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Macroeconomics

Money

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The Money Supply: Questions and Answers

What is money?

Money is anything that is generally accepted as payment (for products, resources, and settling debt).

What are examples of things that are considered money in the U.S.?

Currency (cash and coin)

Checkable deposits (the aggregate value of checking account balances)

Travelers' Checks

Are ATM cards and Debit Cards Money?

Yes. They draw on checkable deposits, so they are part of that category.

Are Credit Cards Money?

No. One doesn't really pay for an item when one presents a credit card. One takes out a loan, and the credit card issuer pays for the item with money loaned to one.

What are near monies?

Near monies are things that can easily be converted into money, such as savings account deposits, money market mutual funds, and CDs.

Why does money have value?

Modern money has value because one can use it to buy stuff from virtually anyone in the economy. Contrary to popular belief, there is no gold or other precious metal backing up money, in Fort Knox or anywhere else. (Earlier in U.S. history, money was backed by gold; the government held a certain amount of gold in bank vaults for every dollar that it issued. This was known as a *gold standard*. Today, this isn't true; though the government still has some gold reserves, the gold does not back up money.)

Why is it a good thing that money exists?

It is much easier to buy and sell things in an economy where there's money than in one where there's no money. Think about a world with no money; if you wanted to buy something, you would have to *barter*—to find someone with something that you want, who is willing to take something from you that has value to her. This is known as a *coincidence of wants*. In contrast, trade is easy in a world with money, since you do not need a coincidence of wants; everyone finds money valuable, so you can trade it for anything that you want from anyone, and you will accept money for anything that you sell.

What is the money supply?

The *money supply* is the amount of money—currency, checkable deposits, and travelers' checks—held by the public, not sitting on reserve in some bank vault. The most popular definition of the money supply is known as M1:

$$M1 = \text{currency in circulation} + \text{checkable deposits} + \text{travelers' checks}$$

Currency in circulation is all currency that is not sitting in a bank vault somewhere.

Are there any other definitions of the money supply?

Yes. M2, for example:

$$M2 = M1 + \text{some near monies}$$

Why should I care about the size of the money supply?

Because I say so. Nah nah nuh nah nah.

Err...actually, the size of the money supply helps determine the level of economic activity in the short run. Consider the extreme of an economy with a zero money supply. All trade would have to be by barter, so there'd be little trade, little economic activity, and a small economy—a small GDP. But if you add money to the economy, people can trade without bartering, and there'd be more economic activity and a larger economy—a larger GDP.

A larger money supply → a larger economy in the short run

A smaller money supply → a smaller economy in the short run

In addition, more money leads to more inflation. Imagine, for example, if money started falling from the sky, so that our nation's money supply skyrocketed. Well, people would grab the money and start going out and trying to buy more stuff. Sellers, seeing all of this new activity, would take advantage of it by raising prices. Higher prices are inflation.

A larger money supply → higher inflation

A smaller money supply → lower inflation

How is the size of the money supply determined?

Well, this is determined in part by the actions of banks and other institutions that accept deposits and make loans, and in part by the actions of the government's Central Bank.

I want to hear more about this process, but first, tell me more about the Central Bank

Every economy has a Central Bank, controlled by government, which does the following things:

--regulates banks and other financial institutions

--lends banks money for short periods of time for various reasons

--conducts **monetary policy**: it attempts to change the size of the money supply to try to affect the economy

The name of the U.S. Central Bank is the *Federal Reserve System*, nicknamed The Fed. It is actually a system of banks located throughout the U.S. with a Board of Governors. The Board of Governors has a Chairperson, who wields much power. Alan Greenspan is the current Chairman. The Chairman is appointed by the President of the U.S. and confirmed by the Senate.

Okay. Now tell me how banks and the Central Bank affects the size of the money supply

First, here's a very brief, intuitive explanation

Brief explanation: The Central Bank prints currency and releases it to the public by trading it for other assets. This currency makes its way into and out of banks, as people deposit it and write checks and as banks make loans. The loan-making process expands the money supply above its initial level.

That's a pretty vague explanation. You suck as a teacher.

Be nice, or I will give you an F.

I mean, tell me more about how private banks affect the money supply.

