Macroeconomics: an Introduction

Chapter 7
The Demand for Money

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Outline

Preview

In the last chapter we saw how *the Federal Reserve can change the quantity of money in existence at will*. In this chapter we will see how *a change in the quantity of money causes interest rates to rise or fall*. Since interest rates are a key variable in decisions to buy or invest, *the ability to move interest rates gives the Fed a powerful lever to move the economy*. That is why it is worth enduring some moderately technical discussion of the demand for money.

We use the familiar supply and demand model of economics to understand how changes in the quantity of money cause interest rates to move. The **supply of money** is the **quantity of money**, currency and bank deposits, set by the Fed. That is the number of dollars available to be held in wallets and bank accounts. The amount of money that people desire to hold is the **demand for money**. Since every dollar is held voluntarily, the quantity of money supplied by the Fed must be equal to the quantity demanded by money holders. As always, the demand for a good or service depends in part on its price or cost. *The cost of holding money is an opportunity cost over time*, because the alternative is

investing those funds to earn interest. What one gets in return for giving up interest income is the liquidity that money provides. Each of us balances the opportunity cost of holding money with the value of that liquidity.

What happens if the Fed increases the supply of money? An increase in the supply of any good causes its price to fall. It must be the case that when the Fed buys bonds in an open market operation, thereby increasing the supply of money, it causes the "price" or opportunity cost of holding money to fall. *Thus, by increasing the supply of money the Fed can push the interest rate down, and by reducing the supply of money it can push interest rates up.*

In the next chapter we will see that lower interest rates stimulate investment spending on new plant and equipment by business and spending on durable goods by households because the cost of borrowing has fallen. The result is higher production and higher employment, at least until prices and wages adjust to the increase in demand. If the Fed persists in more rapid expansion of the money supply then inflation will accelerate.

This process operates in reverse when the Fed sells bonds, thereby reducing the money supply. Smaller supply means higher price, in this case higher interest rates. Higher interest rates mean that some investment projects are not undertaken and some houses are not built that would have been otherwise because loans are more costly. Demand for goods in the economy then falls, and with it production and employment. Inflation will decline, but usually not before the economy experiences a recession.

Interest rates connect the monetary economy of banks and financial markets with the real economy of the production, distribution, and consumption of goods and services. This ability to influence the real economy through interest rates gives the Fed a very important role to play.

7.1 What is "the Demand for Money"?

How much money would you like to have? A billion or two? Of course, that is *not* what we mean by your demand for money! What we do mean by your demand for money is this: how much of your wealth do you wish to keep in the form of money, that is, currency and bank deposits?

For example, suppose that the Joneses have $50,000 in financial assets which they divide between investment in bonds and holding money. How are they going to decide how much of their $50,000 to invest in bonds and how much to hold in the form of money, including currency and the balance in their checking account? An investment in bonds pays interest, but currency pays none and the Joneses receive no interest from their bank on their checking account.

Clearly, the opportunity cost of holding money is the rate of interest. If the Joneses keep $1,000, on average, in currency and in their checking account during the year and bonds yield 10%, then it costs the Joneses $100 in foregone interest to hold that $1,000. Why, then, should the Joneses hold any money at all instead of putting all of their wealth into bonds and other assets that will earn a return? For that matter, why does anyone hold any money?

Economists have identified three primary motives for holding money:

- **To settle transactions, since money is the medium of exchange.**

- **As a precautionary store of liquidity, in the event of unexpected need.**

- **To reduce the riskiness of a portfolio of assets by including some money in the portfolio, since the value of money is very stable compared with that of stocks, bonds, or real estate.**

These three motives for holding money are often referred to as the transactions motive, the precautionary motive, and the portfolio motive respectively. Together they provide good reasons for the Joneses to hold some money in their portfolio in spite of the opportunity cost of foregone interest.

Now suppose, hypothetically, that with the interest rate at 20% the Joneses choose to hold $1,000 of their $50,000 in the form of money. What will they do if the interest rate now drops to 5%? With the opportunity cost of holding money reduced, they will very likely choose to increase their money holdings by reducing their bond holdings. After all, it now costs the Jones only 5 cents per year to hold an extra dollar instead of 20 cents, while adding to their holdings of money will give them more of the services that holding money provides. The more currency in your wallet the less frequently you need to stand in line at a cash machine or teller's window. The larger your checking account balance the more readily you can meet unexpected payments, such as buying that suit that is on sale even though your credit card is up to its limit. The larger your cash position, the less worrisome is a fall in the stock market.

As a result of the interest rate falling from 20% to 5% the Joneses might well decide to increase their money holdings, say from $1,000 to $1,500. They would accomplish that increase in their money holdings by selling bonds worth $500 and keeping the money they would be paid.

The amount of money demanded by the Joneses would change if their income increased. They would demand more money (at a given level of interest rates) primarily because their transactions and precautionary demands would increase at their new higher level of spending. An

increase in their wealth would increase their portfolio demand for money. Even a change of jobs could affect their demand for money. Someone who travels a great deal in a sales position will have a greater precautionary demand for money than someone who stays in town.

We see, then, that a households' demand for money depends on the interest rate, their income, and wealth, among perhaps many other variables. Firms are also holders of money, in their cash registers and bank accounts, for essentially the same basic reasons as households. When we add up the demand for money by all households and firms we have the total demand for money in the economy and that demand will be most importantly a function of the interest rate, income, and wealth in the economy.

The demand for any good or service is usually pictured in economics as a function of its price, holding income and other factors constant. In the case of holding money, the "price" is the opportunity cost of holding one dollar for one year, the interest rate. When we plot the quantity of money demanded on the horizontal axis and the interest rate on the vertical axis, just as we would the quantity of oranges demanded and the price of oranges, we will have a demand curve like the one pictured in Figure 7.1.

