest rate.

Reserve requirement

The amount of money that banks must keep on hand and not loan out. If the Federal Reserve wants to increase the money supply, it will lower the reserve requirement, therefore allowing banks to increase the amount that they can now loan out. Banks will have more excess reserves to loan, and the money supply will increase. If the Fed was worried about inflation and wanted to reduce the money supply, it would increase the reserve requirement. This would force banks to keep more money in vault cash (or on hand at the Fed district banks). This means that banks will decrease the overall amount of loans made, and the money supply will be lower.

Money multiplier

We can use the expression $1/\text{reserve ratio}$ to calculate the multiplier. This means that for a customer deposit of \$100 in a bank with a reserve ratio of 10 percent, the multiplier will be $1/.10$. This formula yields a multiplier of 10. Therefore, a \$100 deposit into a bank will potentially yield $\$100 \times 10 = \$1,000$. However, because the reserve ratio is 10 percent, the bank will still be required to hold \$100 in vault cash (10 percent of \$1,000). Therefore, \$1,000 minus \$100 equals \$900. So \$900 will be injected into the market.

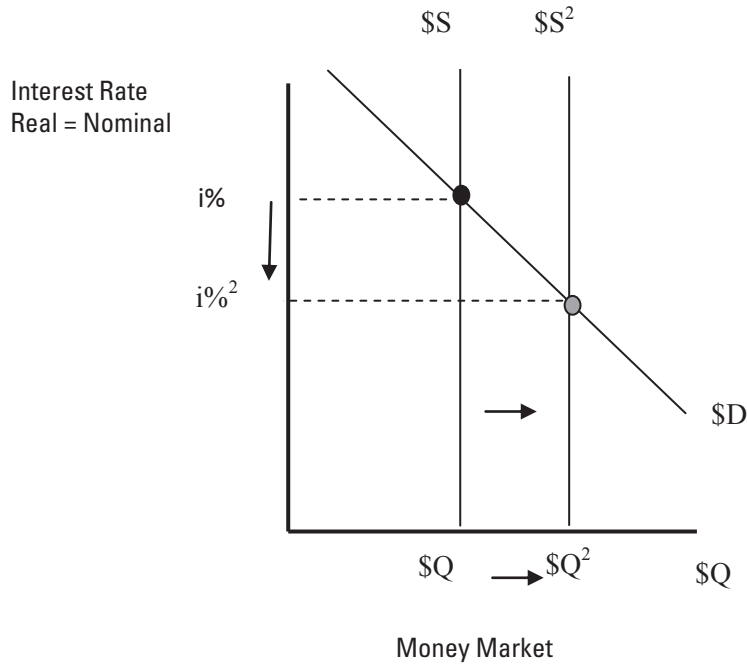
However, if the Federal Reserve buys bonds from a commercial bank, the entire \$1,000 is injected into the market, as the total amount becomes excess reserves. This was not deposited by an individual and does not represent a deposit into the bank, so no required reserves must be held back as legal reserve.

Three tools of the Federal Reserve to affect monetary policy

1. Open market operations — the buying and selling of bonds
2. Adjusting the federal funds rate or the discount rate
3. Adjusting the reserve requirements

Money market graph

Shows how the actions of the Federal Reserve affect interest rates. The graph shows the relationship between interest rates and the quantity of money in the economy. The supply of money is shown as a vertical line because the total amount of money is assumed to be a fixed quantity set by the Federal Reserve. In this graph as shown, when the Fed action increases the money supply, the interest rate falls and the money supply increases.



Starter Activity

Directions

1. Using a primary source about the Federal Reserve and monetary policy is a good way to promote student understanding of the Fed’s role and how markets react to monetary policy. Here is a good example:
http://money.cnn.com/2007/09/18/news/economy/fed_rates/index.htm
2. Asking students the following questions should have them thinking about how money is created in the economy and how this affects interest rates, investment, aggregate demand and GDP. Be careful to lead them through this discussion so that they understand the relationship between the actions taken by the FOMC and the effect on investment and interest-sensitive consumption.

- A. How does the Federal Reserve “create money”?
- B. What changes will occur in the three tools of monetary policy if the economy is in recession? What changes will occur in the three tools of monetary policy if the Federal Reserve is concerned about inflation?
- C. What is the difference between the discount rate and the federal funds rate?
- D. In what way do the Federal Reserve’s open market operations affect interest rates?
- E. How do interest rates affect the level of investment in the economy?
- F. How does the level of investment affect aggregate demand?
- G. What happens to the price level and the level of GDP when aggregate demand changes?

