Money can take many forms and is defined as anything that serves the three main functions of money: a medium of exchange, a standard of value (or unit of account), and a store of value.

Financial assets include stocks and bonds. They represent a claim that entitles the buyer to future income from the seller.

Decisions often have consequences that last well into the future. The concept of present value is used to address the issue of timing when measuring costs and benefits.

The money supply is measured by monetary aggregates M1 and M2. M1 includes liquid assets and M2 is a broader definition of the money supply and consists of M1 plus less liquid assets.

In a fractional reserve banking system, demand deposits lead to money creation. Money is created through the money multiplier process when banks make loans, and it is destroyed when loans are repaid.

Banks are required to keep a percentage of their deposits as reserves. Reserves can be currency in the bank vault or deposits at the Federal Reserve Banks. The reserve requirement limits the amount of money banks can create.

The simple deposit expansion multiplier is equal to 1 divided by the required reserve ratio (rr).

\[
\text{Deposit expansion multiplier} = \frac{1}{rr}
\]

The demand for money is the sum of transactions demand, precautionary demand, and speculative demand. The demand for money is determined by interest rates, income, and the price level. The supply of money is set by the Federal Reserve (the Fed). Equilibrium in the money market determines the interest rate in the economy.

The loanable funds market is made up of lenders, who supply funds, and borrowers, who demand funds. Equilibrium in the loanable funds market determines the interest rate and quantity of loanable funds.

The Federal Reserve regulates financial institutions and controls the nation's money supply. The three main tools that the Fed can use to control the money supply are buying and selling government bonds (open market operations), changing the discount rate, and changing the reserve requirement.

If the Fed wants to increase the money supply, it will encourage bank lending by buying bonds, decreasing the discount rate, or decreasing the reserve requirement. This is referred to as expansionary monetary policy and is used by the Fed to reduce unemployment.

If the Fed wants to decrease the money supply, it will discourage bank lending by selling bonds, increasing the discount rate, or increasing the reserve requirement. This is called a contractionary monetary policy and is used by the Fed to control inflation.

Open market operations are the most frequently used tool. Since changes in the reserve requirement can have substantial economic effects, the Fed rarely changes it.

The federal funds rate (ffr) is the interest rate a bank charges when it lends excess reserves to other banks. The Fed currently targets the ffr to implement monetary policy because it is closely tied to economic activity.

\[ MV = PQ \] is the equation of exchange: Money times velocity equals price times quantity of goods. PQ is the nominal GDP. Velocity is the number of times a year that the money supply is used to make payments for final goods and services.
Money and Financial Assets

Money is generally accepted in payment for goods and services and serves as an asset to its holder. Money is anything that serves three important functions: a medium of exchange, a standard of value, and a store of value.

To be a good medium of exchange, money must be accepted by people when they buy and sell goods and services. It should be portable or easily carried from place to place. It must also be divisible so that large and small transactions can be made. It must also be uniform so that a particular unit such as a quarter represents the same value as every other quarter.

To be a good standard of value, or unit of account, money must be useful for denoting values (prices). To accomplish this, money must be familiar, divisible, and accepted.

To be a good store of value, money must be durable so it can be kept for future use. It also should have a stable value so people do not lose purchasing power if they use the money at a later time.

Throughout history, a wide variety of items have served as money. These include gold, silver, tobacco, beer, cattle, metal coins, paper bills, and checks. Money is evaluated based on how well it accomplishes the three functions of money. Money is what money does!

1. Use the following table to evaluate how well each item would perform the functions of money today. If an item seems to fulfill the function, put a + sign in the box; if it does not fulfill a function well, place a – sign in the box. Put a ? sign in the box if you are unsure whether the item fulfills that function of money. Circle the best form of money (the item with the most + signs).