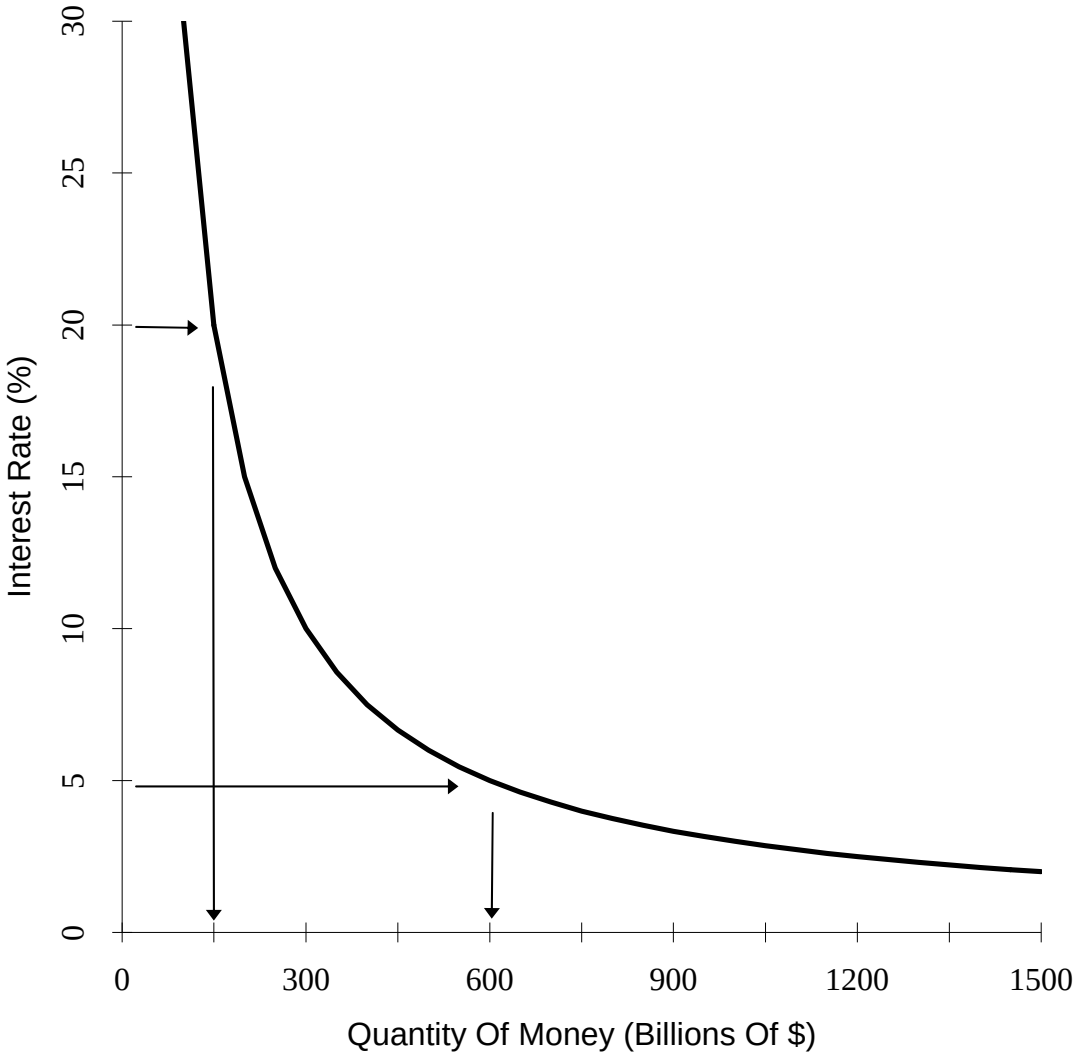
Note that the quantity of money demanded is higher when the interest rate is lower, just as the quantity of oranges demanded is higher when the price of oranges is lower. As this hypothetical demand for money has been drawn, the demand for money is $600 billion when the interest rate is 5%, but only $150 billion when it is 20%. This inverse relationship between the interest rate and the demand for money just reflects the fact that when the opportunity cost of holding money is low, people will want to hold more of it, and when it is high people will want to hold less of it.

Notice, too, that at very low levels of the interest rate in Figure 7.1, the quantity of money demanded increases dramatically, meaning that people would then want to hold a very great amount of their wealth in the form of money. And why not hold money instead of bonds when the reward to holding bonds is very, very small? After all, money is more liquid than bonds, and bonds are subject to the risk of price fluctuation that we discussed in Chapter 3.

In contrast, even when the interest rate is very, very high, people will still want to hold some money. Even if it costs 30 cents per year to hold a dollar, we will still hold *some* dollars because it is even more costly to revert to barter in making transactions.

How will the demand for money change when the income and wealth increases? Imagine that over the next decade the economy grows in real terms by 3% per year while inflation averages 4%, so nominal income roughly doubles (Remember how to compute doubling time?). Clearly the quantity of money demanded will rise. Sales at the supermarket will have doubled, reflecting both the greater quantity of goods and higher prices, so the transactions demand for money must roughly double.

Figure 7.1: The Demand for Money Depends On The Rate of Interest



Further, it is likely that rising wealth will also contribute to higher demand for money holdings through the portfolio motive. Indeed, it seems likely that wealth would also roughly double in nominal terms over a decade in which nominal income had doubled. Overall, the quantity of money demanded at any given interest rate will be much higher a decade later under our assumptions, probably about twice its level a decade earlier. We depict this change in the demand for money by shifting the demand curve to the right. In Figure 7.2, the doubling of nominal incomes and wealth doubles the demand for money at any given interest rate. For example, at an interest rate of 5%, the quantity of money demanded is $1,200 billion at the end of the decade, while it was only $600 billion at the beginning of the decade ago when nominal income and wealth were half as great.

Overall, the quantity of money demanded at any given interest rate will be much higher a decade later under our assumptions, probably about twice as much compared to a decade earlier. We depict this change in the demand for money by shifting the demand curve to the right. In Figure 7.2, the doubling of nominal incomes and wealth doubles the demand for money at any given interest rate. For example, at an interest rate of 5%, the quantity of money demanded is $1,200 billion at the end of the decade, while it was only $600 billion at the beginning of the decade ago when nominal income and wealth were half as great.