Sorry—you'll have to wait until a later set of notes to get the details. For now, let's just assume that the Central Bank conducts **open market operations**

What Are Open Market Operations?

Open market operations involve buying and/or selling of (used) government securities by the Central Bank in the secondary government securities market.

Say What? What's a government security, and what do you mean by "secondary?"

This requires a somewhat involved explanation. Ready?

When the U.S. government borrows money, it issues *brand new* government securities to the people and businesses that lend the government money. Think of these securities as I.O.U.s. The government promises to pay the lenders interest for the term of the loan, then at the end of the loan to pay the whole amount of the loan back.

The Treasury department—NOT THE CENTRAL BANK--issues the brand new securities, since it is the branch of government that borrows money. Hence these securities are usually known as Treasury notes, Treasury bills, or Treasury bonds. The term of the loan can range from 30 days to 30 years.

Now, suppose that in October 2000 you agree to lend the Treasury department \$10,000 for 30 years. The Treasury department issues you a brand new--a "primary" government security, agreeing to pay the bearer (you) interest for 30 years, then at the end of 30 years to pay your \$10,000 back.

One year passes. It is October 2001. (You still have your government security, but now it is 1 year old; it is "secondary.") But now you decide that you don't want to wait another 29 years to get your \$10,000 back; you want some cash now to go to Vegas. What can you do?

You can sell your secondary government security to someone else. Plenty of people will be willing to buy it, since when you give the government security to them they will receive interest for 29 years, and they will get the \$10,000 at the end of 29 years.

In the real world, billions of dollars worth of used government securities are bought and sold each day on in secondary securities markets. These securities are bought and sold by people,

by businesses, and *by the Federal Reserve System—the Central Bank*. When the Central Bank buys or sells a used government security, it is known as an *open market operation*.

Big Deal. Why Should I Care If the Central Bank Engages in Open Market Operations?

Because they affect the money supply. Observe:

Central Bank buys a government security → the Central Bank prints currency to pay for the security → the money supply rises

Central bank sells a government security to a member of the public → the member of the public pays with a check → the Central Bank takes cash from the bank that issues the check; then the Central Bank destroys the cash → the money supply falls.

What is this thing called the *real money supply*?

Well, recall that in macroeconomics one can convert almost any nominal variable into a real variable by dividing the nominal variable by the average price level, P . This is true for the money supply, too. Let's use "M" to abbreviate the money supply. In this case, the real money supply is:

$$\text{real money supply} = M/P$$

Wow. This has been a fascinating look at the supply of money. What's Next?

Next, we'll discuss why people and firms are willing to hold money

Demand for money: Economists call the willingness of people and businesses to hold money (rather than put it in an interest-bearing asset such as a CD, or some other asset such as a stock or land) the *demand for money*. One's willingness to hold money—one's demand for money—depends upon a whole bunch of things, including these 3 things:

1. One's income
2. The prices of stuff
3. Interest rates

Let's take a closer look at each of these things

1. Income: People with more income tend to hold more money—more cash in their wallets and more money in their checking accounts. Why? Because they buy more stuff than poorer people, and need to hold more money to buy the extra stuff.

higher income → higher demand for money
lower income → lower demand for money

2. Prices: Higher prices mean that you need more money to buy the same amount of stuff. Indeed, demand for money is directly proportional to the average price level. For example, suppose that prices rise by 5%; well, you will need exactly 5% more money to buy the same amount of stuff.

higher prices → demand for money rises by the same percentage
lower prices → demand for money falls by the same percentage

3. Interest rates: If interest rates rise, then you are likely to reduce the amount of cash and checking deposits that you hold, instead transferring some of your money into interest-bearing assets such as CDs.

higher interest rates → lower demand for money
lower interest rates → higher demand for money

Economy-wide demand for money: We have just looked at 3 things that affect an individual's or business' demand for money. These same 3 things, in the aggregate, affect the total demand for money in an economy:

1. The national income (Y) affects the demand for money
Higher Y → higher demand for money
Lower Y → lower demand for money
2. The average price level (P) affects the demand for money
Higher P → demand for money rises by the same percentage
Lower P → demand for money falls by the same percentage
3. The nominal interest rate (i) affects the demand for money
Higher nominal interest rate → lower demand for money
Lower nominal interest rate → higher demand for money

