Lesson 1 - [**What is the Federal Reserve System?**](https://study.com/academy/lesson/what-is-the-federal-reserve-system.html)

Have you ever wondered why interest rates go up and down, seemingly at random? Of course you have! Discover what the Federal Reserve is, what its goals are and how those goals are achieved in this introductory lesson explaining the central bank of the United States.

What Is the Federal Reserve?

What if you had the power to create money out of thin air? How would you view the world? What would you do with the money you create? Would you take it up in a helicopter and drop it off the tallest building in the world? Would you use it to buy gold bars and stack the gold in the shape of the pyramids of Giza? Perhaps you would use it to help as many people as possible afford a college education. The Federal Reserve is the only organization in our society that has the authority to legally create money out of nothing. What an awesome power!

The Federal Reserve's power comes from its ability to issue money, called **Federal Reserve Notes**. While many people confuse it with the Bureau of Engraving and Printing, which is part of the Treasury Department, the Federal Reserve is actually not a federal agency. However, its power was delegated to it by Congress in the early 20th century. It doesn't actually run the printing presses where the currency is produced (that's the Treasury Department), but it does create money by increasing bank account balances. This creative power comes from the fact that it's at the very top of a giant pyramid of banking.

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| Federal Reserve Pyramid Illustration |
| ***The Federal Reserve is at the top of the banking pyramid*** |

**The Federal Reserve** (called **the Fed** for short) is the central bank of the United States. Founded in 1913 by an act of Congress called the Federal Reserve Act, it's considered the government's bank as well as the banker's bank. It's also referred to as 'the lender of last resort' because of its ability to step in and loan out money when banks get into trouble. In doing so, it creates stability in the financial system and helps to reduce the severity of economic downturns.

Main Goals of the Fed

Its main goals, at least since 1977, have been to promote maximum sustainable output and employment and to promote stable prices.

Here's what they say about themselves: 'The Federal Reserve sets the nation's monetary policy to promote the objectives of maximum employment, stable prices and moderate long-term interest rates.'

What does that mean? It means they want to see as many people as possible in the town of Ceelo working jobs. It means they don't want to see the prices in the grocery store rising too fast. When prices are somewhat stable, this helps a nation maximize its output while improving its standard of living. Finally, it means the Fed wants interest rates at the First National Bank of Ceelo to be low enough to encourage people to borrow and invest.

How the Fed Achieves Its Monetary Goals

How does the Fed achieve these goals? By controlling the money supply.

**The money supply** is a stock of safe assets that households and businesses can use to make payments or to hold as short-term investments. Common examples of the money supply include the currency and coins in circulation, but also checking and savings accounts, like the one Margie deposits her paycheck into when she goes to the First National Bank of Ceelo.

The actions taken by the Federal Reserve are often too complex and difficult for many people to figure out, although they have a track record of delivering positive results. Here's a more detailed list of the important functions that the Fed performs:

* Acts as the lender of last resort to commercial banks
* Regulates the money supply
* Holds deposits of banks
* Supervises the banking system
* Provides check-clearing services

One thing the Federal Reserve does not do is bank with individuals, so it cannot extend any credit to individuals.

The Fed is able to exercise considerable control over the money supply and interest rates because commercial banks are required to maintain a reserve account of their own at one of the Federal Reserve Banks throughout the country. That's why it's referred to as 'the banker's bank.' Banks are required to keep some of their own money in an account at the Federal Reserve, and the Fed determines the interest rate these banks pay to borrow money. All of the other bank interest rates that affect everyday citizens, like you and me, are somehow tied, either directly or indirectly, to this main interest rate they call **the Federal Funds Rate**.

When the economy is doing really well, the Fed tends to keep interest rates on the higher side. When the economy is doing very poorly, on the other hand, they tend to keep interest rates on the low side in an effort to jump-start the economy's engine.

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| Federal Funds Rate |
| ***When the economy is doing poorly, the Fed tends to keep interest rates low*** |

This matters because lower interest rates influence businesses to borrow more and invest, which leads to a growing economy and more jobs. The Fed also influences consumers to borrow money with mortgages or to build homes, and that leads to economic growth too, which usually results in more jobs.

If you think of the economy as the car you drive, for example, you can imagine the Fed's monetary policy actions like you would imagine me hooking up my car battery to your car battery and jump-starting it. The economy is like your car, and my car (just pretend it's a Bentley) is like the Federal Reserve. Hey, I've always wanted to create money.

Just think about this for a minute. Car batteries are inside cars for the purpose of starting the car when it has stopped. When everything in the car is working fine, the car battery helps you crank up the car, and then the car's engine will actually keep the car battery charged so it'll be there for you, ready to use in the future when you really need it. However, from time to time, your car might get stuck somewhere because the battery is dead.

In that case, I could help you get your car going again long enough for your car engine to charge up the battery on its own. When your car is stuck on the side of the expressway, while you were on your way somewhere, that describes an economy in recession. When my car gives you a jump to get you going again, this describes the actions of the Federal Reserve, which they call monetary policy.

The Money Supply and the Fed

It's all about the money supply. The money supply is the foundation of an economy because all transactions taking place in an economy happen with money, and these transactions generate profit for individuals and businesses. Whoever controls the money supply of a nation has tremendous power over the nation's destiny. President James Garfield said it this way: 'He who controls the money supply of a nation controls the nation.'

Lesson Summary

Let's review the key points. The Federal Reserve (called the Fed for short) is the central bank of the United States. Founded in 1913 by an act of Congress called the Federal Reserve Act, it's considered the government's bank as well as the banker's bank. It's also referred to as 'the lender of last resort'.

The Federal Reserve's power comes from its ability to issue money, called Federal Reserve Notes. Its main goals since 1977 have been to promote maximum sustainable output and employment and to promote stable prices.

The Fed is responsible for:

* Holding deposits of banks
* Acting as the lender of last resort to commercial banks
* Regulating the money supply
* Supervising the banking system
* Providing check-clearing services

In order to achieve the three objectives of maximum employment, price stability and moderate interest rates, the Fed controls the money supply, and the money supply changes the interest rate.

One thing the Fed does not do is bank with individuals directly, so it cannot extend any credit of any kind to individuals. No credit cards, no debit cards - it deals with banks.

Lesson Objectives

After watching this lesson, you should be able to:

* Define the Federal Reserve and understand its main power
* Identify the Federal Reserve's main goals and functions
* Explain why the Federal Reserve is called 'the banker's bank' and the 'lender of last resort'
* Define the money supply and the federal funds rate

Lesson 2 - [**Reserve Requirement, Open Market Operations and the Discount Rate**](https://study.com/academy/lesson/reserve-requirement-open-market-operations-and-the-discount-rate.html)

This lesson outlines the three main tools used by the central bank to conduct monetary policy, including open market operations, required reserves and the discount rate.

The Money [Supply](http://study.com/academy/lesson/supply-in-economics-definition-factors-quiz.html) and the Federal Reserve

In the town of Ceelo, Bob owns a successful lawn business and sometimes needs to borrow money so he can invest into a new mower. When Bob needs a loan, he borrows money from the First National Bank of Ceelo. The money he borrows is part of the money supply of the economy. Margie runs a cake bakery with some of the best and creamiest chocolate cakes that you've ever tasted. She's a business owner like Bob, but she gets a paycheck just like the other workers in her bakery and when she does, she takes it to the First National Bank of Ceelo to deposit it. Her paycheck is part of the money supply.

**The money supply** is a stock of safe [assets](http://study.com/academy/lesson/what-are-assets-definition-examples-quiz.html) that households and businesses can use to make payments or to hold as short-term investments. Common examples of the money supply include the currency and coins in circulation but also checking and savings accounts, like the one Margie deposits her paycheck into.

Banks like the First National Bank of Ceelo are members of a much larger system of banks with one central bank at the top, like the top of a pyramid, much like the one you'll find on the back of a one dollar bill. The central bank in the United States is called **the Federal Reserve**. Its main objectives include full employment, stable prices and moderate interest rates, all of which tend to lead to long-run economic growth. How do they achieve these objectives? Using the three basic tools that we're talking about in this lesson: open market operations, reserve requirements and the discount rate. These three tools enable the central bank to change the money supply and therefore stimulate the economy or slow it down. The first tool is called open market operations.

Open Market Operations

The Fed has a very unique arrangement with the Federal government. It finances the government by buying U.S. government bonds. This enables the congress to spend more money than it takes in with tax revenues, and more importantly, it provides the central bank with a great deal of influence over the economy.

**Open market operations** are the purchases and sales of government securities in the open market by the Federal Reserve.

When it buys government bonds, it uses new money to pay for them, an arrangement that gives the Federal Reserve control over the size of the money supply. While some of this new money could be actual currency, usually it's in the form of numbers added to a bank account electronically. Where does this new money come from? It's created out of thin air. Sometimes I wish I had this power!

Once the Fed buys these government securities in the open market, the money supply immediately goes up, and this initial increase leads to a multiplied increase in money throughout the economy, as banks lend out their excess reserves through what economists call 'the multiplier effect.'

But the Fed can also sell government securities, and the money supply will go down. This is a very powerful thing because changes in the money supply lead to changes in interest rates, and interest rates influence a lot of decisions throughout the economy. Basically, the Federal Reserve has a lot of influence over aggregate demand because interest rates affect the level of saving and investment within the economy.

When banks borrow money from other banks, they use what's called the federal funds rate. **The federal funds rate** is the interest rate charged by banks for overnight loans. This is the interest rate that the Fed directly controls by changing the money supply. If they want to set the Fed funds rate at 3%, then they buy or sell enough government securities to cause the interest rate to settle at this target rate of 3%.