Exercises 7.1

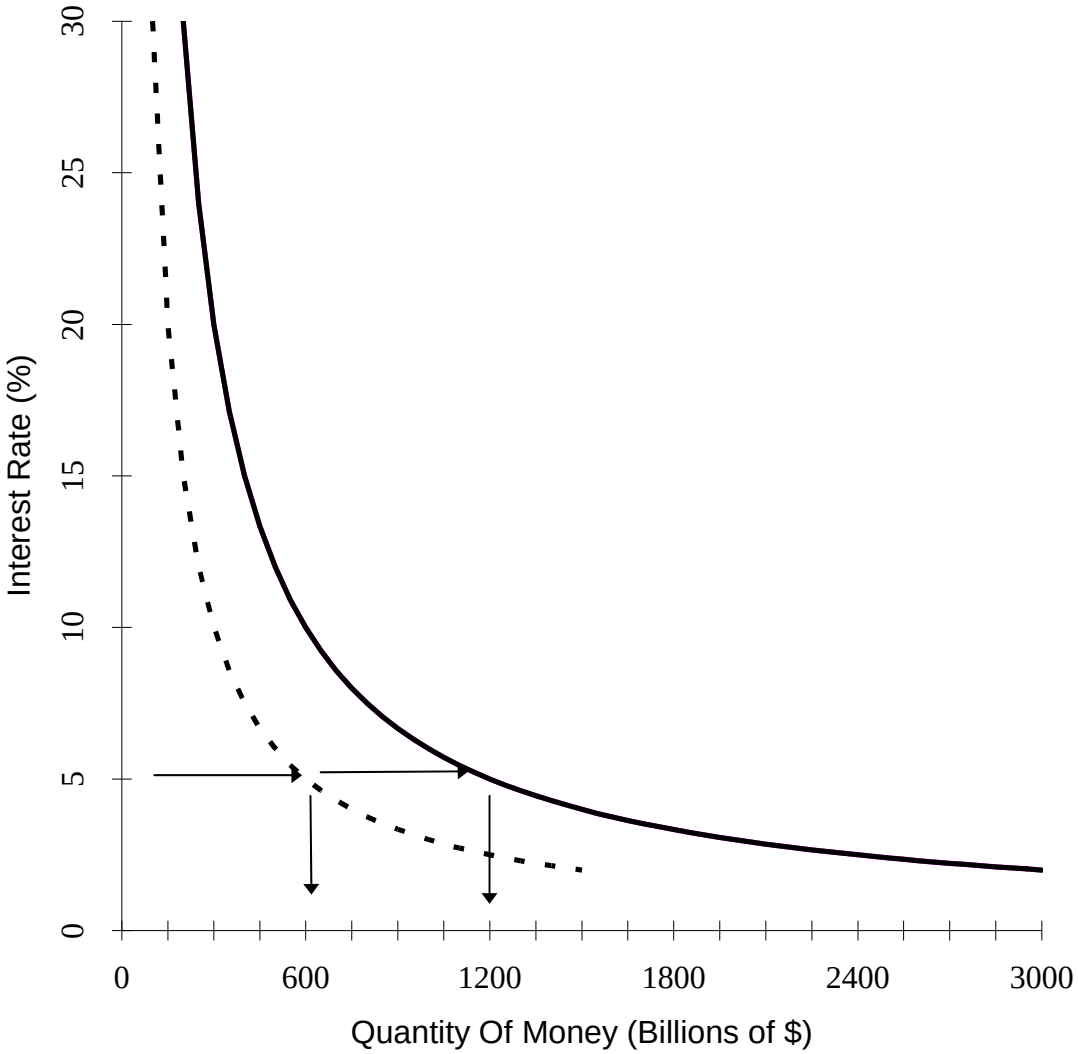
A. Review the three primary motives for holding money. Indicate how important each one is to your own money holding behavior. How does each motive relate to money being the most liquid of assets?

B. Describe briefly the relative importance of each of the three motives for the following pairs of economic agents: (1) a small business owner as compared to a civil servant, (2) a very old person in poor health as compared with a young adult, (3) a retail store as compared with a law office, (4) a traveling salesperson as compared with a school teacher.

C. Imagine that the demand curve in Figure 7.1 represents the demand for money in the US a year ago. Since then, the economy has grown in real terms by 2% and there has been inflation at a rate of 3%. Sketch the position of the demand curve today relative to its old position a year ago.

D. “The price of a dollar is a dollar!” “No, it is the interest rate!” What is the source of this disagreement? Can both be right? Discuss.

Figure 7.2: The Demand for Money Before and After Income Doubles



7.2 How the Supply of Money and the Demand for Money Determine the Interest Rate

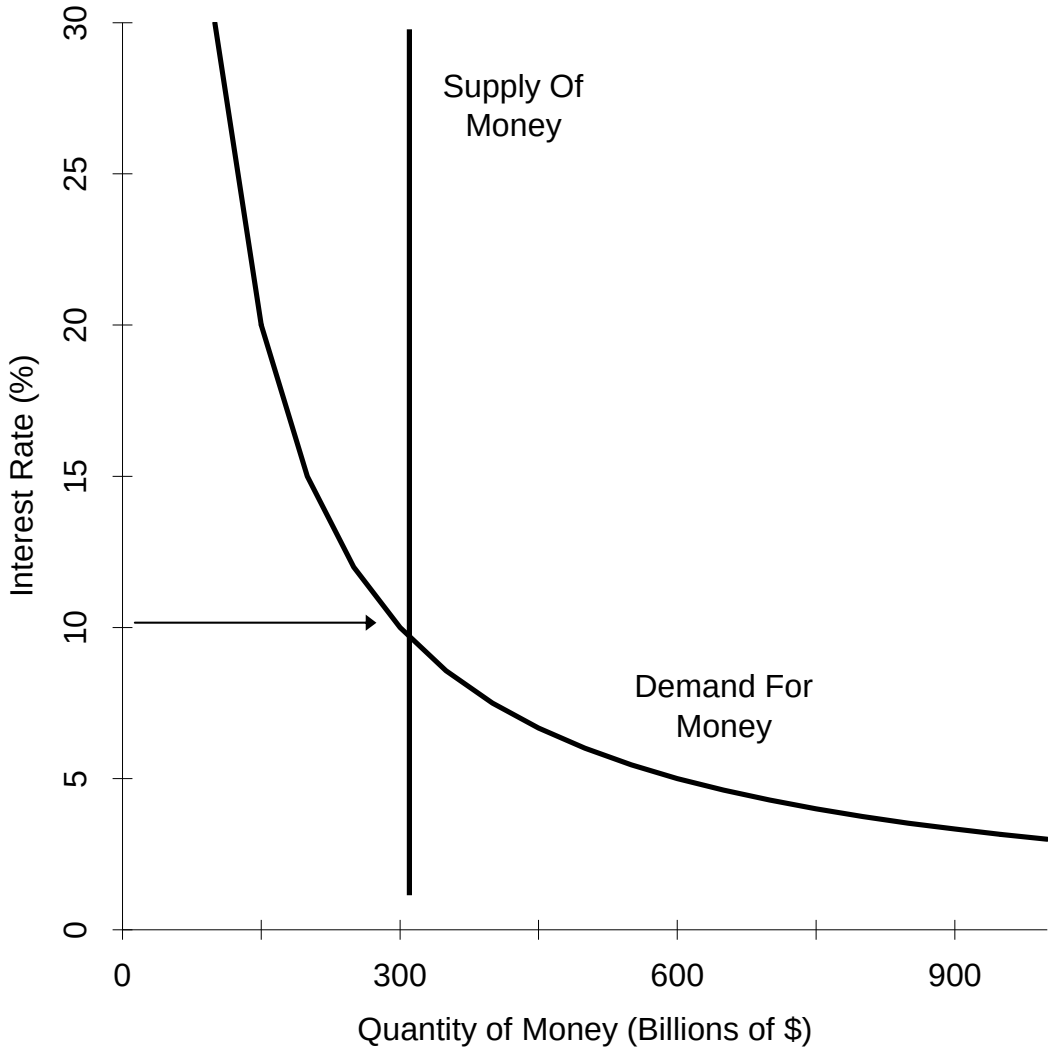
Just as the price we pay at the store for oranges is the price at which the demand for oranges equals the supply of oranges, *the "price of money" is the interest rate at which the demand for money equals the supply of money*. Now the supply of money is the quantity of currency and bank deposits which is set by the Fed. Since the supply of money does not vary with the rate of interest, we can depict the supply curve of money simply as a vertical line at the actual quantity of money.

