

Macroeconomics

Topic 6: “Explain how the Federal Reserve and the banking system create money (i.e., the supply of money) Explain the factors that affect the demand for money.”

Reference: Gregory Mankiw’s *Principles of Macroeconomics*, 2nd edition, Chapter 15.

The Banking System and the Money Supply

The Federal Reserve System, also known simply as the Fed, is the central bank of the United State. The Fed has several important functions such as, supplying the economy with currency, holding deposits of banks, lending money to banks, regulating the money supply and supervising the banking system. Most modern economies are based on a fractional-reserve banking system. Fractional reserve banking is designed to assure that banks have enough liquid assets (reserves) on hand to satisfy the normal withdrawals made from checking account deposits. Actual Bank Reserves = Bank deposits held at the Fed. + Bank Vault Cash. Both of these assets are readily available to satisfy customer withdrawals or transfer to other banks as customers write checks. The Fed. establishes a Required Reserve Ratio which is the percentage of checkable account deposits that the banks are required to hold as reserves. Thus the Minimum required reserves = Required Reserve Ratio X Checkable deposits.

Money Creation with Fractional-Reserve Banking

The money supply is made up of the currency in circulation outside of banks, and the level of checkable deposits in the banking system.

To see how banks create money, lets assume we have an economy without a banking system and this economy has \$1000 in currency, so the total money supply is \$1000. Now suppose someone opens a bank called First Local Bank (FLB) and people in this economy deposit all the money they have at FLB. After \$1000 deposit at the bank the balance sheet of FLB will be:

ASSETS	FLB	LIABILITIES
Vault Cash \$1000		Checkable Deposits \$1000

Money supply in this imaginary economy remains unchanged at \$1000. Every cash deposit made reduces the currency in circulation and raises the checkable deposits by exactly the same amount. In a similar way, the withdrawal of cash from your bank does not change the money supply, as your checkable balance is decreased by the amount of your ATM cash withdrawal.

What is the reserve position of FLB after receiving the deposit? Suppose the required reserve ratio is 10%. FLB must hold a minimum reserve of at least \$100 (10% of the \$1000 checkable deposits.) Since FLB holds actual reserves of \$1000 it has excess reserves of \$900. The excess reserves can then be used to support the creation of a loan.

Suppose FLB now makes a loan of \$900 to an existing customer. The change to the bank's balance sheet appears below.

ASSETS	FLB	LIABILITIES
Vault Cash \$1000		Checkable Deposits $(\$1000 + \$900) = \$1900$
Loans \$900		

FLB's reserves did not change, but notice the checkable deposits have increased by \$900 and therefore the money supply of our economy has just increased by \$900. Remember, the money supply is the sum of currency in circulation plus the level of checkable deposits. Where did the money come from? It was created by the loan creation of FLB. When banks make loans, money is created. When loans are repaid money is destroyed. A fractional-reserve banking system allows banks to create money through loans.

Money Multiplier

The process of money creation does not stop with FLB. Imagine that many other banks have opened in our hypothetical economy and the borrowers of \$900 from FLB either withdraw vault cash and spend it with merchants or write a check to someone with deposits in another bank. For simplicity assume that \$900 of currency or checkable deposits ends up being deposited at a bank called Second Local Bank (SLB). Changes in SLB's balance sheet are shown in the following T-Account:

ASSETS	SLB	LIABILITIES
Reserves \$900		Checkable Deposits \$900

If SLB holds the 10% required reserve and creates a loan equal to excess reserves, its balance sheet will change by

ASSETS	SLB	LIABILITIES
Reserves \$900		Checkable Deposits $(\$900 + \$810) = \$1710$
Loans \$810		

SLB created an additional \$810 of money. Assume the borrowers from SLB deposit the \$810 at a bank called Third Local Bank (TLB). TLB keeps 10% reserve, or \$81, and loans out \$729. So, TLB creates \$790. This process goes on and on.

We can add up all the deposits to determine how much money is eventually created by the entire banking system, as shown on the following page:

Bank	New Deposit	New Required Reserve	New Loan
First Local Bank	\$1000	$0.1 \times 1000 = \$100$	$1000 - 100 = \$900$
Second Local Bank	\$900	$0.1 \times 900 = \$90$	$900 - 90 = \$810$
Third Local Bank	\$810	\$81	\$729
Fourth Local Bank	\$729	\$72.9	\$656.10
.	\$656.10	.	.
.	.	.	.
.	.	.	.
Totals	\$10,000	=	\$1000 + \$9000

The total amount of money created by the entire banking system from the original deposit of \$1000 adds up to \$10,000, or 10 times as much as the original deposit (original reserve). The ratio of total money supplied to the original deposit (original reserve) is called money multiplier. The size of the money multiplier depends on the reserve ratio. For instance, if banks decide to hold 20% reserve money multiplier will be 5. And the sum of new deposits will be \$5000 = (1000 + 800 + 640 + ...). In general, the money multiplier is the reciprocal of reserve ratio. If R is the reserve ratio, then money multiplier is 1/R. In our example, R is 10% (or 0.1) and so the money multiplier is $(1/0.1) = 10$. This reciprocal formula means that money supply by the banking system is 1/R times the entire banking reserves. So, when the banks' total reserve increase and banks loan out the additional reserves, the money supply changes as follows:

$$\text{Change in Money Supply} = (1/R) \times \text{Change in Reserves}$$

The Fed's Tools of Monetary Policy

The Fed has three tools at its disposal to alter the money supply: open market operations, changing the discount rate, and changing the reserve requirement.