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| Federal Funds Rate Borrowing |
| ***Banks borrow from other banks at the federal funds rate.*** |

Banks, in turn, loan out money at the prime rate. **The prime rate** is the interest rate that banks charge to their best customers. Of course, for other customers, they would get a higher rate than that, but the prime rate is for the best customers. The Federal Reserve keeps a firm grip on the money supply through its open market operations and thereby controls interest rates. So this is the first of the three tools.

Reserve Requirements

The second tool of the Federal Reserve is called**reserve requirements**, which is the proportion of customers' deposits a bank is required by the Federal Reserve to hold in reserve without loaning out. The biggest benefit to the commercial bank of setting aside a reserve is that this bank will have enough cash on hand to cover the withdrawals of money that consumers might need on a regular basis. However, the main reason that the Federal Reserve requires commercial banks to maintain reserves with them is to give the Federal Reserve more control over the money supply, which is a very powerful tool that often results in immediate changes within the economy.

For example, when the Fed changes the reserve requirement from 10% to 20%, that means banks are suddenly required to reserve twice as much money out of every deposit than they did before. Whatever they have to reserve cannot be loaned out, so fewer loans take place. And this means a smaller money supply. It also means higher interest rates and lower economic output.

On the other hand, when the Fed lowers the reserve requirement, from, say, 20% to 10%, the opposite scenario takes place. Banks hold fewer reserves and therefore, loan out more money, which stimulates economic output. To see the effects of a change in reserve requirements, just think about this example.

When the Fed lowers the reserve requirements from 20% to 10%, let's say, the money multiplier, whose formula is 1 divided by the reserve ratio, increases from 5 to 10, as follows: 1 divided by 20% equals 5 versus 1 divided by 10% is equal to 10. If excess reserves in the banking system started at $100,000, then the money supply would be $100,000 times 5 which is equal to $500,000. However, when the money multiplier doubles from 5 to 10, the money supply doubles from $500,000 to $1,000,000. So this change in the reserve requirement from 20% to 10% just led to a doubling of the money supply.

The Discount Rate

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| Lender of Last Resort |
| ***When banks cannot borrow from other banks, they can borrow money from the Fed.*** |

The third tool of the Federal Reserve is called **the discount rate**, which is the interest rate charged when member banks borrow directly from the Federal Reserve.

Once in a while, the reserves inside a bank's vault fall below the Fed's required reserve amount. Under normal circumstances, banks borrow from each other. As I said before, when a bank borrows from another bank, the rate of interest it pays on that loan is called the federal funds rate. However, during a crisis, banks may not be able to borrow from each other and choose to borrow from the Fed instead. This is why the Fed is referred to as 'the lender of last resort.' When a bank borrows directly from the Fed, it pays the discount rate, which is set directly by the Fed.

Lesson Summary

Alright, let's review. **The money supply** is a stock of safe assets that households and businesses can use to make payments or to hold as short-term investments.

The Federal Reserve, which is called the Fed for short, is the central bank of the United States, and it controls the money supply in America. It's referred to as 'the lender of last resort' because of its ability to step in and loan out money when banks get into trouble. The one thing that the Fed does not do is bank with individuals or businesses directly.

**Open market operations** are the purchases and sales of government securities in the open market by the Federal Reserve. When the Fed buys government securities in the open market, the money supply increases. Likewise, when the Fed sells government securities, the money supply decreases.

The second tool of the Federal Reserve is called **reserve requirements**, which is the proportion of customers' deposits a bank is required by the Fed to hold in reserve without loaning out. In a fractional reserve banking system, all member banks are required to do this. The main reason that the Federal Reserve requires commercial banks to maintain reserves is to give the Federal Reserve more control over the money supply.

The third tool of the Federal Reserve is called **the discount rate**, which is the interest rate charged when member banks borrow directly from the Federal Reserve. **The federal funds rate** is the interest rate charged by banks for overnight loans. The Federal Reserve attempts to keep this rate at a certain predetermined target by changing the money supply. Banks, in turn, loan out money at the prime rate. **The prime rate** is the interest rate that banks charge to their best customers.

When the Fed wishes to stimulate economic growth, it can increase the money supply by purchasing U.S. government securities in the open market, by lowering the reserve requirement or by lowering the discount rate. On the other hand, when the Fed wishes to cool the economy down, it can decrease the money supply by selling U.S. government bonds, increasing the reserve requirement or raising the discount rate.

So these are three major tools our central bank uses to control the money supply and thereby influence interest rates, and now you know more about what they do and how they do it.

Lesson Objectives

After watching this lesson, you should be able to:

* Define the money supply, the Federal Reserve, the federal funds rate and the prime rate
* Summarize the three tools the Federal Reserve uses to change the money supply: open market operations, reserve requirements and the discount rate

Lesson 3 - [**Open Market Operations & the Federal Reserve: Definition & Examples**](https://study.com/academy/lesson/open-market-operations-the-federal-reserve-definition-examples.html)

This lesson explains the most frequently used monetary policy tool of the central bank, open market operations. Using examples, you'll go inside the formula of the money multiplier and see how the Federal Reserve effectively controls the interest rate of the economy.

The Federal Reserve

In early November 2010, an article from the *National Journal* summarized the weak state of the national economy, burdened with high unemployment, and then outlined the central bank's prescription to encourage economic growth. The article said this:

'The Federal Reserve, in a much-anticipated attempt to rev up the economy and fend off deflation, launched a new program this afternoon to inject $600 billion into the economy... the policy-setting Federal Open Market Committee said it will create $75 billion in new dollars per month through next June and use them to buy long-term Treasury bonds. The goal is to push down the cost of borrowing for both businesses and consumers, and in turn to increase investment and spending.

In addition, the committee said it would continue to reinvest the proceeds from maturing mortgage-backed securities into Treasury bonds, effectively pumping what is expected to be an additional $250 billion to $300 billion into the economy at large.'

The Federal Reserve is the central bank of the nation, and it's solely responsible for controlling the supply of money in the economy - what economists refer to as 'monetary policy.' Just as this article suggests, monetary policy actions that increase the money supply lead to higher economic output as measured by real GDP.

The Fed uses three main tools that it calls open market operations, required reserves and the discount rate. This lesson covers the first one, open market operations. Let's find out what open market operations are, how they work and then see the effect that they have on the money supply using some real-world examples.

In the town of Ceelo, three people are very interested in what the Federal Reserve is doing: Lydia (a factory worker), Bob (a business owner) and Allison (a retired woman living on Social Security and the savings she has at the bank). Each of them are anxiously awaiting the announcement taking place today by the central bank - an announcement that will affect interest rates and the economy as well as impact them on a personal level.

Open Market Operations

**Open market operations** are the purchases and sales of government securities in the open market by the Federal Reserve. According to the New York Federal Reserve, which conducts these activities throughout the year, open market operations are the most flexible and frequently used means of implementing U.S. monetary policy.

**The Federal Open Market Committee** (or FOMC for short) is directly responsible for all open market operations. It's made up of seven Federal Reserve governors plus five Federal Reserve district bank presidents.

Whenever I hear the words 'open market operations,' I imagine a patient in the hospital about to be wheeled in to have open-heart surgery performed. In the physical body, the blood carries oxygen to keep the body alert and strong, and the heart is responsible for pumping this supply of oxygen-rich blood throughout the veins and arteries. Sometimes the heart gets blocked, and this supply can't flow where it's needed. Open heart surgery unblocks the heart so that it can pump the supply of blood needed for survival and good health.

The money supply is the lifeblood of the economy, and the open market operations conducted by the Federal Reserve take place at the heart of the financial system. Their activities ensure that the supply of money flows freely into the hands of consumers and businesses who can use it to invest and make the economy grow.

Why does the Fed want to control the money supply? Because it enables them to control the most basic interest rate in the economy: the federal funds rate. **The federal funds rate** is the interest rate that banks charge other banks for overnight loans; therefore, it is the most short-term of all the interest rates. When the Fed changes the money supply and alters this most basic interest rate, they indirectly affect all other interest rates. This is what gives them the ability to stimulate economic growth or slow the economy down.

For example, if the Fed buys government securities, they pay with new money that gets added to the reserves of the banking system. This increase in the money supply causes the fed funds rate to go down - let's say from 4% to 3%. Why does that matter? Almost immediately, interest rates on many other financial investments in the economy would go down as well, which means that the Fed has just lowered the price of money for consumers and businesses. Interest rates on credit cards, home equity loans and business loans begin to fall, making it cheaper to borrow, and this in turn stimulates the economy. At the same time, interest rates on savings accounts fall.

In the town of Ceelo, Lydia, the factory worker, can now take out a home equity loan and upgrade her kitchen - a project she's been wanting to pursue for a long time. Bob, the business owner of a lawn service, finds it cheaper to borrow money to invest into his business. These people are happy about lower interest rates.

However, people like Allison are not. Allison depends not only on Social Security checks she receives each month, but on the interest she earns in her large savings accounts at the bank. When interest rates go down, Allison earns a lower return, which lowers her income. She's very disappointed to hear this news. Borrowers love it and savers hate it when interest rates go down, something that happens when the Federal Reserve buys bonds in the open market.

On the other hand, when the economy is growing too quickly and inflation is going up, the Federal Reserve may conduct open market operations by selling government securities, leading to an increase in the fed funds rate, which trickles down to many of the other rates that affect consumers and businesses. In this case, interest rates on credit cards, home equity loans and business loans would rise, creating less of an incentive for consumers and businesses to borrow money. This, in turn, slows down the economic output of the nation. However, interest rates on savings accounts would rise, benefiting savers. Borrowers hate it when interest rates go up, but savers love it.

Although the Fed does not control the demand for money, by controlling the supply of money in the money market, it can set the interest rate wherever it wants in order to stimulate growth in the economy or slow the economy down. Let's take a closer look at what happens to the money supply when the Fed conducts its open market operations.