<table>
<thead>
<tr>
<th>Item</th>
<th>Medium of exchange</th>
<th>Store of value</th>
<th>Standard of value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salt</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cattle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gold</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Copper coins</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beaver pelts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personal checks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Savings account passbook</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prepaid phone card</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Debit card</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Credit card</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bushels of wheat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$1 bill</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$100 bill</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Defining and Measuring the Money Supply

Defining and measuring money is a difficult task because of changes in technology and the financial system. There is agreement on a simple conceptual definition of money. However, the complexity of the real world prevents agreement on a single measure of the money supply.

The Federal Reserve (Fed) uses monetary aggregates (called M1 and M2) as a way to measure the money supply. In defining these measures of the money supply, the Fed draws lines between groups of assets that serve both the medium-of-exchange and store-of-value functions of money to varying degrees. M2 is broader than M1. M2 includes M1 plus additional less liquid assets. Liquidity refers to the ease with which an asset can be turned into cash. Cash is therefore the most liquid asset (because it is cash already!). The other assets that are included in M2 are less liquid since it takes time (or a loss of value) to turn them into cash.

- M1 includes paper currency and coins, demand deposits, and traveler’s checks.
- M2 includes M1, savings and small time deposits, and money market shares.

M1 includes items that are primarily used as a medium of exchange while M2 adds items that are primarily used as a store of value.

In each of the following scenarios, which function of money is being served? Indicate M for medium of exchange, S for store of value, or U for unit of account.

___ 2. You pay for your lunch with a $5 bill.
___ 3. A car is described as being worth $5,000.
___ 4. A grandparent puts $200 into a savings account for a grandchild’s future.
___ 5. You decide you want to give $10 worth of candy to a friend for his birthday.
___ 6. A driver pays a $2 toll.
___ 7. You set aside $10 per week to save up for a new computer.

8. Why are credit cards not considered money? Do they serve any of the functions of money?

9. Order the list of assets below from 1 to 5, with 1 being most liquid and 5 being least liquid.

____ a $10 bill ______ a traveler’s check ______ a car ______ a money market share ______ a house
10. Use the data in Table 4-1.1 to calculate M1 and M2 in billions of dollars. Assume all items not mentioned are zero.

Table 4-1.1
Calculating the Money Supply

<table>
<thead>
<tr>
<th>Description</th>
<th>In billions of dollars</th>
</tr>
</thead>
<tbody>
<tr>
<td>Checkable deposits (demand deposits, NOW, ATM, and credit union share draft accounts)</td>
<td>$1,500</td>
</tr>
<tr>
<td>Currency in circulation</td>
<td>$1,000</td>
</tr>
<tr>
<td>Savings deposits</td>
<td>$7,000</td>
</tr>
<tr>
<td>Small-denomination time deposits</td>
<td>$500</td>
</tr>
<tr>
<td>Money market funds</td>
<td>$600</td>
</tr>
</tbody>
</table>

(A) M1 = 

(B) M2 = 

The Financial System and Financial Assets

The financial system is made up of financial markets that facilitate the flow of funds from lenders to borrowers. In financial markets, households invest their savings in financial assets, which provide funds for investment spending. A well-functioning financial system is important to the economy because it makes households’ savings available for investment that leads to long-run economic growth. The financial system helps to address three problems: transactions costs, risk, and liquidity. Financial markets reduce transaction costs by making it easier and less costly to match borrowers and lenders. They can be used to reduce the risk taken by individual lenders and borrowers by allowing diversification (investing in several different assets). And they can be used as a way to provide liquidity (access to cash). Financial intermediaries (e.g., banks and mutual funds) are institutions that transform funds they gather into financial assets.

