



# Supply and Demand in the Market for Money: The Liquidity Preference Framework

Whereas the loanable funds framework determines the equilibrium interest rate using the supply of and demand for bonds, an alternative model developed by John Maynard Keynes, known as the *liquidity preference framework*, determines the equilibrium interest rate in terms of the supply of and demand for money. Although the two frameworks look different, the liquidity preference analysis of the market for money is closely related to the loanable funds framework of the bond market.<sup>1</sup>

The starting point of Keynes's analysis is his assumption that there are two main categories of assets that people use to store their wealth: money and bonds. Therefore, total wealth in the economy must equal the total quantity of bonds plus money in the economy, which equals the quantity of bonds supplied  $B^s$  plus the quantity of money supplied  $M^s$ . The quantity of bonds  $B^d$  and money  $M^d$  that people want to hold and thus demand must also equal the total amount of wealth because people cannot purchase more assets than their available resources allow. The conclusion is that the quantity of bonds and money supplied must equal the quantity of bonds and money demanded:

$$B^s + M^s = B^d + M^d \quad (1)$$

Collecting the bond terms on one side of the equation and the money terms on the other, this equation can be rewritten as

$$B^s - B^d = M^d - M^s \quad (2)$$

The rewritten equation tells us that if the market for money is in equilibrium ( $M^s = M^d$ ), the right-hand side of Equation 2 equals zero, implying that  $B^s = B^d$ , meaning that the bond market is also in equilibrium.

Thus it is the same to think about determining the equilibrium interest rate by equating the supply and demand for bonds or by equating the supply and demand for money. In this sense, the liquidity preference framework, which

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<sup>1</sup>Note that the term *market for money* refers to the market for the medium of exchange, money. This market differs from the *money market* referred to by finance practitioners, which is the financial market in which short-term debt instruments are traded.

analyzes the market for money, is equivalent to the loanable funds framework, which analyzes the bond market. In practice, the approaches differ because by assuming that there are only two kinds of assets, money and bonds, the liquidity preference approach implicitly ignores any effects on interest rates that arise from changes in the expected returns on real assets such as automobiles and houses. In most instances, both frameworks yield the same predictions.

The reason that we approach the determination of interest rates with both frameworks is that the loanable funds framework is easier to use when analyzing the effects from changes in expected inflation, whereas the liquidity preference framework provides a simpler analysis of the effects from changes in income, the price level, and the supply of money.

Because the definition of money that Keynes used includes currency (which earns no interest) and checking account deposits (which in his time typically earned little or no interest), he assumed that money has a zero rate of return. Bonds, the only alternative asset to money in Keynes's framework, have an expected return equal to the interest rate  $i$ .<sup>2</sup> As this interest rate rises (holding everything else unchanged), the expected return on money falls relative to the expected return on bonds, and this causes the demand for money to fall.

We can also see that the demand for money and the interest rate should be negatively related by using the concept of *opportunity cost*, the amount of interest (expected return) sacrificed by not holding the alternative asset—in this case, a bond. As the interest rate on bonds  $i$  rises, the opportunity cost of holding money rises, and so money is less desirable and the quantity of money demanded must fall.

Figure 1 shows the quantity of money demanded at a number of interest rates, with all other economic variables, such as income and the price level, held constant. At an interest rate of 25%, point A shows that the quantity of money demanded is \$100 billion. If the interest rate is at the lower rate of 20%, the opportunity cost of money is lower, and the quantity of money demanded rises to \$200 billion, as indicated by the move from point A to point B. If the interest rate is even lower, the quantity of money demanded is even higher, as is indicated by points C, D, and E. The curve  $M^d$  connecting these points is the demand curve for money, and it slopes downward.

At this point in our analysis, we will assume that a central bank controls the amount of money supplied at a fixed quantity of \$300 billion, so the supply curve for money  $M^s$  in the figure is a vertical line at \$300 billion. The equilibrium where the quantity of money demanded equals the quantity of money supplied occurs at the intersection of the supply and demand curves at point C, where

$$M^d = M^s \tag{3}$$

The resulting equilibrium interest rate is at  $i^* = 15\%$ .