In Figure 7.3 the supply of money is a vertical line at the quantity $300 billion, indicating that in this hypothetical economy the Fed has set the supply of money at $300 billion. The supply of money is fixed at that quantity, and it will remain there until the Fed decides to change it. The quantity of money demanded is equal to the quantity supplied, $300 billion, at an interest rate of 10%. At that interest rate, people are content to hold the quantity of money that is supplied by the Fed. What are the forces that will move the interest rate to 10% in Figure 7.3, and what forces keep it there until the supply or demand curve shifts?

Consider what would happen if, somehow, the interest rate were 9% instead of 10%. At an opportunity cost of only 9% people would want to hold more money than when the opportunity cost is 10%. As we see in Figure 7.3, they would want to hold more money than the Fed has actually supplied. In an attempt to increase their holdings of money to the level they desire, people like the Joneses would sell some of their bonds in order to increase their holdings of money.

However, while any one economic agent can increase or decrease the quantity of money that they hold, *all economic agents taken together cannot change the quantity of money that they hold because the quantity of money is fixed*. Currency and bank account balances can move from one agent to another, but only the Fed can change the total amount of money that everybody holds in aggregate. What *can* change is the interest rate. As everybody tried to sell bonds to increase their holding of money, the price of bonds would fall, causing bond yields to rise. Recalling that the interest rate is just the yield on bonds, we see that the interest rate would rise and it would continue to rise until it was back up to 10%. At that point the interest rate would stop rising because then the Joneses and everyone else would be content to hold the quantity of money that exists.

Figure 7.3: Intersection of Demand for Money and Supply of Money Determine the Interest Rate



Suppose, on the other hand, the interest rate rose temporarily to 11%. Then the Joneses and others would find the cost of holding money had risen, and they would want to reduce their money balances in order to hold more of their assets in the form of bonds. As the Joneses and others try to purchase bonds, they bid bond prices up and bond yields down.

Again, keep in mind that the total quantity of money in the economy is not altered by the attempts of individuals to change their own holdings of money. The currency or checking account balance that one person uses to buy a bond only passes into someone else's hands. Therefore, the adjustment process can only be complete when the interest rate has fallen enough so that the Joneses and others are content to hold the existing quantity of money, and that occurs only when the interest rate is 10%. This is why economists call the intersection of the demand curve and the supply line the **equilibrium** in the money market. In our hypothetical example pictured in Figure 7.3, the equilibrium occurs at an interest rate of 10%.

Two Sides of the Same Coin

Students are sometimes puzzled that we think of the interest rate being determined by the supply and demand for money rather than by the supply and demand for bonds. After all, the price of a bond is just a transformation of the interest rate; if you know one you know the other. Indeed, it would be paradoxical if the price of bonds were not in fact determined by the supply and demand for bonds. There is no paradox here because the two markets, for money and for bonds, can be thought of as two sides of the same coin (pun intended).

Agents make a portfolio decision to divide their financial wealth between money, which offers no reward other than its services, and securities such as bonds and stocks that pay interest and may rise or fall in price. Our analysis is simplified by using bonds to represent all financial assets, and the yield on bonds as the reward for holding financial assets. Agents then decide to divide their wealth between money and bonds in light of the interest rate offered on bonds, and other factors. The interest rate, then, can be thought of as being determined in either the bond market or the money market interchangeably.

What Happens When the Fed Increases the Supply of Money?

Imagine that the Fed boosts the money supply suddenly from $300 billion to $600 billion. In Figure 7.4 this is indicated by the shift in the vertical supply line to the right. At the old interest rate of 10%, agents wish to hold only $300 billion, not $600 billion. What could induce them to hold the additional money? Certainly an increase in their income or wealth would induce them to hold larger money balances, but it seems evident that these variables do not change very rapidly. What *can* change rapidly enough to clear the money market is the rate of interest. In fact, interest rates do change daily and even hourly in response to Fed

actions. How will the interest rate change as a result of our hypothetical doubling of the money supply?

Clearly, the interest rate must fall so that the opportunity cost of holding money is reduced to the point that people want to hold twice as much money. From Figure 7.4 we see that at an interest rate of 5% the quantity of money demanded is equal to the supply, $600 billion. Money is now much cheaper to hold because there is much more of it available.

The mechanism that pushes the interest rate down from 10% to 5% in our example is, again, the efforts of households and firms to adjust their money balances to their desired levels. At the old interest rate of 10%, economic agents find that their money holdings, now $600 billion, are too large. Their ensuing efforts to switch from money into bonds will bid bond prices up and bond yields down until the new equilibrium is reached at the new, lower interest rate. Finally, at an interest rate of 5% the agents in this economy are content to hold the $600 billion supply of money and the money market is again in equilibrium.

This application of the principle supply and demand shows how the Fed uses its control of the money supply to move interest rates up or down. As we shall see in Chapter 8, the ability to move the interest rate up or down gives the Fed a powerful lever with which to move the real economy.