A financial asset is a paper claim that entitles its buyer to future income from the seller. There are four important types of financial assets: loans, stocks, bonds, and bank deposits. A loan is an agreement to repay, with interest. A bond is an IOU issued by the borrower that represents a promise to pay fixed interest payments at regular intervals and repay the principal on a specified date. A stock is a share in the ownership of a company. A mutual fund is a financial intermediary that creates a portfolio (collection of financial assets) made up of different stocks and resells shares of it to individual investors. A mutual fund allows small investors to diversify their portfolio. Bank deposits are claims on a bank that oblige it to give funds back to a depositor on demand.
11. In each of the following scenarios, identify the financial asset (*loan, stock, bond, bank deposit*) and what important function of financial markets is being served (*reduce transaction costs, reduce risk, provide liquidity*). Explain how the asset is serving the function(s) you identify.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Financial asset</th>
<th>Function(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A) The cost of building a new factory is financed by selling shares in the company.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(B) Funds from many small savers are combined and provided to an individual to buy a house.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(C) The $1,000 in your savings account at your local bank pays you 3 percent interest.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(D) A firm borrows money by promising to pay a fixed sum of interest each year for 10 years and then pay back the amount borrowed at the end of 10 years.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Time Value of Money**

A dollar you receive today is worth more than a dollar you may receive a year from today! Money has a time value because interest rates are positive. For example, if you earn 5 percent per year on your savings account, one dollar will grow to one dollar plus five cents after one year. Since the present value of $1.05 to be received one year from now (if interest rates are 5%) is $1.00, then the present value of $1.00 to be received one year from now (again if interest rates are 5%) must be some value less than $1.00. In fact, the present value can be calculated using the formula

\[ PV = \frac{FV}{(1 + r)^n} \]

where
- \(PV\) is present value
- \(FV\) is future value
- \(r\) is the rate of interest per period
- \(n\) is the number of compounding periods (per year).

Using the formula for our example:
- \(PV = \frac{1.00}{(1.05)^1}\)
- \(PV = 0.95\).

Today’s value of $1.00 to be received one year from now if the interest rate is 5 percent is $0.95.

Business executives must consider the time value of money when making business investment spending decisions. They know that future profit projections must be converted to the present value in order to make a correct decision about whether a certain business project is profitable. Notice that the interest rate is in the denominator of the formula indicating the present value is inversely related to the interest rate. Thus, less business investment spending is worthwhile at higher interest rates.

For example, assume a business was considering the purchase of a new machine that costs $2,000 now. The machine is expected to generate profits of $1,000 at the end of year one and $1,400 at the end of year two. For simplicity, assume the machine completely wears out and is worthless after the two years. Also assume the business must borrow the $2,000 at 9 percent interest. Should the business borrow and purchase the machine?

Using the present value formula:

\[ PV = \frac{1,000}{(1.09)^1} + \frac{1,400}{(1.09)^2} = \frac{917.43}{1} + \frac{1,178.35}{1.198809} = 2,095.78 \]

The business should invest in the machine since the present value of its future profits from the machine is greater than the cost of the machine: $2,095.78 – $2,000 = $95.78.

Now, what if the rate the business had to pay to borrow increased to 15 percent?

Using the present value formula:

\[ PV = \frac{1,000}{(1.15)^1} + \frac{1,400}{(1.15)^2} = \frac{869.57}{1} + \frac{1,058.60}{1.32209} = 1,928.17 \]
The business should not invest in the machine since the present value of its future profits from the machine is now less than the cost of the machine: $1,928.17 - $2,000 = ($71.83).

Understanding the time value of money also helps for understanding the relationship between bond prices and interest rates. A bond is a loan with a fixed interest rate called the coupon rate. Bonds are long-term fixed-rate loans of usually 20 or 30 years. The seller (borrower) of a bond agrees to pay the buyer (lender) the amount of interest specified each year plus the face value of the bond at the end of the specified period, again typically 20 or 30 years. Often the buyer of the bond (lender) incurs a liquidity problem and needs to sell the bond before it reaches its maturity. So, at what price can the owner of the bond sell the bond?