Activity

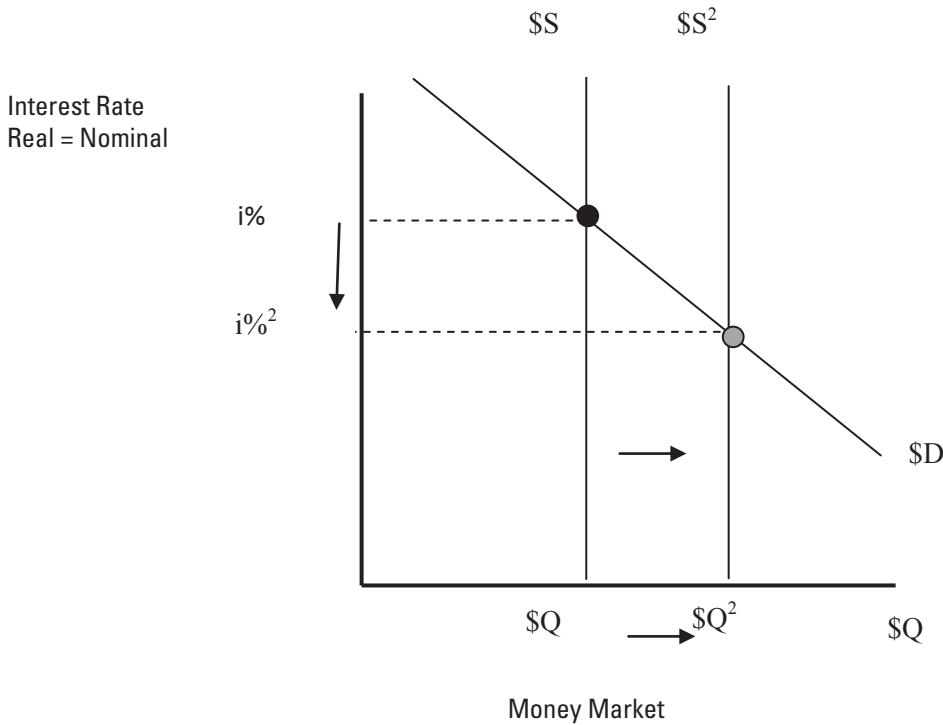
Assume that citizens in the United States have begun to be concerned about sliding into a recessionary period. The FOMC is scheduled to meet in one week. You have been asked by a newspaper to write an article that both describes the role of the Federal Reserve and predicts what policy actions the FOMC will take at their meeting. In addition, you have been asked to describe how their actions will affect the economy. Your article should be written in the style of a newspaper article. Use columns and create a clever headline. Find pictures of Fed officials and draw graphs if needed.

Be sure to include the answers to the following questions to complete your article:

1. What is the FOMC?
2. What are the three tools that can be used by the FOMC, and how do you predict the FOMC would adjust each?
3. Which of the tools is the FOMC most likely to use?
4. How will the Federal Reserve’s decision affect nominal interest rates?
5. How will this decrease in nominal interest rates affect investment? Explain.
6. How will the change in the level of investment affect aggregate demand? Explain.
7. How will this FOMC policy action affect the overall price level?
8. Using shorthand, draw an easy way to remember how the Federal Reserve’s monetary policy affects GDP below.

Answers to Activity Questions

1. The Federal Open Market Committee. The FOMC is made up of the seven Federal Reserve governors plus five Federal Reserve district bank presidents. The New York Fed Bank president is always a voting member; the other Federal Reserve district bank presidents rotate for the other four positions.
2. There are three tools the FOMC can use to affect the supply of money:
 - a. Open market operations — The Federal Reserve would recommend buying bonds to increase the supply of money.
 - b. Adjusting the federal funds rate — The Federal Reserve would most likely lower the federal funds rate. This is the rate that banks charge each other on overnight loans. If it gets “cheaper” to borrow money, banks will be more willing to borrow money to eventually loan out. This will increase the supply of money in the economy.
 - c. Adjusting the reserve requirements — The Federal Reserve would lower the reserve requirements. This means that banks would have more excess reserves that they could loan out, therefore increasing the supply of money in the economy.
3. The FOMC is most likely to use open market operations. When the Federal Reserve chooses to lower the federal funds rate it is able to add money supply to the economy. This policy is called expansionary. Selling of bonds will be ordered to affect the change in rate. The Federal Reserve rarely changes the reserve requirement for banks, though it recently took that action to send a signal to the housing and prime loan markets.
4. If the Federal Reserve purchases bonds in the open market, there will be an increase in the supply of money. As the supply of money increases (shifts to the right), the nominal interest rates will decrease. The graph shows this increase in the money supply that aids the economy because new investment and interest-sensitive borrowing will be easier.



5. As nominal interest rates decrease (assuming no change in the price level so that real interest rates also decrease), the level of investment will increase. There are two reasons for this. First of all, when interest rates decrease, it becomes cheaper for businesses to invest by purchasing new capital goods. Consumers will also be encouraged to buy new homes and automobiles, because borrowed funds are common for these goods. Second, when interest rates decrease, the opportunity cost of holding the money increases as returns from savings decrease.
6. As the level of investment from both business and consumers increases, aggregate demand (AD) will increase. Consumption and investment spending are both part of AD.
7. As aggregate demand increases, the price level and Gross Domestic Product will increase in the short run.
8.
 - a. Fed buys bonds \rightarrow $MS \uparrow \rightarrow i\% \downarrow \rightarrow$ Inv/C $\uparrow \rightarrow$ AD $\uparrow \rightarrow$ GDP \uparrow PL \uparrow
 - b. Fed sells bonds \rightarrow $MS \downarrow \rightarrow i\% \uparrow \rightarrow$ Inv /C $\downarrow \rightarrow$ AD $\downarrow \rightarrow$ GDP \downarrow PL \downarrow

About the Contributors

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Matt Pedlow has taught AP Economics for more than seven years at two different schools, currently teaching at Chelsea High School in Chelsea, Mich. He was a semifinalist in 2004 for the NASDAQ Teaching Award and served as an AP Economics Reader from 2003 to 2005. In 2006, he was given the added responsibility as a Table Leader at the Reading. When not teaching economics, Pedlow coaches girls' varsity tennis.



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