Calculating Changes in the Money [Supply](http://study.com/academy/lesson/supply-in-economics-definition-factors-quiz.html)

Suppose the reserve requirement set by the Fed is 20% (we'll talk more about this in a few minutes). Now suppose the Federal Reserve makes an open market purchase of $500,000 of U.S. government bonds.

The question we want to answer is this: what is the maximum amount that the money supply could increase by? First we take the reserve ratio, and we use it to calculate the money multiplier.

The formula for the money multiplier is this: money multiplier = 1/the reserve ratio.

The money multiplier is the reciprocal of the reserve ratio; in this case, it would be 1/20%, which is equal to 5.

The second formula we need tells us how much the money supply would change when open market operations are used. Here's that formula: change in money supply = change in reserves \* the money multiplier.

So the maximum change in the money supply in this example would be: $500,000 \* 5, which equals $2.5 million. When the Fed buys $500,000 worth of government bonds in the open market, the maximum amount that the money supply across the economy could increase would be $2.5 million.

So purchasing U.S. government bonds, otherwise known as 'government securities,' leads to an increase in the money supply. This is what the Federal Reserve does to increase the money supply.

Of course, the process works in reverse as well. When the Fed wants to decrease the money supply, they do so by selling government bonds to the public in the open market. The money used in this exchange gets removed from the banking system, so the money supply goes down.

For example, assume that the Federal Reserve decreases the monetary base by $10 billion when they purchase government bonds in the open market. The reserve requirement is currently 10%. What is the maximum amount the money supply could decrease?

We know that the increase in reserves is $10 billion. Now let's calculate the money multiplier using the reserve ratio of 10%.

So, money multiplier = 1/reserve ratio. Therefore, we have 1/10%. That means the money multiplier in this case is 10.

Plugging it into the second formula, we get: change in money supply = change in reserves \* money multiplier, or the maximum change in the money supply would equal $10 billion x 10 = $100 billion.

Open market operations are one of the most common activities performed by the Federal Reserve. Now you know more about these open market operations and how to calculate the change in the money supply when the Fed buys or sells government securities.

Lesson Summary

Time to review. The Fed uses three main tools to increase or decrease the money supply that it calls open market operations, required reserves and the discount rate.

**Open market operations** are the purchases and sales of government securities in the open market by the Federal Reserve.

When the Fed wants to increase the money supply, they do so by purchasing government bonds from the public in the open market. The cash they use to buy these bonds is new money that gets added to the reserves of the banking system, so this increases the money supply.

When the Fed wants to decrease the money supply, they do so by selling government bonds to the public in the open market. The money used in this exchange gets removed from the banking system, so the money supply goes down.

The formula used to calculate the money multiplier is as follows: money multiplier = 1/the reserve ratio.

Here's the formula used to calculate changes in the money supply: change in money supply = change in reserves \* the money multiplier.

Lesson Objectives

After watching this lesson, you should be able to:

* Define open market operations and the Federal Open Market Committee
* Explain how the Federal Reserve increases and decreases the money supply and interest rates
* Recall the two formulas to calculate the changes in money supply

Lesson 4 - [**How the Reserve Ratio Affects the Money Supply**](https://study.com/academy/lesson/how-the-reserve-ratio-affects-the-money-supply.html)

Where does our supply of money come from. Well, it's in the hands of the Federal Reserve. In this lesson, discover how the central bank can dramatically alter the supply of money in the economy by changing the reserve requirements of the banks it oversees.

The Reserve Ratio

Imagine with me that you and nine other friends are all sitting at your house seated at a table playing blackjack. After talking on the phone earlier in the day, you all agreed to play blackjack for money. Specifically, each hand of blackjack will be worth $5 per person. The game starts out with all five of you placing $5 in a pile on the table. This 'supply of money' is the beginning of what someone will win after the first hand.

Now imagine that you're playing the same card game with the same friends at the same table, and the only thing different is that instead of playing the game for $5 per game, you're playing it for $10 a game instead. When you think about this game of blackjack, it's pretty easy to see that whatever amount you and your friends decide to play for will affect the outcome of every hand you play. Playing for $10 a game will definitely create a larger supply of money in the game than $5 a game will. You have to actually play a hand in order to win the money, but whenever you do play a hand, a larger ante will lead to a larger supply of money in the game.

Changing the dollar amount of a card game is similar to the central bank changing the reserve ratio. They both lead to changes in the supply of money and affect economic output. Let's talk about what the reserve requirement is and with the help of some examples, take a closer look at how a reserve ratio of 20% or 10%, for example, affects the money supply.

Changes in Reserve Requirement

The **reserve requirement** is the proportion of customers' deposits a bank is required by the Fed to hold in reserve without loaning out. Suppose that the Federal Reserve has set the reserve ratio at 20%. That means The First National Bank of Ceelo is required to reserve 20% of every dollar that gets deposited in their bank, while the remaining 80%, which is called excess reserves, can be loaned out to borrowers. The reserve ratio could be 15% or 10%, whatever the Fed decides to set it at.

As part of its monetary policy, the Fed may decide to raise or lower the reserve requirement for all banks that it oversees, and this has a direct and immediate impact on the money supply. Here's why: money that doesn't have to be reserved at a bank is money that can be used to make new loans. Money that can be loaned out is money that can filter through the economy and multiply through a process of multiple deposit expansion as businesses and consumers borrow money to invest. This multiplication process is described by economists as the multiplier effect. That means changes in the reserve ratio will change the multiplier effect, and that changes the money supply.

The Money Multiplier

The formula for the money multiplier is **Money Multiplier = 1 / Reserve Ratio**. The money multiplier is the reciprocal of the reserve ratio. As you can see, changing the reserve ratio, which is inside of the multiplier, quickly changes the multiplier in the opposite direction. When the reserve ratio is 10%, the multiplier would 10. However, when the reserve ratio is increased to 20%, the multiplier goes down to 5, and so on and so forth. It's an inverse relationship.

Calculating Changes in the Money Supply

It's important to understand that when the Fed changes the reserve ratio, this doesn't actually increase or decrease the money supply by itself. What it does is change the magnitude of the multiplier effect so that when the Fed actually changes the money supply using open market operations, the result is a larger or smaller multiple of what they started with.

Suppose the reserve requirement is currently 20%, and the Federal Reserve makes an open market purchase of $500,000 worth of US government bonds. The maximum amount the money supply could increase because of this open market purchase is $2.5 million. How did I get this? Well, let's take a look.

First, I used the money multiplier formula and determined that the multiplier is 1/20%, which is 5. Second, I used this formula - **Change in Money Supply = Change in Reserves \* Money Multiplier** - to calculate the maximum change in the money supply as follows: change in money supply = $500,000 \* 5, or $2.5 million. So, a 20% reserve ratio multiplied a $500,000 deposit five times into a $2.5 million money supply.

Now suppose that the reserve ratio was set by the Fed at 10% instead of 20%. A $500,000 open market purchase of government bonds could lead to a maximum increase in the money supply of $5 million - twice as much as before. All we did was change the reserve ratio, which is *r*, and this changed the money multiplier to 10. So, here's what the formula would look like: the maximum change in the money supply would be $500,000 x 10, which is $5 million. So, now we want to know how this affects economic output.

Effect on Interest Rates and Output

The Federal Reserve has the ability to change the reserve ratio whenever it wants, and as you can see, this small detail can have a powerful impact on the money supply, and the money supply directly affects interest rates in the economy. When the money supply increases, interest rates go down and vice versa.

Assuming that all this money gets loaned out to individuals and businesses that use it to invest and produce something, then this change in the reserve ratio will have a dramatic effect on nominal GDP. The reserve ratio is part of the Federal Reserve's monetary policy toolbox. When they want to stimulate the economy, they can lower the reserve ratio. On the other hand, when they want to slow down the economy, they could increase the reserve ratio.

Now, think back to the game of blackjack. A game of blackjack at $5 per game is like a reserve ratio of 20% that results in a money multiplier of 5. If you have ten players, then the supply of money on the blackjack table would be $50. On the other hand, blackjack at $10 per game is like a reserve ratio at 10%, resulting in a money multiplier of 10. On the blackjack table, you'd have a money supply of $100 instead of $50. Going from $5 per game to $10 per game can lead to a large change in the economic output of the game, just like the Federal Reserve changing the reserve ratio and the effect that that has on the money supply of an economy.

Lesson Summary

Let's review. The **reserve requirement** is the proportion of customers' deposits a bank is required by the Fed to hold in reserve without loaning it out. It is sometimes referred to as the reserve ratio and other times called the required reserve ratio, but this is really the same thing.

As part of its monetary policy, the Fed may decide to raise or lower the reserve requirement for all banks it oversees, and this has a direct and immediate impact on the money supply. Money that doesn't have to be reserved at the bank is money that can be loaned out, and money that's loaned out can filter through the economy and multiply through a process of multiple deposit expansion as businesses and consumers borrow money to invest. This multiplication process is described by economists as the multiplier effect. That means that changes in the reserve ratio will change the multiplier effect, and that changes the money supply.

Assuming that all this money gets loaned out to individuals and businesses that use it to invest and produce, a change in the reserve ratio can have a dramatic effect on economic output. The formulas for calculating changes in the money supply are as follows. Firstly, **Money Multiplier = 1 / Reserve Ratio**. Finally, to calculate the maximum change in the money supply, use the formula **Change in Money Supply = Change in Reserves \* Money Multiplier**.

A decrease in the reserve ratio leads to an increase in the money supply, which puts downward pressure on interest rates and ultimately leads to an increase in nominal GDP. An increase in the reserve ratio leads to a decrease in the money supply, driving interest rates up and pulling nominal GDP downward. The reserve ratio is part of the Federal Reserve's monetary policy toolbox. When they want to stimulate the economy, they can lower it, and when they want to slow the economy down, they can raise it.