We can again see that there is a tendency to approach this equilibrium by first looking at the relationship of money demand and supply when the interest rate is above the equilibrium interest rate. When the interest rate is 25%, the quantity of money demanded at point A is \$100 billion, yet the quantity of money supplied is \$300 billion. The excess supply of money means that people are holding more money than they desire, so they will try to get rid of their excess money balances by trying

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<sup>2</sup>Keynes did not actually assume that the expected returns on bonds equaled the interest rate but rather argued that they were closely related. This distinction makes no appreciable difference in our analysis.

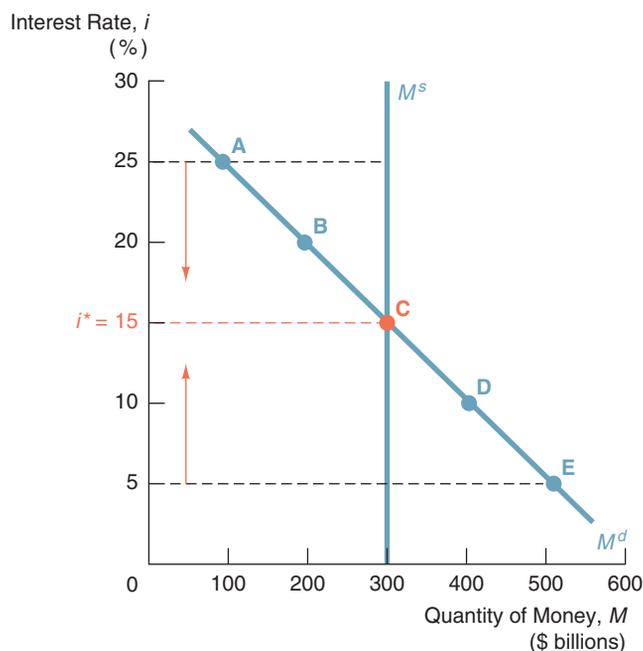


FIGURE 1 *Equilibrium in the Market for Money*

to buy bonds. Accordingly, they will bid up the price of bonds, and as the bond price rises, the interest rate will fall toward the equilibrium interest rate of 15%. This tendency is shown by the downward arrow drawn at the interest rate of 25%.

Likewise, if the interest rate is 5%, the quantity of money demanded at point E is \$500 billion, but the quantity of money supplied is only \$300 billion. There is now an excess demand for money because people want to hold more money than they currently have. To try to get the money, they will sell their only other asset—bonds—and the price will fall. As the price of bonds falls, the interest rate will rise toward the equilibrium rate of 15%. Only when the interest rate is at its equilibrium value will there be no tendency for it to move further, and the interest rate will settle to its equilibrium value.

## Changes in Equilibrium Interest Rates

Analyzing how the equilibrium interest rate changes using the liquidity preference framework requires that we understand what causes the demand and supply curves for money to shift.

### Study Guide

Learning the liquidity preference framework also requires practicing applications. When there is a case in the text to examine how the interest rate changes because some economic variable increases, see if you can draw the appropriate shifts in the supply and demand curves when this same economic variable decreases. And remember to use the *ceteris paribus* assumption: When examining the effect of a change in one variable, hold all other variables constant.

## Shifts in the Demand for Money

In Keynes's liquidity preference analysis, two factors cause the demand curve for money to shift: income and the price level.