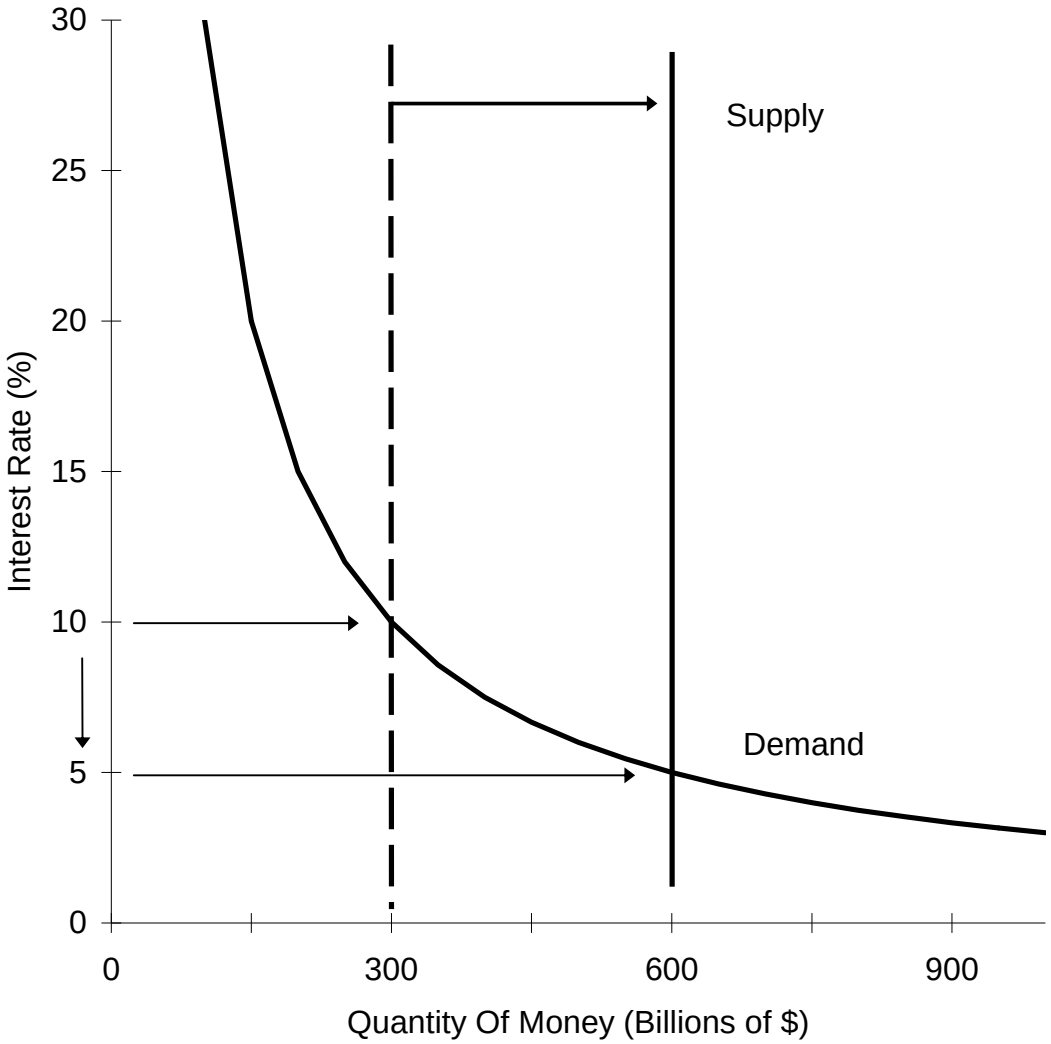
The Liquidity Trap

Is there a limit to how low the fed can push down the interest rate? Yes, and it poses a major challenge for the Fed at times such as 2009-2011 when interest rates are low but the Fed would like to give the economy a boost.

At very low levels of interest rates the reward for owning bonds is so small that people see little point in owning more bonds, preferring instead the safety and **liquidity** of money. Thus, further increases in money supply do not stimulate investors to bid up the price of bonds which would be required if interest rates are to fall further. At the extreme, interest rates cannot fall below zero because holding money is always superior to holding a bond that does not pay at least zero interest. So we know that there is a floor below which the Fed cannot push interest rates, and this **liquidity trap** effectively limits its ability to use lower interest rates to stimulate the economy.

With short term interest rates near zero (Treasury bill rates at about 0.1%!) during 2009-2011, the Fed looked to different strategies and came up with “quantitative easing” which we will discuss in Chapter 9.

Figure 7.4: An Increase in the Supply of Money Causes the Interest Rate to Fall



What Happens When There is a Change in the Demand for Money?

The interest rate will also change when there is a shift in the demand for money. By a shift in the demand for money we mean a change in the quantity demanded at any given interest rate. We have already surmised that the demand for money depends on nominal income and wealth. It will also be affected by fluctuations in the volume of transactions of assets. Heavy trading on the stock exchanges or rapid turnover in the real estate market, for example, will both increase the quantity of money demanded simply because these transactions are settled in the medium of exchange, money. A great deal of money is used in retail trade, so during the holiday season in December there is always a large increase in the demand for money.

While there are many variables that affect the demand for money, the most important source of shifts in the demand for money are changes in nominal income. One of the key strategies of economic analysis is to simplify, reducing the virtually infinite detail of reality to a small number of key variables which we can reasonably hope to incorporate in an economic model. The test of the model is not whether it is a detailed description of reality, but whether it is useful in explaining the important features of the economy that we seek to understand. In this spirit we choose nominal income as the key variable that shifts the demand for money.

Pursuing this strategy, it seems reasonable, as a working assumption, that the quantity of money demanded at a given interest rate will be roughly proportional to nominal income. This is easiest to see as a consequence of the transactions motive for money holding. If your nominal income doubles you probably will want to keep about twice as much cash on hand since your transactions will be about twice as great in dollars as before. This relation should hold regardless of whether income doubles because of a doubling of the price level, or because of a doubling of real income, or because of increases in both.

For example, if we learn that over time the Jones' income has increased from $25,000 per year to $50,000 per year, we would not be surprised to find that they now have $2,000 in the bank instead of $1,000 (assuming the interest rate is still 10%). In addition, we can think of changes in nominal income as also serving as a "proxy" for other variables, such as wealth and the volume of trading in stocks and real estate, that tend over time to increase in proportion to income. In light of Chapter 2, our measure of nominal income for the economy is, of course, nominal GDP.

A Simple Model of the Demand for Money

This line of reasoning leads us to a simple algebraic model of the demand for money that looks like this:

$$M^d = k(i) \bullet GDP$$

where "M^d" is the quantity of money demanded and "k(i)" a coefficient which is a function of the interest rate "i". This simple equation says that the amount of money demanded, at any given interest rate, is proportional to nominal income, as measured by nominal GDP. For example, if GDP increases by 10% then the demand for money increases by 10% as well, at any given interest rate. Graphically, the demand curve shifts to the right by an amount equal to k(i) times the change in GDP.

Since the demand for money varies inversely with the interest rate, the factor of proportionality k(i) must vary inversely with the interest rate. This means that k(i) decreases as the interest rate increases, and this gives the demand curve its downward slope when we graph it.

To see how a change in nominal GDP by itself affects the interest rate, we use Figure 7.5 to show what would happen to the interest rate if there were an increase in nominal GDP with no change in the supply of money. Suppose, hypothetically, that nominal income doubles. (In reality it would take several years for US GNP to double and certainly the supply of money would have grown during that time, but here we are conducting a thought experiment to help us understand how shifts in demand affect the interest rate.) The quantity of money demanded at any given interest rate doubles, because the demand is proportional to nominal GDP.