Lesson Objectives

Once you finish this lesson you'll be able to:

* Define reserve requirement
* Understand how adjustments to the reserve requirement can influence the economy
* Explain the multiplier effect
* Calculate changes in the money supply
* Understand what happens to a money supply when the reserve ration is increased or decreased
* Comprehend how adjustments to the rserve ratio can either stimulate or slow down an economy

Lesson 5 - [**The Discount Rate & Monetary Policy: How Banks Can Borrow Money from the Federal Reserve**](https://study.com/academy/lesson/the-discount-rate-monetary-policy-how-banks-can-borrow-money-from-the-federal-reserve.html)

Learn more about the discount rate, which is the rate that banks pay to the central bank when borrowing money. This lesson explains how changes in the discount rate affect the money supply and how the central bank can use the discount rate as part of monetary policy.

When a Bank's Reserves Fall

The First National Bank of Ceelo has had a great year. Deposits have increased and so have new loans in the community. Businesses have done well, and some business owners have gone from rags to riches, as evidenced by this man, Frohm, who has worked as a Santa Claus during the Christmas season at a commodities trading firm. Frohm used to live in this van down by the river, throwing darts, counting the days and waiting for Christmastime to roll around again and again.

After Frohm completed an economics course on Study.com, he borrowed from the bank to finance a new business he calls Frohm Jon Surfboards. Now he lives in this 20,000 square-foot mansion overlooking the river where his van used to park each night. Sometimes you can catch Frohm sitting by his backyard pool, staring through binoculars toward the river where the tire tracks from his old van can still be seen from afar.

When the First National Bank extended a loan to Frohm, the original amount of the loan was $500,000. After several weeks of negotiations and requests from Frohm, the bank increased this loan amount from $500,000 to $1,000,000. While the bank is happy about the extra interest it will earn from this business loan, they quickly realize that they won't have enough cash on reserve to cover their everyday needs and to comply with regulations from the Federal Reserve, who oversees their operations.

When the First National Bank discovers their reserves have fallen short, they try to borrow money from other banks but are not able to find one that will lend to them.

Jerry, a former rock star with long hair and gigantic Botoxed lips, is the manager of the bank who discovers this urgent matter. To bring their reserves back up to the required levels, Jerry does two things. First, he gets on the loudspeaker and plays a guitar solo. Immediately afterwards, he contacts the Federal Reserve and asks to borrow money from them to increase the reserves of the bank. The interest rate he pays on this loan is called the discount rate. Let's find out more about it and discover how the central bank uses it as a tool of monetary policy.

What is the Discount Rate?

The **discount rate** is the interest rate charged when member banks borrow directly from the Fed. All banks are required to set aside a certain proportion of their deposits in reserve, according to the reserve ratio set by the Federal Reserve. Throughout the year, a bank may find that their reserves are lower than the amount required. In order to correct this deficiency, the bank typically borrows money from other banks and pays the federal funds rate.

In the event they can't borrow enough from other banks to cover their reserve amount, they always have the option of borrowing directly from the Federal Reserve, in which case they pay the discount rate. That's why the Fed is referred to as the 'lender of last resort.' When Jerry contacted the Federal Reserve, he was quite happy to know that the Federal Reserve will always lend a hand in a crisis situation. The financial system is more stable because of this arrangement - not the music arrangement that Jerry played over the loudspeaker, but the ability to borrow from the Fed at the discount rate.

A Tool of Monetary Policy

Changing the discount rate is one of the three main tools of monetary policy the Fed uses to increase or decrease the money supply so they can stimulate or slow down the economy. However, the effects of this tool aren't as powerful as other tools they use, such as open market operations or changing the reserve requirements.

When the Fed lowers the discount rate, this increases excess reserves in commercial banks throughout the economy and expands the money supply. With a larger money supply, banks like the First National Bank of Ceelo can continue to make loans to businesspeople like Frohm, who went from rags to riches selling surfboards.

When the Fed raises the discount rate, this decreases excess reserves in commercial banks and contracts the money supply. Although this happens less frequently, when the discount rate goes up, the Fed is purposely trying to slow down an overheating economy. When the economy begins to overheat, it can lead to rising inflation, which steals the purchasing power of every dollar.

In addition, during times like these, there may be over a hundred businesspeople like Frohm who went from rags to riches and are now living in mansions, supplying too many products and services - more than anyone needs or wants. In order to bring the economy back into balance, the central bank has the option of raising the discount rate, causing inflation to cool down while restoring the balance between supply and demand.

Lesson Summary

Let's summarize what we've talked about in this lesson. The **discount rate** is the interest rate charged when member banks borrow directly from the Fed.

In the event they can't borrow enough from other banks to cover their reserve amount, they can borrow directly from the Federal Reserve and pay the discount rate. That's why the Federal Reserve is called the 'lender of last resort.'

Changing the discount rate is one of the three main tools of monetary policy the Fed uses to increase or decrease the money supply so they can stimulate or slow down the economy. However, the effects of this tool aren't as powerful as the other tools that they use, including open market operations or changing the reserve requirements.

When the Fed lowers the discount rate, this increases excess reserves in commercial banks throughout the economy and expands the money supply. On the other hand, when the Fed raises the discount rate, this decreases excess reserves in commercial banks and contracts the money supply.

Lesson Objectives

After watching this lesson, you should be able to:

* Define the discount rate and understand why banks borrow from the Federal Reserve
* Explain why the Federal Reserve increases and decreases the discount rate

Lesson 6 - [**How the Federal Reserve Changes the Money Supply and Affects Interest Rates**](https://study.com/academy/lesson/how-the-federal-reserve-changes-the-money-supply.html)

Discover the connection between the money supply and economic output and how the central bank's tools lead to an increase or decrease in real GDP via expansionary and contractionary monetary policy.

The Cause of the Great Depression

In 2002, before he became the chairman of the Federal Reserve, Ben Bernanke wrote a paper and gave it to the famous economist Milton Friedman in celebration of his 90th birthday. In the paper, Chairman Bernanke made an amazing statement. Understand that Ben Bernanke is a scholar when it comes to the Great Depression. He's studied it more than almost any economist in the world, it seems like. Here's the comment he made: 'Let me end my talk by abusing slightly my status as an official representative of the Federal Reserve. I would like to say... Regarding the Great Depression. You're right, we did it. We're very sorry. But thanks to you, we won't do it again.'

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| Cause of Great Depression |
| ***Ben Bernanke acknowledged that the Federal Reserve was responsible for the Great Depression*** |

What was Bernanke talking about? Isn't the job of the Federal Reserve to protect the banking system from collapse? How could he say that the Federal Reserve caused the Great Depression? He did say it, and he was right. What he was really talking about was the money supply, which is controlled by the Federal Reserve. When you study the Great Depression, you realize that it was caused by a major decline in the money supply. By the time the economy reached its low in March of 1933, the money supply had fallen by 33 percent!

Obviously, the Fed understands things today that it didn't understand back then. There wouldn't have been a Great Depression, or at least to the extent that we had it, if they understood that the money supply has an enormous influence over the economy. When the economy was in recession in December of 2007, the Federal Reserve did the opposite of what it did during the Great Depression - it increased the money supply. It's very interesting that the one economist who became an expert in his understanding of the Great Depression happened to be seated in the most powerful financial position exactly when his country needed him the most. His expertise is largely responsible for keeping our economy out of another depression.

But how can pumping money into the economy make it grow faster? In other words, how does the money supply affect real GDP?

The Fed Controls the Fire Beneath the Economy

To answer this question, let's go back to the town of Ceelo, where people all over the town are enjoying their Friday night. Imagine you're on a camping trip in the foothills, which is about an hour away from town - just close enough to drive there fairly quickly and just far enough to feel like the destination is 'out of town' and therefore disconnected from the hustle and bustle and grind of everyday living and the routines of waking up before the roosters even think about crowing.

It's about five o'clock, and the sun will start going down in a few hours. Along with a small group of three friends, you're at a campsite, and earlier that day, everyone agreed by text that it would be a rewarding experience to cook pasta for dinner over the campfire - like they probably did in Florence during the Renaissance, you think to yourself, with a healthy dose of [optimism](http://study.com/academy/lesson/what-is-optimism-definition-lesson-quiz.html) and hopeful expectation of enjoying the company of your friends. As a matter of fact, one of the other campers is Margie, the cake baker.

After spending a few minutes complementing her on the quality of her chocolate cake, you look around the campsite and begin thinking about how to accomplish the task of cooking a pasta dinner. You're so hungry that you're about to faint.

Suppose your group has a large pot for boiling water. There's a river nearby that someone can use to fill up your pot with water. Also, there's a wood-burning fire, boxes of pasta, and finally a large supply of gas (more specifically, lighter fuel) that can be poured onto the fire.

Now suppose Margie looks at you and gives you the choice of performing one of these three tasks. You can be responsible for the supply of water and the pot that goes with it, you can be responsible for the raw materials, in this case, the pasta, or you can be responsible for the fire and the gas that comes with it. You think to yourself, I'm so hungry I'm about to faint. How can I speed up this process?

What's the one role in the cooking process that you want to control in order to have the greatest influence over how fast the pasta gets cooked? If you choose to control the size of the fire and the gas that gets poured onto the fire, you would gain a great deal of control.

The bigger the fire is, the faster the water boils and the more pasta your group can cook. If you want the cooking process to go faster, you can simply pour gas on the fire to light it up quickly. The person who controls the fire supply can choose with one move to dramatically increase the speed of the cooking process.

When you compare the process of getting the economy to grow with cooking pasta, it's easier to understand why the Federal Reserve wants to control the money supply - not because it's filled with people of Italian descent, but because it can quickly light a fire underneath the economy to increase economic output. I bet that's the first time you've ever heard anyone compare the economy to cooking pasta.