**Income Effect** In Keynes's view, there were two reasons why income would affect the demand for money. First, as an economy expands and income rises, wealth increases and people will want to hold more money as a store of value. Second, as the economy expands and income rises, people will want to carry out more transactions using money, with the result that they will also want to hold more money. The conclusion is that ***a higher level of income causes the demand for money to increase and the demand curve to shift to the right.***

**Price-Level Effect** Keynes took the view that people care about the amount of money they hold in real terms, that is, in terms of the goods and services that it can buy. When the price level rises, the same nominal quantity of money is no longer as valuable; it cannot be used to purchase as many real goods or services. To restore their holdings of money in real terms to its former level, people will want to hold a greater nominal quantity of money, so ***a rise in the price level causes the demand for money to increase and the demand curve to shift to the right.***

## Shifts in the Supply of Money

We will assume that the supply of money is completely controlled by the central bank, which in the United States is the Federal Reserve. (Actually, the process that determines the money supply is substantially more complicated and involves banks, depositors, and borrowers from banks. We will study it in more detail later in the book.) For now, all we need to know is that ***an increase in the money supply engineered by the Federal Reserve will shift the supply curve for money to the right.***

## Case

### CHANGES IN THE EQUILIBRIUM INTEREST RATE DUE TO CHANGES IN INCOME, THE PRICE LEVEL, OR THE MONEY SUPPLY

To see how the liquidity preference framework can be used to analyze the movement of interest rates, we will again look at several cases that will be useful in evaluating the effect of monetary policy on interest rates. (As a study aid, Table 1 summarizes the shifts in the demand and supply curves for money.)

#### Changes in Income

When income is rising during a business cycle expansion, we have seen that the demand for money will rise. It is shown in Figure 2 by the shift rightward in the demand curve from  $M_1^d$  to  $M_2^d$ . The new equilibrium is reached at point 2 at the intersection of the  $M_2^d$  curve with the money supply curve  $M^s$ . As you can see, the equilibrium interest rate rises from  $i_1$  to  $i_2$ . The liquidity preference framework thus generates the conclusion that ***when income***

**TABLE 1 SUMMARY** *Factors That Shift the Demand for and Supply of Money*

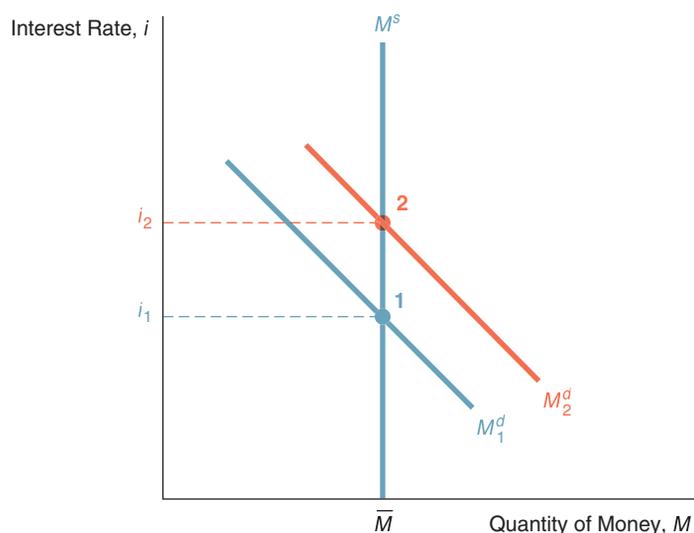
Variable	Change in Variable	Change in Money Demand [ $M^d$ ] or Supply [ $M^s$ ]	Change in Interest Rate	
Income	↑	$M^d \uparrow$	↑	
Price level	↑	$M^d \uparrow$	↑	
Money supply	↑	$M^s \uparrow$	↓	

*Note:* Only increases (↑) in the variables are shown. The effect of decreases in the variables on the change in demand or supply would be the opposite of those indicated in the remaining columns.

**is rising during a business cycle expansion (holding other economic variables constant), interest rates will rise.** This conclusion is unambiguous when contrasted to the conclusion reached about the effects of a change in income on interest rates using the loanable funds framework.