To answer that question, let's assume the original bond was a 20-year bond with a face value of $1,000 and the coupon rate was 5 percent. That means the owner was receiving $50 in interest payments each year and was planning on receiving the $1,000 back at the end of year 20. But, let's further assume the owner needs some cash and wants to sell the bond after owning it for 18 years and that current interest rates for bonds with the same level of risk are now 7 percent. That means there are two more interest payments due (one next year and one two years from now) and the face value will be due at the date of maturity or 20th year (two years from now). What price can the owner sell the bond for now that current interest rates are higher?

Using the present value formula:

\[ PV = \frac{50}{(1.07)^1} + \frac{1,050}{(1.07)^2} = 46.73 + 917.11 = 963.84. \]

*Note:* Current interest rate is higher and the price of the bond is lower.

Now assume that current interest rates for bonds with the same level of risk are now 3 percent, which is lower than the 5 percent coupon rate. So, now what price can the owner sell the bond?

Using the present value formula:

\[ PV = \frac{50}{(1.03)^1} + \frac{1,050}{(1.03)^2} = 48.54 + 1,019.42 = 1,067.96. \]

*Note:* Current interest rate is lower and the price of the bond is higher. We can conclude that bond prices are inversely related to interest rates.

**Final note:** What would the same $1,000 bond sell for if interest rates were still equal to the 5 percent coupon rate? Hopefully, you concluded that the price would be the same as the original price or $1,000. To check this out using our formula:

\[ PV = \frac{50}{(1.05)^1} + \frac{1,050}{(1.05)^2} = 47.62 + 952.38 = 1,000. \]

1. What will $3,000 deposited into a savings account be worth after one year if interest rates are 3 percent compounded yearly?
2. What will $3,000 deposited into a savings account be worth after two years if interest rates are 3 percent compounded yearly?

3. What is the present value of $3,000 you are scheduled to receive one year from today if you are currently earning 3 percent on your savings account?

4. What is the present value of $3,000 you are scheduled to receive two years from today if you are currently earning 3 percent on your savings account?

5. Assume you have owned a 20-year $1,000 bond with a coupon rate of 6 percent for 17 years. If current interest rates on similar bonds are 9 percent, at what price could you sell the bond today?

6. Assume a business is deciding whether to invest in a new project that is projected to generate profits of $90,000 each year for the next three years. The project start-up costs are $225,000.

   (A) If the business normally earns 11 percent on its investments, should the business invest? Show/explain.

   (B) If the business normally earns 5 percent on its investments, should the business invest? Show/explain.
Banks and the Creation of Money

A bank is a financial intermediary that uses bank deposits to finance investment. That is, a bank receives deposits from savers (households) and loans them out to investors (firms). Banks earn profits by making loans. They will loan out most, but not all, of the deposits they receive. They can’t loan out all of the deposits because they have to provide depositors with their funds, on demand (which is the origin of the term demand deposits). The fraction of deposits that a bank keeps on hand (either in their vault or deposited with the Federal Reserve) is the bank’s reserves. Banks are required by law to keep a certain minimum fraction of their deposits on reserve. These are called required reserves. Any reserves in excess of the required reserves are called excess reserves. When banks keep only a fraction of their deposits on hand and can loan out the rest, it is called a fractional reserve banking system. With a fractional reserve system, banks can create money to expand the money supply.

To see how a bank can create money and increase the money supply in the economy, consider the following scenario.

1. A new checkable deposit of $1,000 is made in Bank 1. The required reserve ratio is 10 percent of checkable deposits, and banks do not hold any excess reserves. That is, banks loan out the other 90 percent of their deposits. Assume that all money loaned out by one bank is redeposited in another bank. To see how the new deposit creates money and increases the money supply, find the following values.

(A) Bank 1 must keep required reserves = $____________

(B) Bank 1 can loan = $____________

(C) When the proceeds of the loan are redeposited, Bank 2 receives new deposits = $____________

(D) Bank 2 must keep additional required reserves = $____________

(E) Bank 2 can now make new loans = $____________

(F) When the proceeds of the loan are redeposited, Bank 3 receives new deposits = $____________

(G) Bank 3 must keep additional required reserves = $____________

(H) Bank 3 can now make new loans = $____________
2. Use your answers from above to complete Table 4-3.1. Round the values to two decimals (e.g., $59.05). After you have completed the table, fill in the blanks in the statements that follow.