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| Increasing Money Supply |
| ***Increasing the money supply is like lighting a fire under the economy to increase economic output*** |

How the Fed Achieves its Objectives

In order to achieve its three objectives of maximum employment, price stability, and moderate interest rates, the Federal Reserve controls the money supply, and the money supply changes the interest rates. Increasing the money supply is like pouring gas on the campfire. Why do they want to control the interest rate? Because it directly influences the demand for money, which affects how the economy grows.

In the town of Ceelo, when the interest rate is 20%, businesses like Margie's Cake Walk, an award-winning cake bakery, have very little incentive to borrow money and invest. The monthly payments on a loan with a 20% interest rate would be too expensive and would eat up all the profit she could generate by expanding her business.

However, when the interest rate is 7%, Margie's monthly payments on a business loan would be much lower and she has an incentive to invest into her business by purchasing new equipment. Suppose Margie buys a new oven to bake more cakes in her business, increasing her productivity and raising her profit potential. Investment like this leads to a higher economic output, as measured by real GDP.

Economists would say it this way: low interest rates create an incentive for businesses to borrow money and invest, while new investment leads to economic growth. When the Federal Reserve takes action to control the money supply and change the interest rate, they are creating the incentive for new investment and economic growth, so they can potentially have an enormous influence over the economy.

The Fed's monetary policy will have the greatest effect on real GDP when interest rates are low and when investment is highly sensitive to interest rates, as in the example we just talked about, when Margie took advantage of a low 7% rate to borrow and invest into her business.

Illustrating Money Supply Changes

Now let's look at how economists illustrate changes in the money supply and changes in the economic output that follow them.

The Fed increases the money supply by buying U.S. government bonds and paying with cash. Economists illustrate this as a rightward shift of the money supply curve, as follows.

When the money supply increases, the money market reaches a new equilibrium at a lower interest rate. On the graph, the money supply shifts to the right from M1 to M2, and the interest rate falls from r1 to r2. This lower interest rate leads to an increase in investment and an increase in real GDP. Economists illustrate this as a rightward shift of aggregate demand. So if you look at the graph, you see that the aggregate demand curve has shifted to the right. Economists illustrate this as a rightward shift of the aggregate demand curve from Y1 to Y2.

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| Money Supply Changes |
| ***When the money supply increases, interest rates fall and investment increases*** |

An increase in the supply of money by the Federal Reserve is referred to as **expansionary monetary policy**.

Let's look at this from the opposite point of view now.

When the Fed decreases the money supply by selling U.S. government bonds, they remove some of the cash that was in the money market. The money market reaches a new equilibrium at a higher interest rate. On the graph, the money supply decreases by shifting leftward from M1 to M2. The interest rate therefore rises from r1 to r2. This higher rate causes a decrease in investment as businesses across the economy stand to make less profit from the projects they want to borrow money to finance. This decrease in investment, in turn, leads to a lower level of real GDP. Economists illustrate this as a leftward shift of aggregate demand - on the graph, AD1 shifts leftward to AD2.

A decrease in the supply of money by the Federal Reserve is referred to as **contractionary monetary policy**.

Lesson Summary

Let's summarize the key points from this lesson. An increase in the money supply leads to a lower interest rate, higher levels of investment, and greater economic output. This is referred to as **expansionary monetary policy**. Monetary policy actions that decrease the money supply is referred to as **contractionary monetary policy**. And finally, the Fed's monetary policy will have the greatest effect on real GDP when interest rates are low and the interest rate has a large effect on investment spending.

Lesson 7 - [**Quantity Theory of Money: Output and Prices**](https://study.com/academy/lesson/quantity-theory-of-money-output-and-prices.html)

This lesson explains the quantity theory of money and how to apply it, including the idea that an increase in the money supply leads to inflation in the long run.

One Man's Economic Decisions

Go with me to the town of Ceelo, where one man's economic decisions are affecting the lives of many others. At the Federal Reserve Bank of Ceelo, Ben the Banker oversees the money supply within this part of the country. Joe the Plumber remodels kitchens and bathrooms for $50 an hour. Margie the Cake-baker offers her legendary chocolate cake for $10 each, both in the bakery as well as in the grocery stores, while Sheila runs a restaurant by the name of The Salad Shaker. Her signature salad entree sells for $15. This week, Ben the Banker has increased the money supply by around 20% by purchasing government bonds in the open market.

Let's take a look at what happens in the lives of these Ceelo professionals both in the short run and the long run. Once Ben increases the supply of money, almost immediately there are more dollars floating around the economy. This means more customers for Joe, Margie, and Sheila.

All three of them are overjoyed with the increase in sales they're observing. Joe is happier because he's getting more phone calls requesting remodeling jobs. To satisfy these new customers, Joe works longer days and even starts working on Saturdays. After a solid week of higher sales volume, Joe realizes he can raise his hourly charge from $50 to $60 without losing any customers. Joe is already thinking about things he'll be able to buy and enjoy for himself, including Margie's cakes and Sheila's salads, which have been recommended time and again by the food critic at the local news service.

All the while that Joe is experiencing an increase in business, Margie and Sheila are going through the same experience. Margie begins working longer hours to keep up with extra demand and realizes that she can raise the price of her chocolate cake from $10 to $12, making her even more profit that she can spend by remodeling her basement with Joe's help. She's also imagining the benefit of going out to eat at Sheila's Salad Shaker with the extra income she's currently earning. Sheila is thrilled to see her salads are flying out of the kitchen as fast as she can create them, and she raises the price of her signature salad from $15 to $18. Throughout the day, she daydreams about cheating on her diet by enjoying Margie's delicious frosting.

Now the plot thickens, and so does the frosting and the salad dressing, for that matter. When Joe shows up to start buying additional cakes at Margie's bakery, he's quite shocked to see that the price of her cakes has risen substantially. Sheila and Margie both find the same thing when they show up to buy the goods and services that they've been wanting recently. Each of them has been tricked into thinking their sales increased and that they're now more wealthy. In reality, economic output rose in the short run (because of Ben's increase in the money supply) but not in the long run. The only thing that happened in the long run is that prices went up, which means that the value of the money has gone down.

Let's take a look at the theory that economists use to describe this scenario as well as the key equation that central banks have used in the process of conducting monetary policy.

**The quantity theory of money** describes the relationship between inflation, the money supply, real output, and prices. It's a theory that explains how much money is needed in order for an economy to function.

The quantity theory of money started in the early 1900s by Irving Fisher. Challenged by Keynesian economists, it was later updated and reinvigorated by the new monetarist school of economics. **Monetarism** is the economic viewpoint that excessive expansion of the money supply leads to inflation and that economic output will grow steadily as long as the money supply grows steadily as well.

Economist Milton Friedman was a monetarist and was quoted as saying 'Inflation is always and everywhere a monetary phenomenon.' Although Milton opposed the existence of the Federal Reserve, he did believe that, in order to avoid inflation, the best way for the central bank to reach its goals is by keeping the growth rate of the money supply at a certain predetermined rate, a process that is known as targeting the money supply. While the central bank doesn't follow this wholeheartedly today, many economists accept the wisdom in this theory. At the heart of the theory is the equation of exchange.

The Equation of Exchange

**The equation of exchange** shows the relationship between the money supply, velocity, the price level and economic output. Here's the equation:

*MV* = *PY*

where *M* = the money supply, *V* = the velocity of money, *P* = the price level, and *Y* = real GDP. Another way to think about the equation is to say that *M* x *V* = nominal GDP, because nominal GDP is simply real GDP times the price level. This means that the money supply times the velocity of that money is equal to the price level times real GDP. At the center of this equation is the velocity of money.

The Velocity of Money

I'm sure you've had times when you received cash from a bank or a retail store that seemed brand-new - it was so untouched and crisp that the bills actually stuck together. Why does currency start out brand-new in circulation like that and then get worn out and replaced with new currency within a short amount of time? Because the same $20 bill will be used in transactions to buy and sell goods many, many times throughout the course of a single year.

**The velocity of money** is how many times single unit of currency gets turned over within the economy during the year. It measures how fast money changes hands. Now that you're familiar with the components of the equation of exchange, you can use it, along with the variables you do know, to solve for the one that you don't know.

Solving for Velocity

As with any equation, if I know three out of four things and only one unknown, I can solve for the one missing item. If you know any three of these four variables - the money supply, velocity of money, the price level, or nominal GDP - then you can solve the equation and find the missing piece.

To keep things easy, let's just say that in Ceelo, the price level (*P*) is 1, while the real GDP (*Y*) is $200, and suppose that the money supply (*M*) is $100. What we want to know is - what is the velocity of this $100 supply of money?

Plugging in these numbers to the formula gives us:

$100 x *V* = 1 x $200

When we solve for *V*, we get:

$100 x 2 = 1 x $200

That means that the velocity of money is 2. The average dollar bill in circulation is getting spent 2 times during the year; money is turning over at a rate of 2 times per year. If Joe spends $20 at Margie's bakery, then Margie goes to eat salad at Sheila's restaurant with the same $20, this would be an example of a velocity of 2.

Of course, this makes sense logically - in order for a $100 money supply to create $200 worth of transactions, the same money in circulation had to be used twice.

Solving for the Price Level

Now suppose that instead of the 20% increase that we saw in the opening story, the central bank doubles the money supply from $100 to $200, while real GDP and the velocity of money stay the same. What we're looking for now is what happens to the price level.

Here's what the updated formula looks like:

$100 x 2 = *P* x $200

Solving for *P* gives us a price level of 2 instead of 1. That means that when the central bank increased the money supply by 100%, the price level also increased by 100%.