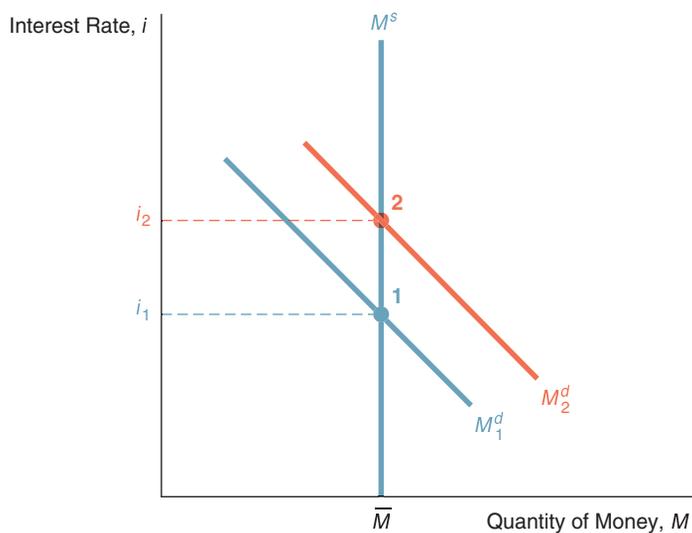
### Changes in the Price Level

When the price level rises, the value of money in terms of what it can purchase is lower. To restore their purchasing power in real terms to its former level, people will want to hold a greater nominal quantity of money. A higher price level shifts the demand curve for money to the right from  $M_1^d$  to  $M_2^d$  (see Figure 3). The equilibrium moves from point 1 to point 2, where the equilibrium interest rate has risen from  $i_1$  to  $i_2$ , illustrating that **when the price level increases, with the supply of money and other economic variables held constant, interest rates will rise.**



**FIGURE 2** *Response to a Change in Income*

In a business cycle expansion, when income is rising, the demand curve shifts from  $M_1^d$  to  $M_2^d$ . The supply curve is fixed at  $M^s = \bar{M}$ . The equilibrium interest rate rises from  $i_1$  to  $i_2$ .

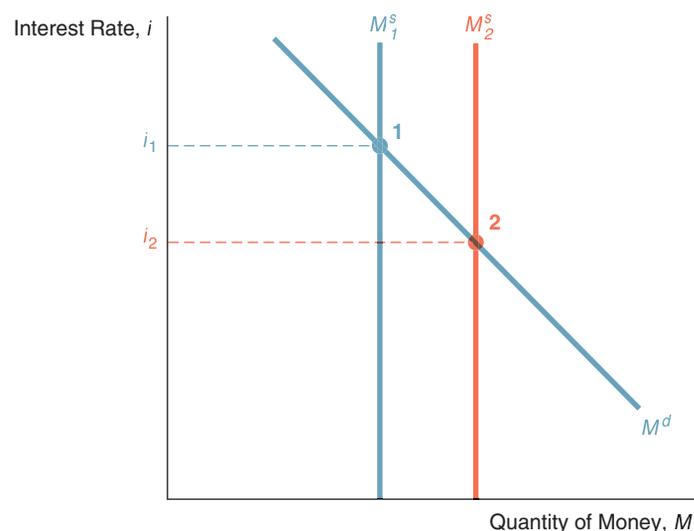


**FIGURE 3** *Response to a Change in the Price Level*

An increase in price level shifts the money demand curve from  $M_1^d$  to  $M_2^d$ , and the equilibrium interest rate rises from  $i_1$  to  $i_2$ .

### Changes in the Money Supply

An increase in the money supply due to expansionary monetary policy by the Federal Reserve implies that the supply curve for money shifts to the right. As is shown in Figure 4 by the movement of the supply curve from  $M_1^s$  to



**FIGURE 4** *Response to a Change in the Money Supply*

When the money supply increases, the supply curve shifts from  $M_1^s$  to  $M_2^s$ , and the equilibrium interest rate falls from  $i_1$  to  $i_2$ .