<table>
<thead>
<tr>
<th>Bank</th>
<th>New checkable deposits</th>
<th>10% required reserves</th>
<th>Loans</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$1,000.00</td>
<td>$100.00</td>
<td>$900.00</td>
</tr>
<tr>
<td>2</td>
<td>$900.00</td>
<td></td>
<td>$810.00</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>$81.00</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td>$656.10</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td>$59.05</td>
</tr>
<tr>
<td>7</td>
<td>$531.44</td>
<td></td>
<td>$478.30</td>
</tr>
<tr>
<td>All other banks combined</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total for all banks</td>
<td>$10,000.00</td>
<td></td>
<td>$9,000.00</td>
</tr>
</tbody>
</table>

(A) The original deposit of $1,000 increased total bank reserves by $___________. Eventually, this led to a total of $10,000 expansion of bank deposits, $__________ of which was because of the original deposit, while $__________ was because of bank lending activities.

(B) If the required reserve had been 15 percent instead of 10 percent, the amount of deposit expansion would have been (more/less) than in this example.

(C) If the fractional reserve had been 5 percent instead of 10 percent, the amount of deposit expansion would have been (more/less) than in this example.

(D) If banks had not loaned out all of their excess reserves, the amount of deposit expansion would have been (more/less) than in this example.

(E) If all loans had not been redeposited in the banking system, the amount of deposit expansion would have been (more/less) than in this example.
3. Another way to represent the multiple expansion of deposits is through *T-accounts.* A T-account shows offsetting assets and liabilities. For the bank, *assets* include loans, deposits with the Federal Reserve, and Treasury securities. *Liabilities* include deposits. Use the T-account below to show how the new $1,000 deposit described in the previous example would be listed in a T-account.

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

An easier way to determine how much money can be created if the bank loans out all of its excess reserves is to use the *deposit expansion multiplier.* The deposit expansion multiplier determines how much money can be created in the economy from an initial deposit. The formula for the deposit expansion multiplier is equal to \((1/rr)\), where \(rr\) is the reserve requirement.

**Deposit expansion multiplier = \(1/rr\).**

In this example, the reserve requirement is 10 percent so the deposit expansion multiplier is \((1/0.1)\), which equals 10. This means that for every dollar of new excess reserves, the money supply will increase by $10.

To find the total amount of money created, use the following equation:

\[
\text{Expansion of the money supply} = \text{excess reserves} \times \text{multiplier}.
\]

The multiplier is 10, and excess reserves from the initial bank deposit are $900. So the potential expansion of money (M1) would be $900 times 10, or $9,000. M1 now consists of the new deposit of $1,000 plus the $9,000 created.
Student Alert: Make sure you read any money multiplier questions carefully to determine exactly which value the question asks for. For example, does it ask you to calculate the initial change or the final change?

4. Assume that $1,000 is deposited in the bank, and that each bank loans out all of its excess reserves. For each of the following required reserve ratios, calculate the amount that the bank must hold in required reserves, the amount that will be excess reserves, the deposit expansion multiplier, and the maximum amount that the money supply could increase.

<table>
<thead>
<tr>
<th>Required reserve ratio</th>
<th>1%</th>
<th>5%</th>
<th>10%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required reserves</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excess reserves</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deposit expansion multiplier</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum increase in the money supply</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(A) Will an increase in the reserve requirement increase or decrease the money supply? Explain.

(B) What will happen to deposits, required reserves, excess reserves, and the money supply if deposits are withdrawn from the banking system?

(C) What could happen at each stage of the money creation process to prevent the money supply from increasing the full amount predicted by the deposit expansion multiplier?