What would we expect to see in Ceelo? We'd expect to see Joe the Plumber double his consulting fee from $50 to $100, while Margie's cake would sell for $20 instead of $10, and Sheila's salad would go for $30 instead of $15. When one person can raise their prices while everyone else's prices stay the same, then they're, of course, immensely happy. On the other hand, when everyone raises their prices, people are at first immensely happy, but once they figure out that they've been tricked, they're quite sad.

Important Conclusions

Let's talk about some important conclusions. In the opening story of the lesson, when the central bank increased the money supply by 20%, at first Joe, Margie, and Sheila experienced more economic output. However, in the long run, each of them discovered that prices in the economy had all increased by 20%. The quantity theory of money explains that the money supply of a nation has a direct proportional relationship with the price level. Here's the important conclusion we can draw: other things remaining the same, if the quantity of money is doubled, prices will double also.

Lesson Summary

All right, it's time to review. **The quantity theory of money** describes the relationship between inflation, the money supply, real output, and prices. It's a theory that explains how much money is needed in order for the economy to function.

**The equation of exchange** shows the relationship between the money supply, the velocity of money, the price level, and economic output. Here's the equation of exchange: *MV* = *PY*, where *M* = the money supply, *V* = the velocity of money, *P* = the price level, and *Y* = real GDP.

At the center of the equation of exchange is the velocity of money. **The velocity of money** is how many times a single unit of currency gets turned over within the economy during the year. It measures how fast money changes hands. When you know three of the four variables in the equation of exchange, you can always solve to find the value of the variable that you don't know.

**Monetarism** is the economic viewpoint that excessive expansion of the money supply leads to inflation and that economic output will grow steadily as long as the money supply grows steadily. The quantity theory of money explains that the money supply of a nation has a direct proportional relationship with the price level. The important conclusion we can draw from this is: other things remaining the same, if the quantity of money is doubled, prices will double also.

Lesson 8 - [**The Velocity of Money: Definition and Circulation Speed**](https://study.com/academy/lesson/the-velocity-of-money-definition-and-circulation-speed.html)

Learn about the method economists use to measure how fast money changes hands throughout the economy, referred to as the velocity of money. With the help of an imaginative story, this lesson defines the concept of velocity as well as what determines it.

The Velocity of Money

Imagine an economy of exactly ten gnomes who all go by the name Namji. Each of them are completely identical in every way, and each of them is holding a giant red and yellow lollypop. The lollypops are for sale for the incredible low price of exactly $1. In addition to a lollypop, one of the ten gnomes is holding a dollar bill. This one dollar bill is the only money in the economy, so we can refer to it as 'the money supply.' This gnome, acting out of a genuine zest for life and an unwavering zeal to improve his standard of living, approaches a colleague asking to buy his lollypop. After exchanging the dollar for the lollypop, the first gnome has two lollypops. The second gnome smiles because he now has a dollar.

However, within a few seconds, he realizes that he is without a lollypop, and so he approaches another gnome asking to purchase one with his newly-acquired currency. Again, the dollar changes hands and settles in the hands of another gnome, who is temporarily happy until he realizes that he greatly desires a giant red and yellow lollypop. This scenario plays out again and again until every gnome has spent a dollar buying a lollypop, and the dollar ends up back in the hands of the original gnome. Everyone has a lollypop, and there is still only one dollar bill in this economy.

Let's take a look at how economists describe this scenario:

The **velocity of money** is how fast money changes hands in the economy during the year. It's defined as nominal GDP divided by the money supply. It can be thought of as the rate of turnover in the money supply: that is, the number of times that one dollar is used to purchase final goods and services included in the GDP.

In our economy, the Federal Reserve is in charge of managing the money supply, which they call **monetary policy**. They use monetary policy in an effort to encourage steady economic growth, stable prices and low unemployment. Estimating the velocity of money is an important part of this process and guides them in their policy decisions.

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| Velocity of Money Graph |
| ***Graph showing the velocity of money from 1971 to 2011*** |

So as you can see here, in 2012, the velocity of money was approximately 7 and had fallen from a high of more than 10 just a few years earlier. In the scenario I shared with you earlier, one dollar changed hands (or in this case, gnomes), ten times, so the velocity of money was 10.

The question I want to answer in the remainder of this lesson is, 'What determines velocity?' To help us find the answer, I want you to go with me as we briefly visit two towns - the town of Ceelo and the town of Keelover.

In the town of Ceelo, a lot of people live in a small area, which means that it's densely populated. As a result, banking is easy, and business is pretty smooth. There's a bank located at nearly every corner. When you're driving about town, you'll never have to worry about getting a check cashed or withdrawing money from an ATM machine. Most banks in Ceelo have them.

Speaking of driving, the average speed limit in Ceelo is 50 miles per hour, and traffic lights are only two minutes long, so traffic keeps moving. There's a saying you can hear them use quite frequently - 'Don't let money burn a hole in your pocket!' You have plenty of opportunities to spend your money quickly because the stores in Ceelo are filled with dozens of checkout lanes, and the lines move quickly. They even have self-checkout lanes where you can check yourself out. Many residents have stopped using checks and now use debit cards instead, and that speeds up transactions even more.

Since things are so smooth, most citizens you run into are peaceful and joyful, and the economy is usually growing nicely. Interest rates are moderately high in Ceelo. Because transactions are so easy in this town, money changes hands frequently. The faster that money changes hands in an economy, the greater the economic output is.

Economists would say it this way: When the velocity of money is high, money changes hands quickly, and therefore, changes in the money supply will have a greater effect on nominal GDP.

On the other hand, in the town of Keelover, the residents are spread out over a large area. Banking is difficult, and business is slow. Banking is difficult because there are very few banks anywhere around. Whenever you would expect to pass one on the road, you end up having to drive many miles away to find one. At these banks, very few of them have ATM machines, so it's very inconvenient.

The average speed limit in Keelover is 25 miles per hour (yikes!), and traffic lights are five minutes long. In this town, there's a saying you can hear them use quite frequently - they say, 'Quality is the least of our problems.' This is very apparent when you visit the local stores because they hardly have any checkout lanes, and it takes forever to pay for your stuff. Most people whip out their checkbooks to pay for stuff at the store, which slows things down even more.

As a result of all these negatives, the general mood is fearful and anxious, and the economy here is usually in recession. Most people keep money under their mattress. When you visit this place, you literally feel like you're going to 'keel over'. Needless to say, money changes hands very slowly. The slower that money changes hands in an economy, the lower the economic output is.

Economists would say it this way: When the velocity of money is low, money changes hands slowly, and therefore, changes in the money supply will have a smaller effect on nominal GDP.

Here are some of the things that determine velocity:

* The number of financial institutions in an area
* The population density of an area
* The speed of transportation

The Equation of Exchange

Now that we've talked about what velocity is and what determines it, let's talk about how to use it.

The velocity of money is part of what economists call the **equation of exchange**: *MV* = *PY*

In English, this means that the money supply (*M*) times the velocity of money (*V*) equals the price level (*P*) times real GDP (*Y*).

It means that there's a direct proportional relationship between the supply of money, how fast it changes hands, the price level in the economy and the economic output. If you know three variables in an equation, you can always solve to find the missing variable that you don't know. Here's an example.

Assuming that the price level remains constant, if real GDP is $6 trillion and the money supply is $2 trillion, the velocity of money would be what?

Using the equation of exchange, we get:

$2 trillion x *V* = 1 x $6 trillion

And when we solve the equation, we find that the velocity *V* = 3.

A velocity of 3 means that each dollar in circulation changes hands three times during the year. Another way to read the equation is to say, '$2 trillion of money changed hands three times during the year, producing $6 trillion of economic output.'

Remember the illustration I started with where the ten gnomes took one dollar and completed ten transactions with the same dollar? Assuming the price level is 1, here's what the equation of exchange looks like for the scenario that we talked about:

*MV* = *PY*

Plugging in the numbers, that looks like:

$1 x 10 = 1 x $10

Based on the way things played out, the money supply in this economy was only one dollar. The economy produced ten dollars in total because the velocity of money was 10. The same one dollar bill changed hands again and again, which enabled the total spending to be greater than the amount of money in circulation.

Lesson Summary

All right, it's time to review. According to the Federal Reserve, the **velocity of money** is a ratio of nominal GDP to a measure of the money supply. It can be thought of as the rate of turnover in the money supply: that is, the number of times that one dollar is used to purchase final goods and services included in the GDP.

Velocity is a key element of the **equation of exchange**, a formula that the central bank uses when considering monetary policy. When the velocity of money is high, money changes hands quickly, and therefore, changes in the money supply will have a greater effect on real GDP. When the velocity of money is low, money changes hands slowly, and therefore, changes in the money supply will have a smaller effect on real GDP.

The [determinants](http://study.com/academy/lesson/determinant-definition-meaning-quiz.html) of velocity include:

* Financial institutions
* [Population density](http://study.com/academy/lesson/what-is-population-density-definition-lesson-quiz.html)
* Speed of transportation

Lesson 9 - [**Real vs. Nominal Interest Rates and Changes in Prices**](https://study.com/academy/lesson/real-vs-nominal-interest-rates-and-changes-in-prices.html)

This lesson explains the important difference between nominal and real interest rates and provides examples of how to use the Fisher equation to adjust nominal rates for inflation.

Evaluating Interest Rates

Please join me at The First National Bank of Ceelo, where Margie the Cake Baker already has a simple checking account that pays her basically no interest and wants to earn a higher rate. Why? Because she really wants to enlarge her kitchen, so she can have dessert parties and advertise her incredible cakes.

As you'll see, Dave the branch manager is going to offer her three different types of accounts: a money market account, a bond, and also a consumer loan. In this lesson, we're going to learn about the difference between nominal and real interest rates. We're also going to see how Margie can use a simple equation called the Fisher equation, using a few practice problems, to convert a nominal interest rate into a real interest rate, which is what she really needs to know to make a wise decision.