$M_2^s$ , the equilibrium moves from point 1 down to point 2, where the  $M_2^s$  supply curve intersects with the demand curve  $M^d$  and the equilibrium interest rate has fallen from  $i_1$  to  $i_2$ . **When the money supply increases (everything else remaining equal), interest rates will decline.**<sup>3</sup>

Money supply data, which the Federal Reserve reports at 4:30 p.m. every Thursday, are available online at [www.federalreserve.gov/releases/H6/Current](http://www.federalreserve.gov/releases/H6/Current)

## Case

### MONEY AND INTEREST RATES

The liquidity preference analysis in Figure 4 seems to lead to the conclusion that an increase in the money supply will lower interest rates. This conclusion has important policy implications because it has frequently caused politicians to call for a more rapid growth of the money supply in order to drive down interest rates.

But is this conclusion that money and interest rates should be negatively related correct? Might there be other important factors left out of the liquidity preference analysis in Figure 4 that would reverse this conclusion? We will provide answers to these questions by applying the supply and demand analysis we have learned in this chapter to obtain a deeper understanding of the relationship between money and interest rates.

An important criticism of the conclusion that a rise in the money supply lowers interest rates has been raised by Milton Friedman, a Nobel laureate in economics. He acknowledges that the liquidity preference analysis

<sup>3</sup>This same result can be generated using the loanable funds framework. The primary way that a central bank produces an increase in the money supply is by buying bonds and thereby decreasing the supply of bonds to the public. The resulting shift to the left of the supply curve for bonds will lead to a decline in the equilibrium interest rate.

is correct and calls the result—that an increase in the money supply (*everything else remaining equal*) lowers interest rates—the *liquidity effect*. However, he views the liquidity effect as merely part of the story: An increase in the money supply might not leave “everything else equal” and will have other effects on the economy that may make interest rates rise. If these effects are substantial, it is entirely possible that when the money supply rises, interest rates too may rise.

We have already laid the groundwork to discuss these other effects because we have shown how changes in income, the price level, and expected inflation affect the equilibrium interest rate.

### Study Guide

To get further practice with the loanable funds and liquidity preference frameworks, show how the effects discussed here work by drawing the supply and demand diagrams that explain each effect. This exercise will also improve your understanding of the effect of money on interest rates.

1. *Income effect*. Because an increasing money supply is an expansionary influence on the economy, it should raise national income and wealth. Both the liquidity preference and loanable funds frameworks indicate that interest rates will then rise (see Figure 2). Thus ***the income effect of an increase in the money supply is a rise in interest rates in response to the higher level of income.***
2. *Price-level effect*. An increase in the money supply can also cause the overall price level in the economy to rise. The liquidity preference framework predicts that this will lead to a rise in interest rates. So ***the price-level effect from an increase in the money supply is a rise in interest rates in response to the rise in the price level.***
3. *Expected-inflation effect*. The rising price level (the higher inflation rate) that results from an increase in the money supply also affects interest rates by affecting the expected inflation rate. Specifically, an increase in the money supply may lead people to expect a higher price level in the future—hence the expected inflation rate will be higher. The loanable funds framework has shown us that this increase in expected inflation will lead to a higher level of interest rates. Therefore, ***the expected-inflation effect of an increase in the money supply is a rise in interest rates in response to the rise in the expected inflation rate.***

At first glance it might appear that the price-level effect and the expected-inflation effect are the same thing. They both indicate that increases in the price level induced by an increase in the money supply will raise interest rates. However, there is a subtle difference between the two, and this is why they are discussed as two separate effects.

Suppose that there is a onetime increase in the money supply today that leads to a rise in prices to a permanently higher level by next year. As the price level rises over the course of this year, the interest rate will rise via the price-level effect. Only at the end of the year, when the price level has risen to its peak, will the price-level effect be at a maximum.

The rising price level will also raise interest rates via the expected-inflation effect because people will expect that inflation will be higher over

the course of the year. However, when the price level stops rising next year, inflation and the expected inflation rate will fall back down to zero. Any rise in interest rates as a result of the earlier rise in expected inflation will then be reversed. We thus see that in contrast to the price-level effect, which reaches its greatest impact next year, the expected-inflation effect will have its smallest impact (zero impact) next year. The basic difference between the two effects, then, is that the price-level effect remains even after prices have stopped rising, whereas the expected-inflation effect disappears.