Open Market Operations

Open market operation refers to Fed's purchases and sales of bonds issued by the US treasury. These transactions are with banks, public, and firms. When the Fed buys bonds in the bond markets it pays for the bond by creating new Bank deposits at the Fed. These new Bank deposits at the Fed add to banks excess reserves, and can therefore form the basis of a multiple expansion of the money supply through new loan creation by banks. To see how open market operation works, assume the Fed purchased \$100 bonds from the First Local Bank and banks required reserve ratio is $R = 20\%$. Changes in the FLB's balance sheet are shown in the following T-account:

ASSETS	FLB	LIABILITIES
Reserves	+\$100	
Bonds	-\$100	

Since excess reserves have increased by \$100, applying the money supply formula, total money supply will increase by $\$100 \times (1/0.2) = \500 . To reduce the money supply, the Fed does just the opposite.

In summary: Open market purchases increase reserves and allow the banks to increase the money supply. Open market sales reduce reserves, thus reducing the banks ability to create money and therefore reducing the money supply.

Changes in the Discount rate

The Federal Reserve Discount rate is the interest rate on discount loans that the Fed makes to banks. Banks borrow discount loans from the Fed when they do not have enough reserve to meet the reserve requirements. Banks borrowings from the Fed increase the level of banks reserves and these additional reserves allow the banks to create more money. The Fed can alter the discount lending by changing the discount rate. When the Fed lowers the discount rate it encourages banks to borrow more from the Fed, leading to more reserves in the banking system. These additional reserves will eventually increase the money supply, because of the money multiplier principle, by a greater extent than the increase in reserves. Conversely, an increase in the discount rate discourages banks borrowing from the Fed and reduces the money supply. Lowering the Fed discount rate is expansionary monetary policy, while raising the Fed discount rate is contractionary monetary policy.

Changes in Reserve Requirements

The last tool of changing the money supply is the required reserve ratio. Required reserve ratio determines how much money the banking system can create with each dollar of reserves. When the Fed lowers the required reserve ratio money multiplier increases as well as excess reserves. These changes can lead to increase in money supply. For example, assume the entire banking system has \$1000 in deposits and the required reserve ratio is 10% and banks are fully loaned up. That means the total reserve in the banking system is \$100. Now suppose the Fed lowers the required reserve ratio to 8%, and hence, reduces the total required reserve to \$80. With this change banks find themselves with excess reserves of \$20. If banks decide to loan out the entire excess reserves the money supply can increase by as much as $20 \times (1/0.08) = \$250$. Conversely, an increase in required reserve ratio raises the reserve ratio, lowers the money multiplier, and decreases the money supply. Lowering the required reserve ratio is expansionary monetary policy; raising the required reserve ratio is contractionary monetary policy.

There are two problems that the Fed faces in trying to control the money supply. The first problem is that the Fed does not control the amount of money that households want to hold as deposits in banks. The more money the households deposit in banks, the more reserves banks have, and the more money banking system can create. And if households choose to hold more in cash and less in deposits, banks lose reserves and money supply decreases. The second problem is that the Fed does not control the amount of money that banks choose to lend. If banks decide to hold more excess reserves and make fewer loans, the amount of money supply will be smaller.

Determinants of Money Demand

People have several motives for holding non-interest-earning money balances. The transaction demand is the main reason why people hold money. This is the money people hold for payments of their regular and expected expenditures such as paying for rent, groceries, movie ticket and so on. Transaction demand is directly influenced with income and price level. Increases in income and prices lead to increases in money demand. Transaction demand also depends on availability of other methods of payments for transactions. For example, the more people rely on using credit cards, the less is the demand for money.

People also hold money for precautionary reasons to make unexpected purchases or to meet emergencies. Precautionary demand, similar to transaction demand, depends directly on income and the price level. The asset demand for money is when people hold money balances as store of value. People may choose to hold money balances rather than other interest-earning assets, such as bonds, because of its liquidity and lack of risk. The disadvantage of holding money as an asset is interest earnings forgone. The decision about how much to hold as an asset, hence, depends on the interest rate. The higher the interest rate, which is the opportunity cost of holding money, the lower the money balances people want to hold. And the lower the interest rate, the higher the money balances people want to hold.