Dave offers her three options: a money market account that's paying 4% interest, a bond that's paying 5% interest, and a consumer loan that's charging her 8%. What Margie wants to do is adjust these rates by inflation so she can decide if they are a good deal. Let's begin by exploring two ways that economists look at interest rates.

Real vs. Nominal Interest Rates

When the bank publishes the interest rate for the money market account, they use the nominal rate. The**nominal interest rate** is the interest rate in terms of dollars, so it's not adjusted for inflation. Nominal simply means it has not been adjusted in any way - when you hear the word 'nominal,' just think nothing's been done to it - it's nominal. However, the rate that Margie really cares about is the real interest rate. The **real interest rate** is the rate of interest after adjusting for inflation. This year, Margie expects inflation to be 2%, let's say. This is what economists call expected inflation.

Why is the real interest rate the more important one? Because inflation reduces the purchasing power of money. When prices rise by, say, 2% this year, a bank account that pays 2% interest on one of their accounts is essentially paying nothing after accounting for the rise in prices in goods and services in the economy. Accounting for inflation tells you what you're really getting. This is sometimes called inflation-adjusted. The real interest rate is the 'what you see is what you get' version.

Economists have a simple equation, of course, to help us find the real interest rate, and it's called the Fisher equation.

The Fisher Equation

The Fisher equation is simply:

*r* = *n* - *i*

where *r* = the real interest rate, *n* = the nominal interest rate, and *i* = the expected rate of inflation.

So, we can say it this way: real interest rate = nominal interest rate - expected inflation.

Now Margie can evaluate the money market account and the other options that she's going to get from Dave the branch manager. So let's try a few problems and help her find the real interest rate using the Fisher equation.

Let's start with the money market account:

Since she expects inflation to be 2%, we can use the Fisher equation like this:

*r* = 4% - 2%, which equals 2%. This means that the money market she's been offered has a real interest rate of 2%.

Margie can use the Fisher equation on the bond as well. Using the Fisher equation, she calculates the real interest rate, as follows:

Remember, the nominal rate on the bond was 5%, so when we plug it into the Fisher equation, it looks like this:

*r* = 5% - 2% = 3%, so 3% is the real interest rate on this bond.

So far, the bank manager has talked to Margie about a money market account and a bond. Now suppose he offers her a third product, which is a consumer loan.

This time, let's just change it up a little bit. Let's suppose the manager has done the calculation already for her and gives Margie the real interest rate instead of the nominal rate. The real interest rate on this consumer loan is going to be 6%. Margie still expects the [inflation rate](http://study.com/academy/lesson/what-is-inflation-rate-definition-formula-quiz.html) to be 2%, so that hasn't changed. Although she's going to make her decision based on the real interest rate of 6%, Margie's curious to find out what the nominal interest rate on this loan is. Of course, she can do this by using the Fisher equation.

So let's try one last problem. Remember that *r* = *n* - *i*.

Plugging in 6% for *r* and 2% for *i* gives us:

6% = *n* - 2%

When we add 2% to both sides of this equation, that gives us:

*n* = 6% + 2% = 8%

That means that this consumer loan has an 8% nominal interest rate. Since this is the nominal rate, this is what would be published on the bank's sign or perhaps in a brochure or rate sheet, just like the nominal rate of the money market account or the bond.

Keep in mind that the expected real interest rate can vary considerably from year to year because expectations for inflation change. That's why the Fisher equation is so valuable. So now you know the difference between real and nominal interest rates and how to calculate the real interest rate.

Lesson Summary

Okay, let's summarize what we've talked about. The **nominal interest rate** has not been adjusted in any way. The rate that Margie really cares about when she's evaluating investment options, like the money market account or the bond or the consumer loan, is the real interest rate. The **real interest rate** is the rate of interest after adjusting for inflation - it's inflation adjusted.

In order to find the real interest rate, we can use what economists call the **Fisher equation**, which is simply ***r* =*n* - *i***, or another way to say it: the real interest rate is equal to the nominal interest rate minus expected inflation.

Lesson 10 - [**Private Investment and Real Interest Rates**](https://study.com/academy/lesson/private-investment-and-real-interest-rates.html)

When you borrow money, where does that money come from and why is it available? In this lesson, you'll learn about the market for loanable funds, where savers deposit money and entrepreneurs borrow money to finance private investment.

The Need for Expansion

When Bob the business owner signs up new customers for his weekly lawn service, he needs to borrow money to invest in a new mower. I'm not talking about a tiny little household lawn mower. I'm talking about a large, ginormous commercial mower with heated seats, gold plating and anti-lock brakes. When Bob needs a new mower, he goes to the **market for loanable funds** to accomplish this. From Bob's perspective, he just gets onto his Harley and drives to the bank to sit down with a loan officer. We'll call him Sam, but his name has been changed to protect the innocent. Although Bob may not think about it when he's filling out the paperwork for a loan, he's participating in the market for loanable funds.

The Market for Loanable Funds

In the market for loanable funds, banks facilitate the connection between saving and investing. In this market, the [demanders](http://study.com/academy/lesson/demand-in-economics-definition-lesson-quiz.html) are the entrepreneurs who borrow money to invest into physical capital, such as machinery and equipment, so they can produce products and services. The suppliers are the savers who deposit money into savings accounts at banks like the one Bob is talking to in order to finance a new mower for his business.

While Bob's in the office with the loan officer, he happens to see Margie the cake baker come into the lobby of the bank to deposit a check into her savings account. The bank serves an important purpose by connecting savers like Margie, who want to earn a return on their money, with borrowers like Bob, who are willing to pay a price for the use of that money in their businesses. Bob doesn't even realize it at the time, but when his loan for a new mower is approved, some of the money comes from Margie's savings account. In essence, Margie's savings is helping to fund Bob's business. If he knew this, he'd probably send her some flowers or pass out refrigerator magnets to his customers to advertise Margie's cake bakery.

Private Investment

Whenever a person or business spends money on capital equipment, buildings or machinery for use in producing products or performing services, economists call it **gross private domestic investment**. It's also referred to as **private investment** for short.

Private investment is an important part of the economy, and has a major impact on the employment situation, because businesses that expand usually need more workers. When private investment goes way down, unemployment tends to go up. For example, in 2006, gross private domestic investment represented 17.3% of the economic output of the United States. By 2009, it had dropped to only 11.2%. At the same time, unemployment went from 4.4% in December of 2006 all the way up to 10% during 2009. As you can see, private investment went way down, while unemployment went way up.

So how does this market work? Let's begin with the demand side of the market.

The Demand for Loanable Funds

The demand for loanable funds depends on two things: the interest rate that entrepreneurs will pay to borrow money and the amount of profit they expect to make from investing.

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| Downward Sloping Demand Curve |
| ***The downward-sloping demand curve depicts lower demand for loanable funds*** |

Businesses like Bob's compare the real interest rate they must pay to the bank with the rate of profit that they expect to earn on the money they borrow. For example, let's say that Bob can borrow $10,000 to buy a high-end, jet-powered, disco-inspired commercial mower and some matching shades, all at a real interest rate of 8%. Since it's a loan, that means he'll make monthly payments to the bank for a certain number of years. With the size of these payments, suppose that Bob can afford to invest into one mower, which will empower one of his workers to mow more lawns. As long as Bob can use this new mower to earn more than his monthly payment, he'll make a profit by borrowing money for his business.

Now let's say that the real interest rate was 5% instead of 8%. When Bob goes to the loan officer at his bank to discuss expansion, he finds that he can invest into two mowers instead of one, because the payments would be lower at an interest rate of 5%. As you can see, Bob's investment into his business depends on what real interest rates are and also how much profit he can generate. The lower the real interest rate, the more profit he can generate, and the more his investment can be. This dynamic plays out across the whole economy. The lower the real interest rate is, the higher the quantity demanded of loanable funds.

Expectations also play an important role in this market. What do I mean by that? If investors feel that business conditions will deteriorate in the future, then the demand for loanable funds and the real interest rate will go down. Economists illustrate demand in this market using a downward-sloping demand curve.

The Supply of Loanable Funds

Now let's talk a little more about the supply side of the market for loanable funds. The supply of loanable funds in the economy is affected by the real interest rate, by [disposable income](http://study.com/academy/lesson/what-is-disposable-income-definition-lesson-quiz.html) and by the wealth level. So let's talk about what those three things mean.

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| Upward Sloping Supply Curve |
| ***The supply of loanable funds available is shown with an upward-sloping supply curve*** |

For example, if Margie earns $70,000 per year in her cake business, and she spends $65,000 per year, that means she has $5,000 left over. Margie deposits this extra amount into a savings account at her bank, which then gets loaned out to borrowers. Although Margie may only earn an interest rate of, say, 2% to 5%, the bank will loan out most of her money at a higher interest rate, like 8% or 10%, for example. The money Margie deposits into her private savings account increases the supply of loanable funds.

So the most important determinant of saving is the real interest rate. The higher the real interest rate, the more people like Margie want to save, and the greater the quantity supplied of loanable funds.

But other things affect the supply of loanable funds as well. The higher that disposable income is in the economy, the more loanable funds will be supplied. For example, if Margie earned $100,000 per year instead of $75,000 per year, she could save even more in her savings account, and that means more funds can be loaned out at the bank.

Finally, the more wealth people have, the more that they will save some of their wealth in savings accounts. Let's say that in addition to saving out of her income, Margie has $200,000 of wealth. She has decided to keep some of that wealth in savings accounts in the bank.

All three of these things, the real interest rate, the level of disposable income and the amount of wealth determine how much supply is in the market for loanable funds. Economists illustrate this supply with an upward-sloping supply curve.