An important point is that the expected-inflation effect will persist only as long as the price level continues to rise. A onetime increase in the money supply will not produce a continually rising price level; only a higher rate of money supply growth will. Thus a higher rate of money supply growth is needed if the expected-inflation effect is to persist.

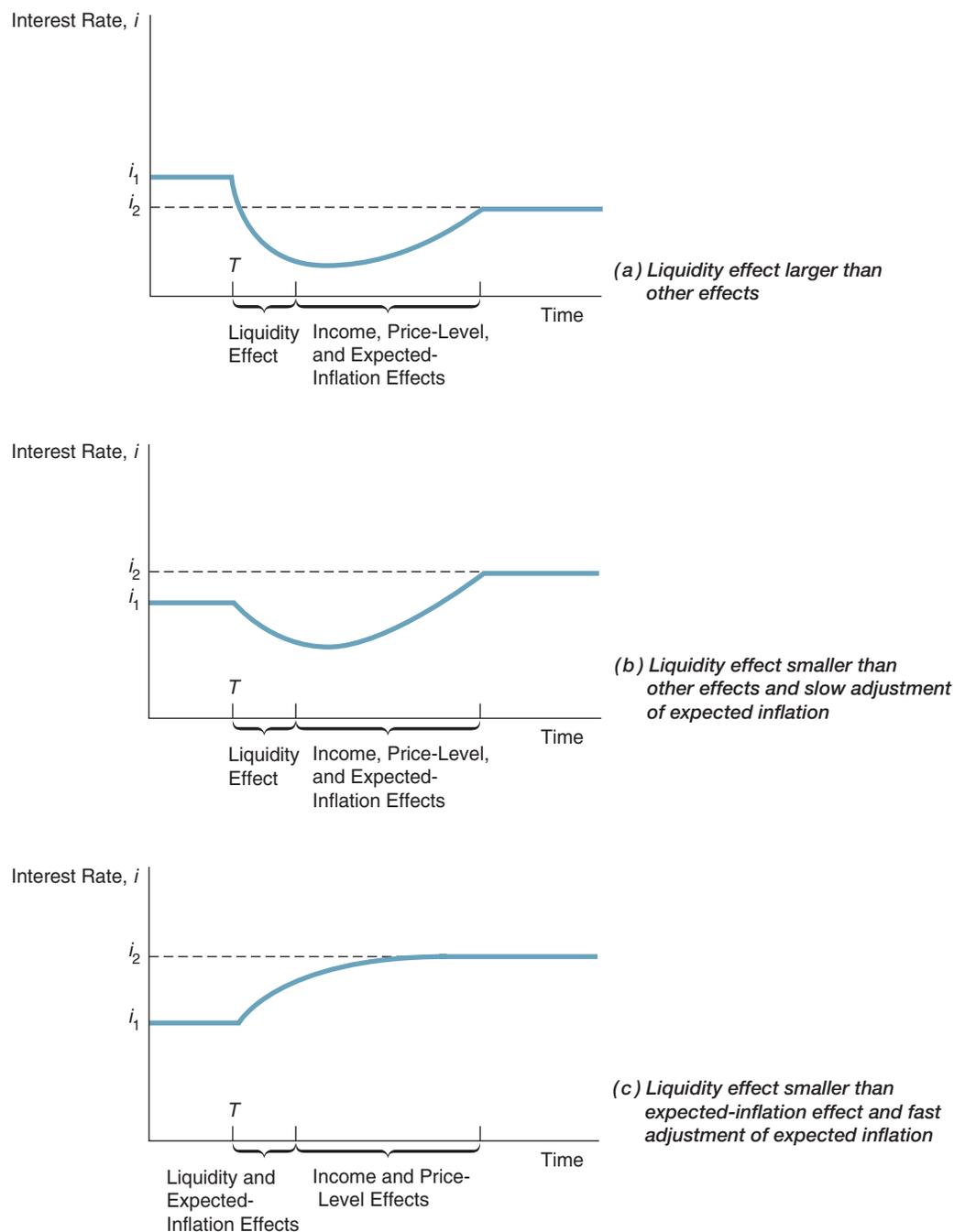
### Does a Higher Rate of Growth of the Money Supply Lower Interest Rates?