This is seen in Figure 7.5 as a horizontal shift of the demand curve to the right, so that now the demand is twice what is was before the shift.

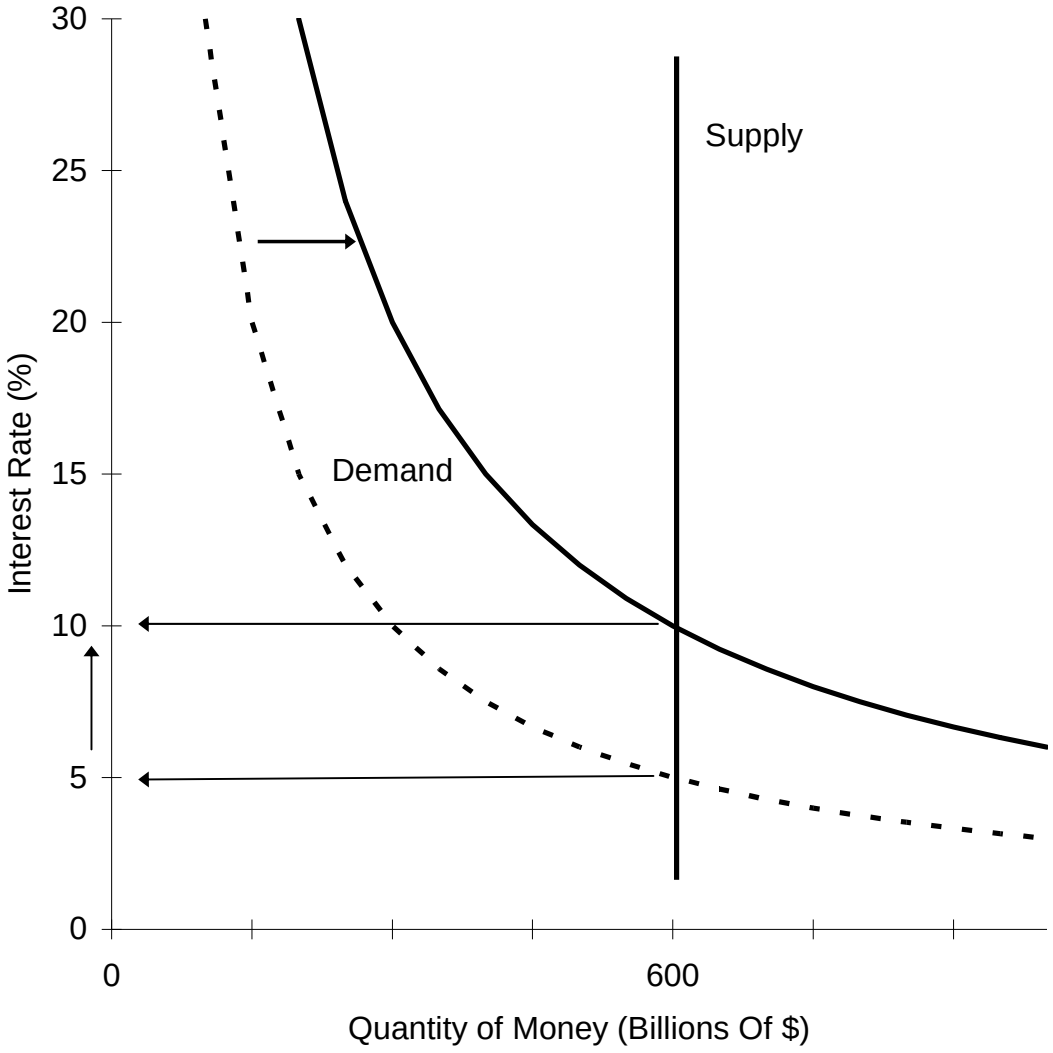
We can also see from our simple money demand equation that the demand doubles by using the fact that "new GDP" is just "2 • old GDP" which gives us:

$$\textbf{New } M^d = k(i) \bullet \textbf{new } GDP = k(i) \bullet [\textbf{2} \bullet \textbf{old } GDP] = \textbf{2} \bullet \textbf{old } M^d$$

As we see in Figure 7.5, the new intersection of demand and supply must necessarily occur at a higher interest rate. Before the shift, the demand for money equals the supply of $600 billion at an interest rate of 5%. After the shift, the demand for money at the old interest rate of 5% far exceeds the quantity supplied, which is still $600 billion.

As people seek to increase their holdings of money by selling bonds, the price of bonds falls while the interest rate (the yield on bonds) rises. When the interest rate has risen to 10%, people are content to hold only the previously existing quantity of money in spite or their higher incomes and the higher demand for money that accompanies that higher income.

Figure 7.5: Higher Income Shifts the Demand for Money Causing the Interest Rate to Rise



One of the implications of our money demand model is that if the Fed wishes to keep the interest rate constant, it must increase the supply of money at the same rate as the increase in nominal GDP. For example, suppose that nominal GDP is growing at a rate of 8% per year, consisting of 3% real growth and 5% inflation. To prevent the interest rate from changing, the Fed must keep the money supply growing by 8% per year. If it does this, then both supply and demand are increasing at the same rate so that the equilibrium interest rate is unchanged.

If the money supply were to grow faster than 8% then the supply curve would be shifting to the right faster than the demand curve, and then the intersection of the two would occur at a lower interest rate. Conversely, if the Fed slowed money growth to below 8%, the interest rate would rise. We see, then, that in a dynamic economy in which output and prices are both changing, the effect of the money supply on the interest rate will depend on the *relative* growth rates of money and income.

Exercises 7.2

A. Suppose the Fed announced tomorrow that it is cutting the required reserve ratio for banks. What would be the response of interest rates? of bond prices?

How does your answer change if instead the Fed announced an increase in required reserves? Explain your answer with a supply and demand diagram, being careful to label the axes and curves.

B. Imagine that a recession starts in the fall of 1997 and results in a decline in national income. What prediction does our money demand model make about what would be the effect on interest rates? Explain your answer with a supply and demand diagram.

C. If nominal GDP is growing at a rate of 7% per year and the Fed wants to keep the interest rate constant, how fast should it increase the money supply? Explain your answer both algebraically and graphically.

D. Every December retail sales are far greater than at any other time of the year. This heavy volume of transactions results in a large increase in the demand for money which disappears after the holidays are over. What prediction would we make about the seasonal pattern of interest rates if the Fed did not take any action to change the supply of money in December? Explain.

In fact, interest rates are not higher in December than in other months, on average. What inference can we draw about how the Fed manages the money supply?