This market works according to the laws of supply and demand. That means that at the intersection of the supply and demand, there is an equilibrium interest rate and equilibrium quantity.

Government Policies

Government policies can strongly influence the market for loanable funds. Let's look at a few real-world examples, beginning with the supply side of the market.

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| Supply Demand Intersection Graph |
| ***The intersection point shows there is equilibrium in quantity and interest rates*** |

Suppose the government provides a tax incentive for people to save more. Specifically, they lower the taxes that people pay on savings accounts. What would this do to the supply for loanable funds?

If people have an added incentive to save, then they would save more money. For example, instead of saving $5,000 of her income, suppose that Margie decides to save $10,000 instead. Economists would say it this way: the quantity supplied of loanable funds would go up. With a larger supply and the same demand, this would lead to a lower interest rate.

Now let's look at two examples from the opposite part of the market - from the demand side.

Suppose the government provides a tax incentive for businesses to invest. When this happens, more businesses spend money on capital equipment, or other things that help them produce the products they sell. Economists would say it this way: increased investment leads to a greater demand for loanable funds, shifting the demand curve to the right. This leads to a higher real interest rate.

Finally, suppose the government spends more and borrows more. Economists would describe the consequences this way: greater government borrowing leads to a greater demand for loanable funds. This causes the demand curve to shift to the right, resulting in a higher real interest rate. Economists call this**crowding out** because the higher interest rates caused by government borrowing crowds out individuals and businesses who can't afford to invest at the higher rates.

Lesson Summary

Here are the key points that we talked about in this lesson. In the **market for loanable funds**, banks facilitate the connection between saving and investing. In this market, the demanders are the entrepreneurs who borrow money to invest into physical capital like machinery and equipment, what economists call **private investment**. The suppliers are the savers who deposit money into savings accounts at the banks, hoping to earn interest.

The demand for loanable funds depends on two things: the real interest rate that entrepreneurs will pay to borrow money and the amount of profit they expect to make from investing.

Expectations also play an important role in this market. If investors feel that business conditions will deteriorate in the future, the demand for loanable funds and the real interest rate will go down. Economists illustrate demand in this market using a downward-sloping demand curve.

The supply of loanable funds is how much people are saving in the economy. The most important determinant of saving is the real interest rate. However, other things affect it, including the level of disposable income and the amount of wealth. These determine how much supply is in the market for loanable funds. Economists illustrate supply with an upward-sloping supply curve.

Government policies that influence the supply of loanable funds include fiscal policies such as lower taxes on savings. Government policies that influence the demand for loanable funds include investment tax credits and government [budget deficits](http://study.com/academy/lesson/what-is-a-budget-deficit-definition-causes-history.html) financed with borrowed money.

Lesson Objectives

Once you finish this lesson you'll be able to:

* Explain the market for loanable funds
* Define private investment
* Determine what factors influences the demand for loanable funds
* Understand how the supply of loanable funds fluccuates
* Explain how government policies can influence the supply of loanable funds

Lesson 11 - [**Hyperinflation, Money Supply and the Consumer Price Index**](https://study.com/academy/lesson/hyperinflation-money-supply-and-the-consumer-price-index.html)

Is there such a thing as too much money? Maybe. What happens when inflation is excessive? This lesson explores what hyperinflation is and how it is connected with the money supply.

What Hyperinflation Looks Like

Can I introduce you to somebody? I want to introduce you to Otto, not auto like the car; his name is Otto. Today, Otto is sitting next to a wood-burning stove getting warm. It's a cold fall morning shortly after breakfast, and Otto is warming up the house. Otto is doing something unusual, however. He's sitting next to a large, wooden box, and the front of the stove is open, so you can see the fire inside of it with a flame going. Today, instead of placing wood in the fire, Otto is shoving large piles of cash into the stove and using it as firewood!

Outside the house, his young daughter, Frieda, is using bundles of cash as toys, stacking dozens of them into a large tower that's now almost as tall as she is. What in the world is going on? Are these people related to the Rockefellers? Did they win the lottery?

No, they aren't as rich as Rockefeller, and they didn't just win the lotto. Prices are going up and fast. At the dollar store, everything is now much more than a dollar. Who can afford gas anymore? It's skyrocketing, and so is the price of groceries!

Hyperinflation Throughout History

We're talking about hyperinflation. During the 1970s, great concern arose in the United States about inflation, which surpassed 10% per year. At that time, President Gerald Ford referred to the inflation threat as 'public enemy number one.' A 10% [inflation rate](http://study.com/academy/lesson/what-is-inflation-rate-definition-formula-quiz.html) sounds pretty bad. However, compared to other time periods and what's happened in other countries, this level of inflation is not extreme. To show you why, let's look at some examples from history where inflation was extremely high, find out how economists describe this situation and then learn how it affects the economy.

After the First World War, Germany experienced a rapid rise in prices at a rate exceeding - listen to this - 855 million percent per year! Even as recently as 2008, Zimbabwe experienced an inflation rate of 231 million percent that year! Wow.

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| German Hyperinflation |
| ***After the First World War, prices in Germany rose at a rate of 855 million percent per year.*** |

I'm sure the first thing that came to mind when you read the word 'hyperinflation' was a giant balloon shaped like a lawn gnome being overinflated, then suddenly bursting. I thought of this myself. That's not what hyperinflation means, although it might be cool to watch.

Hyperinflation and Its Effects

**Hyperinflation** is a rise in prices exceeding 50% per month. Just think about that for a second. At this rate, if you bought a candy bar that cost you $1 at the beginning of the year, guess what? That same candy bar would cost you $130 by the end of the year! How would that make you feel, and what kinds of things would happen if prices were going up that fast in your country?

The effect of hyperinflation is that a country's currency can quickly lose most of its value until it becomes nearly worthless. During a hyperinflation, strange things can happen. For example, in Germany, people routinely used cash as firewood and as toys for the kids, while (believe it or not) in Zimbabwe, they used it as toilet paper.

Hyperinflation is a cycle that feeds on itself. Once it starts, it's very difficult to stop, and prices tend to double very quickly. In some countries, during hyperinflation, when people went out to eat at a restaurant, the price of their meal doubled even before they finished eating. I guess it's better to read the menu while you're standing outside and pay the bill as soon as you sit down.

Causes of Inflation

In the long run, inflation is determined by the growth rate of the money supply. This cycle tends to happen when citizens lose all faith in the government or as a result of extremely high government overspending during a war. When a government overspends, it must borrow from a central bank to make up the difference, leading to a rapid rise in the money supply. This causes a shortage of products and services and erodes the value of the money, which drives prices up dramatically; not by the amount that most of us are used to when gas prices go up or when food prices go up but an extremely fast rise in the prices of everyday necessities.

The great economist Milton Friedman said that 'inflation is always and everywhere a monetary phenomenon.' In order to explain the link between inflation and the money supply, economists use what's called the quantity theory of money. It centers around the quantity equation.

Quantity Equation Formulas

In its simplest form, it says this:

**Real GDP = *M* \* *V***

In English, this means that economic output (which is Gross Domestic Product) is equal to how big the money supply is - that's the *M* - multiplied by the velocity of money, which is how many times the same dollar gets spent throughout the year, and that's the *V*.

Macroeconomics also splits up the GDP in this formula and turns it into a second formula, as follows:

***M* \* *V* = *P* \* *Y***

Again, in English, this means that the money supply times the velocity of money is equal to the price level times nominal GDP.

For example, suppose the price level (*P*) is 1, while nominal output (*Y*) is $200. And the money supply (*M*), in this case, is $100. Plugging these numbers into the formula gives us: $100 \* *V* = 1 \* $200. When we solve for *V*, we get: $100 \* 2 = 1 \* $200; *V* = 2. That means the velocity of money is 2. The average dollar bill in circulation is getting spent two times during the year. Another way of saying it is the money is turning over at a rate of two times per year. That's the velocity of money.

Now suppose that the central bank doubles the money supply from $100 to $200, while nominal GDP and the velocity of money stay the same. What we are looking for now is what happens to the price level. The updated formula would look like this: $100 \* 2 = *P* \* $200. Solving for *P* gives us a price level of 2 instead of 1. What kind of conclusions can we draw from this? That means the price level just doubled because it went from 1 to 2. When the central bank increased the money supply by 100%, the price level also increased by 100%. As you can see here, the money supply is directly connected to the price level. This explains what's going on with hyperinflation.

Lesson Summary

All right, let's review. **Hyperinflation** is a rise in prices exceeding 50% per month. At this rate, an item purchased for $1 would cost $130 exactly one year later.

Hyperinflation tends to happen when citizens lose all faith in the government or as a result of extremely high government overspending during a war. When a government overspends, it must borrow from a central bank to make up the difference, leading to a rapid rise in the money supply. This causes a shortage of products and services and erodes the value of the money, which drives prices up dramatically. The effect of a hyperinflation is that a country's currency can quickly lose most of its value until it becomes nearly worthless.

The great economist Milton Friedman said that 'inflation is always and everywhere a monetary phenomenon.' In order to explain the link between inflation and the money supply, economists use the quantity theory of money, which centers around the quantity equation, as follows: GDP = *M* \* *V*, where *M* is the money supply and*V* is the velocity of money. A second equation is also used that expands on the first one. This equation is: *M* \* *V*= *P* \* *Y*, which means the money supply times the velocity of money is equal to the price level times nominal GDP. What this equation tells us is that if the money supply were to double, the price level would also double. Changes in the money supply lead to changes in the price level. Hyperinflations are caused by rapid increases in the money supply.

Lesson Objectives

After watching this lesson, you should be able to:

* Define hyperinflation and explain what causes it
* Describe the effects of hyperinflation
* Recall and apply the quantity equation