We can now put together all the effects we have discussed to help us decide whether our analysis supports the politicians who advocate a greater rate of growth of the money supply when they feel that interest rates are too high. Of all the effects, only the liquidity effect indicates that a higher rate of money growth will cause a decline in interest rates. In contrast, the income, price-level, and expected-inflation effects indicate that interest rates will rise when money growth is higher. Which of these effects are largest, and how quickly do they take effect? The answers are critical in determining whether interest rates will rise or fall when money supply growth is increased.

Generally, the liquidity effect from the greater money growth takes effect immediately because the rising money supply leads to an immediate decline in the equilibrium interest rate. The income and price-level effects take time to work because the increasing money supply takes time to raise the price level and income, which in turn raise interest rates. The expected-inflation effect, which also raises interest rates, can be slow or fast, depending on whether people adjust their expectations of inflation slowly or quickly when the money growth rate is increased.

Three possibilities are outlined in Figure 5; each shows how interest rates respond over time to an increased rate of money supply growth starting at time  $T$ . Panel (a) shows a case in which the liquidity effect dominates the other effects so that the interest rate falls from  $i_1$  at time  $T$  to a final level of  $i_2$ . The liquidity effect operates quickly to lower the interest rate, but as time goes by, the other effects start to reverse some of the decline. Because the liquidity effect is larger than the others, however, the interest rate never rises back to its initial level.

Panel (b) has a lesser liquidity effect than the other effects, with the expected-inflation effect operating slowly because expectations of inflation are slow to adjust upward. Initially, the liquidity effect drives down the interest rate. Then the income, price-level, and expected-inflation effects begin to raise it. Because these effects are dominant, the interest rate eventually rises above its initial level to  $i_2$ . In the short run, lower interest rates result from increased money growth, but eventually they end up climbing above the initial level.



**FIGURE 5** Response over Time to an Increase in Money Supply Growth

Panel (c) has the expected-inflation effect dominating as well as operating rapidly because people quickly raise their expectation of inflation when the rate of money growth increases. The expected-inflation effect begins immediately to overpower the liquidity effect, and the interest rate immediately starts to climb. Over time, as the income and price-level effects start

to take hold, the interest rate rises even higher, and the eventual outcome is an interest rate that is substantially above the initial interest rate. The result shows clearly that increasing money supply growth is not the answer to reducing interest rates but rather that money growth should be reduced in order to lower interest rates!

An important issue for economic policymakers is which of these three scenarios is closest to reality. If a decline in interest rates is desired, then an increase in money supply growth is called for when the liquidity effect dominates the other effects, as in panel (a). A decrease in money growth is appropriate if the other effects dominate the liquidity effect and expectations of inflation adjust rapidly, as in panel (c). If the other effects dominate the liquidity effect but expectations of inflation adjust only slowly, as in panel (b), then whether you want to increase or decrease money growth depends on whether you care more about what happens in the short run or the long run.

Which scenario is supported by the evidence? The relationship of interest rates and money growth from 1950 to 2004 is plotted in Figure 6. When