7.3 Evidence that the Demand for Money Depends on the Interest Rate

Does the demand for money look anything like the downward sloping, concave curve that we have used in our hypothetical discussions? How can we investigate such a question? The simple model of the demand for money developed in the previous section gives us a framework in which to work. Recall that our model says that the demand for money is given by,

$$M^d = k(i) \bullet GDP$$

while the supply of money is just the actual quantity supplied by the Fed,

$$M^s = M$$

where "M^s" denotes the supply of money and "M" the actual quantity of money. In equilibrium the quantity of money demanded equals the actual quantity supplied, so we have,

$$k(i) \bullet GDP = M$$

and that tells us that k(i) is just,

$$k(i) = M/GDP$$

Now k(i) can be thought of as the quantity of money demanded *per dollar of GDP*. Since in market equilibrium the quantity demanded is always equal to the actual money supply, M, we can observe k(i) at any point in time by dividing the actual quantity of money by GDP. We can then see whether the observed values of k(i) bear the relationship to observed values of "i" that we had hypothesized. In Figures 7.6 and 7.7 we do just that.

Figure 7.6 is an "XY plot," also called a "scatter plot," with the quantity of M1 per dollar of GDP on the X axis and the Treasury Bond yield on the Y axis. Each point corresponds to a paired observation of [M/GDP] and the bond yield during one calendar quarter. For example, in the first quarter of 1994 the bond yield was 6.44% and the ratio of M to GDP was 0.17, so the observation for that quarter corresponds to the black square with coordinates (0.17, 6.44).