Recall that the nominal interest rate i equals the real interest rate plus the expected inflation rate:
 $r + \pi^e = i$

A money demand equation: Money demand, M^d , can expressed in equation form like so:

A general money demand equation

$$M^d = P \times L(Y, r + \pi^e)$$

where M^d is amount of money demanded
 P is the average price level
 Y is real national income
 r is the real interest rate
 π^e is the expected inflation rate
 $L()$ means “is a function of” (it is not multiplication)

Sometimes, one divides both sides of the above equation by P :

$$M^d/P = L(Y, r + \pi^e)$$

“ M^d/P ” is called *real money demand*

Here’s a more specific version of a real money demand equation:

$$\text{Real money demand} = .1Y - 10i$$

Remember how we can convert a nominal variable into a real variable by dividing by the average price level? Well, that’s what we do to the left; we divide nominal money demand by the price level to get real money demand.

The Money Market

We have seen that there is a supply of money (that the Central Bank tries to control using open market operations) and a demand for money (that depends upon inflation, income, and interest rates). So, there must be a market for money, since we have both a demand and supply of it.

Here’s an example of a money market:

Money supply: $M = 1000$

Money demand: $\text{money demand} = P \times (.1Y - 10i)$

Equilibrium in the money market

Equilibrium in the money market occurs when the money supply equals money demand.
This equilibrium determines the nominal interest rate, i !

Let’s use our example of the money market to find equilibrium:

Money supply: $M = 1000$

Money demand: $\text{money demand} = P \times (.1Y - 10i)$

Suppose that P is fixed at $P = 1$ (allowing us to ignore P). Further assume that full employment Y equals 11,000.

Equilibrium: $M = .1Y - 10i$

$$1000 = .1(11,000) - 10i$$

$$1000 = 1100 - 10i$$

$$10i = 100$$

$$i = 10$$

Events Changing Equilibrium

Note that the equilibrium nominal interest rate will change if either of these things happen:

1. The money supply changes

or

2. Y changes

Continuing our Example: Suppose that M rises from 1000 to 1050 (perhaps due to an open market purchase of government securities by the Central Bank)

New Equilibrium: $M = .1Y - 10i$

$$1050 = .1(11,000) - 10i$$

$$1050 = 1100 - 10i$$

$$10i = 50$$

$$i = 5$$

A Final Example of changing equilibrium: Return to the money supply of 1000 scenario. But now assume that Y rises from 11,000 to 12,000

New Equilibrium: $M = .1Y - 10i$

$$1000 = .1(12,000) - 10i$$

$$1000 = 1200 - 10i$$

$$10i = 200$$

$$i = 20$$

Enough about the money market. Now, a new topic

The Quantity Theory of Money

The quantity theory of money is a theory that relates the size of the money supply to three other variables:

- real national income, Y
- the average price level, P
- the *velocity* of money, V (the velocity of money is the number of times the average dollar of money changes hands in a year)

Here's the theory:

$$M \times V = P \times Y$$

Implications of the theory:

This theory helps explain why a larger money supply causes inflation in the long run. If we assume that V is constant, then a higher M must lead to either higher Y and/or higher P . We can see this by taking the total derivative of the above equation:

$$\% \text{ change in } M + \% \text{ change in } V = \% \text{ change in } P + \% \text{ change in } Y$$

Example:

We have seen using the growth accounting equation (in the notes file macro-growth) that the average growth of U.S. real GDP may be 3.8% per year for the next decade. Suppose that the money supply grows by 6% per year over this time period, and that the velocity of money remains constant. What will be the average inflation rate per year over the next decade?

Answer: Substitute the appropriate values into the above equation

$$6\% + 0\% = \% \text{ change in } P + 3.8\%$$

$$\% \text{ change in } P = 2.2\%$$

Warning! The quantity theory of money is only applicable for long term inflation forecasts. It is folly to use it to try to forecast inflation over the short term, say the next year or two, since there are a lot of other things that can affect inflation over the short run. (We will discuss some of these things when we look at short run economic fluctuations—business cycles—later in the semester.)