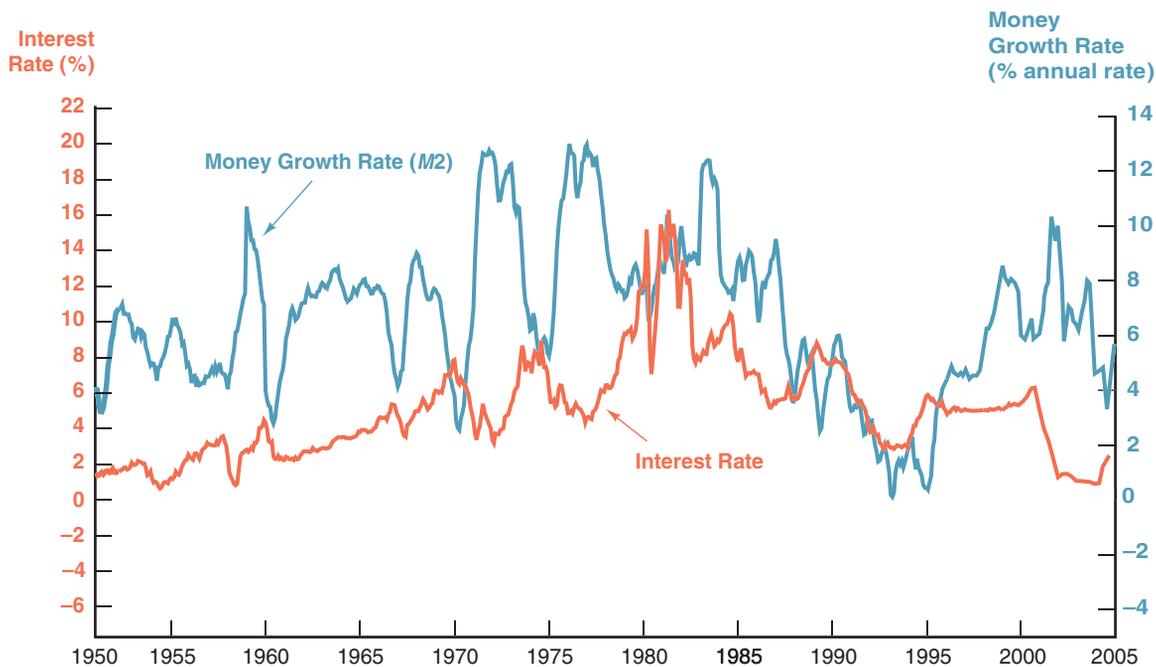


FIGURE 6 Money Growth (M2, Annual Rate) and Interest Rates (Three-Month Treasury Bills), 1950–2004

Sources: Federal Reserve *Bulletin*, various years. Tables 1.1 line 6 and <http://www.federalreserve.gov/releases/H15/data.htm>

the rate of money supply growth began to climb in the mid-1960s, interest rates rose, indicating that the liquidity effect was dominated by the price-level, income, and expected-inflation effects. By the 1970s, interest rates reached levels unprecedented in the period after World War II, as did the rate of money supply growth.

The scenario depicted in panel (a) of Figure 5 seems doubtful, and the case for lowering interest rates by raising the rate of money growth is much weakened. You should not find this too surprising. The rise in the rate of money supply growth in the 1960s and 1970s is matched by a large rise in expected inflation, which would lead us to predict that the expected-inflation effect would be dominant. It is the most plausible explanation for why interest rates rose in the face of higher money growth. However, Figure 6 does not really tell us which one of the two scenarios, panel (b) or panel (c) of Figure 5, is more accurate. It depends critically on how fast people's expectations about inflation adjust. However, recent research using more sophisticated methods than just looking at a graph like Figure 6 does indicate that increased money growth temporarily lowers short-term interest rates.<sup>4</sup>

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<sup>4</sup>See Lawrence J. Christiano and Martin Eichenbaum, "Identification and the Liquidity Effect of a Monetary Policy Shock," in *Business Cycles, Growth, and Political Economy*, ed. Alex Cukierman, Zvi Hercowitz, and Leonardo Leiderman (Cambridge, Mass.: MIT Press, 1992), pp. 335–370; Eric M. Leeper and David B. Gordon, "In Search of the Liquidity Effect," *Journal of Monetary Economics* 29 (1992): 341–370; Steven Strongin, "The Identification of Monetary Policy Disturbances: Explaining the Liquidity Puzzle," *Journal of Monetary Economics* 35 (1995): 463–497; and Adrian Pagan and John C. Robertson, "Resolving the Liquidity Effect," *Federal Reserve Bank of St. Louis Review* 77 (May–June 1995): 33–54.