Figure 7.6: Scatter Plot of T Bond Yield and M1 per dollar of GDP

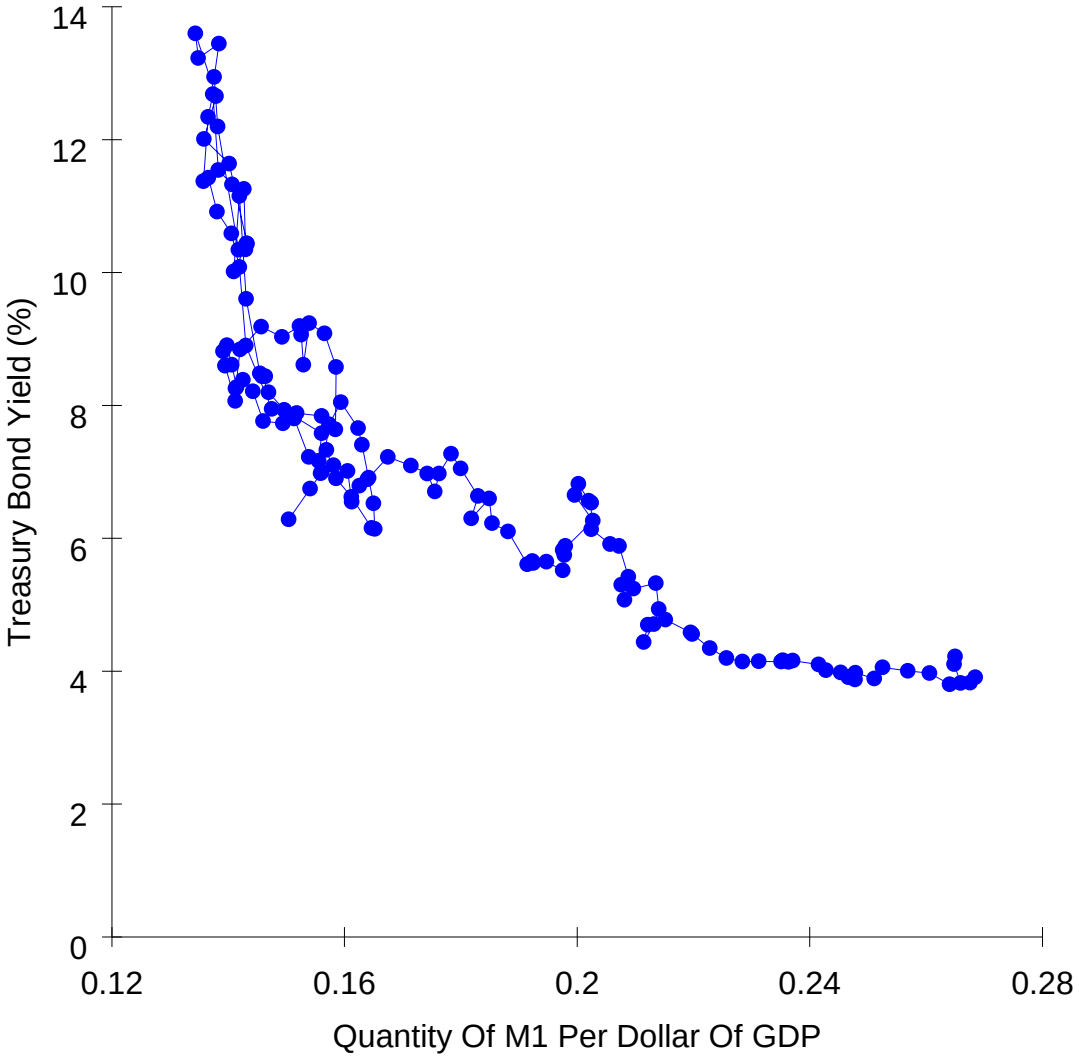


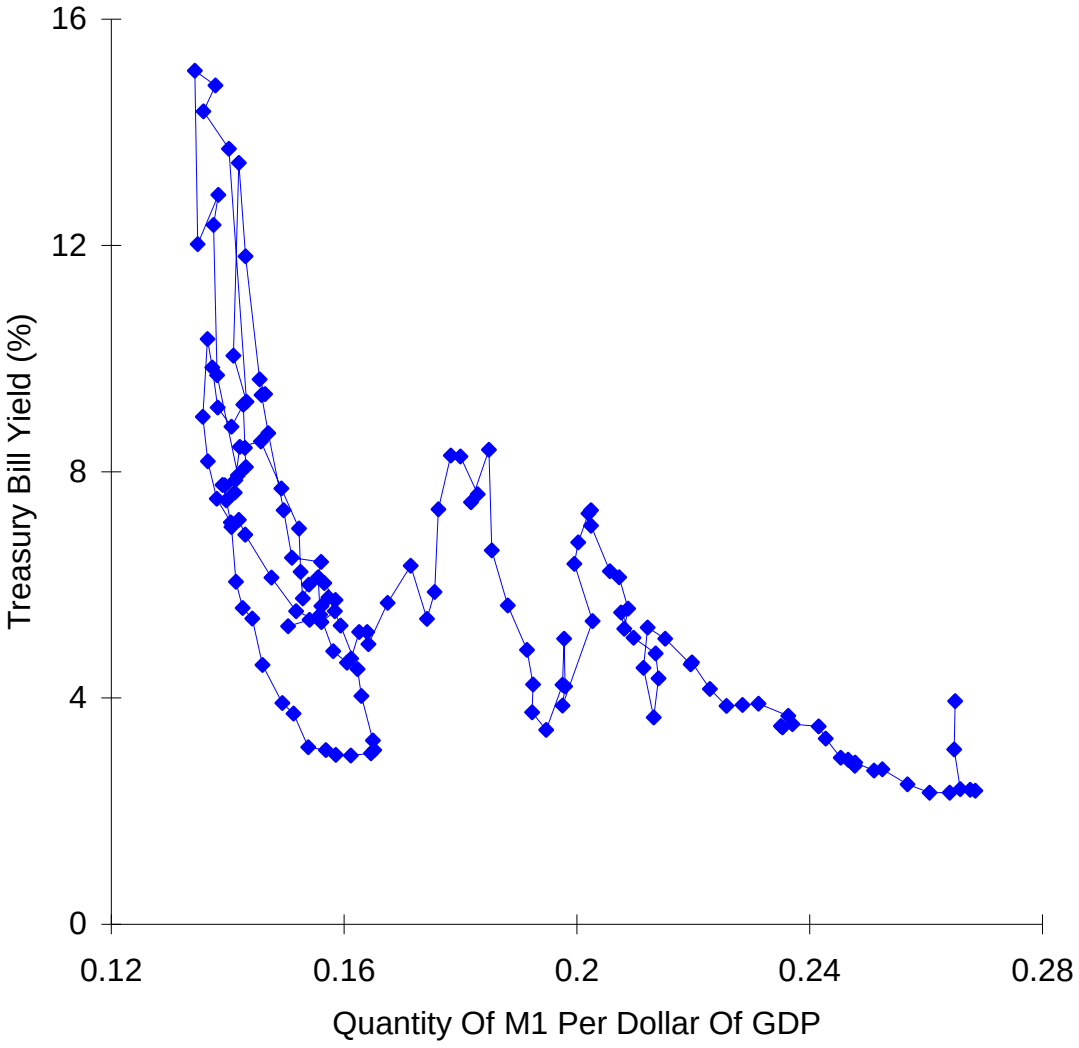
Figure 7.7 is a corresponding scatter plot using the yield on US Treasury bills instead of bonds. Why two interest rate and two figures? In theory we speak of "the interest rate" and in reality we observe many interest rates, but the yields on Treasury bills and bonds are two important benchmark interest rates in the economy.

What we see when we look at these figures is that the points do form *a pattern that has the general shape of the demand function that we hypothesized*. It is downward sloping and concave, flattening as it approaches the X axis and steepening as it approaches the Y axis. The points do not, however, lie exactly along a smooth line, rather they appear to be scattered around a curve that has the shape we have described.

Evidently, our model does not describe the demand for money exactly. What might be missing or wrong in the model? We have left out variables besides income and the interest rate that may affect the demand for money, such as the volume of trading on the New York Stock Exchange. It seems unlikely that the effect of income on the demand for money is exactly one of proportionality. More complex models of the demand for money attempt to address these issues, but the simple model is a useful approximation for our purposes.

The relationship between the demand for money per dollar of GDP and the bond yield is smoother and more precise than is the same relationship for the bill yield. Note that there is a good bit of up and down variation, or “noise,” in the T bill yield that is not associated with M/GDP. Which interest rate, then, is the "right" one to use? The much more complex models of the demand for money developed and used by the Fed recognize that several interest rates, all representing alternatives to holding wealth in cash, will be involved.

Figure 7.7: Scatter Plot of T Bill Yield and M1 per Dollar of GDP



The "Velocity" of Money

A useful concept in thinking about the demand for money is the velocity of money, defined as nominal GDP divided by the quantity of money. Giving velocity the symbol V and using M for the quantity of money we can write the definition of velocity as

$$V = GDP/M$$

Think of the velocity of money as the rate at which dollars circulate through the economy. It is the number of times a dollar gets used per year in the purchase of the goods and services that make up GDP.

In light of what we know about the demand for money, the velocity of money also must depend on the interest rate, and it will be higher when the interest rate is higher. The intuition behind this is that when the interest rate is high people will respond to the high cost of holding money by holding less money M, relative to their incomes, GDP, so the ratio GDP/M will be higher. When interest rates are higher it pays to run to the bank more often. We can be pretty sure that V will be higher in Brazil, where interest rates are very high, than in Switzerland, where interest rates are very low. Brazilians go to a lot of trouble to hold as little money as possible; knowing it is expensive to hold money, they convert their pay into goods very quickly. The Swiss, on the other hand, can afford the convenience of larger money balances relative to their incomes because holding Swiss francs costs little.

We can also see the relation between velocity and the interest rate algebraically by using our demand for money equation. Since the interest rate will adjust to equate the demand for money with the actual quantity supplied, we can replace M in the definition of velocity with the quantity demanded which is k(i) • GDP. Making this substitution we get,

$$V = GDP/[GDP \bullet k(i)] = 1/k(i)$$

Since k(i) varies *inversely* with the interest rate, i, velocity will vary *directly* with i. If interest rates rises, so will velocity. If interest rates fall, so too will velocity. Of course this is not a precise relationship; it is only as good as our simple model of the demand for money. If we redrew Figures 7.6 and 7.7 with velocity, GDP/M, instead of M/GDP on the X axis, the effect would simply be to turn them upside down.

Exercises 7.3

A. Suppose the interest rate in Japan is 3% and in Russia it is 150%. Which country do you think has a higher quantity of money per dollar of GDP? Which country do you think has a higher velocity of money? Explain your answer in a way that would be understood by someone who hadn't taken economics.

B. From our study of Figures 7.6 and 7.7 we concluded that there are factors besides interest rates and GDP which influence the demand for money. What are some of factors that might influence the demand for money over short periods of time? over long periods of time? Explain briefly how these factors would influence the demand for money per dollar of GDP, increasing it or decreasing it.

C. Imagine that in the future the Treasury bill yield returns to the levels of the late 1970s (what was that level?). What change would you expect to see in the demand for money per dollar of GDP and in the velocity of money? Explain.

D. If credit cards were suddenly declared illegal, what effect would you expect it to have on the demand for money? What would be the effect on interest rates immediately? (Something close to this situation actually occurred in 1980 toward the end of the Carter Administration!)

E. Imagine that there is a major financial crisis that makes all of us much more uncertain about future economic conditions and impairs our access to credit at banks. (Wait a second, that actually happened in 2008!) What effect do you expect this to have on the amount of money people wish to hold relative to their wealth and income compared to normal times?

End.