Chapter 26

Transmission Mechanisms of Monetary Policy: The Evidence

PREVIEW

Since 1980, the U.S. economy has been on a roller coaster, with output, unemployment, and inflation undergoing drastic fluctuations. At the start of the 1980s, inflation was running at double-digit levels, and the recession of 1980 was followed by one of the shortest economic expansions on record. After a year, the economy plunged into the 1981–1982 recession, the most severe economic contraction in the postwar era—the unemployment rate climbed to over 10%, and only then did the inflation rate begin to come down to below the 5% level. The 1981–1982 recession was then followed by a long economic expansion that reduced the unemployment rate to below 6% in the 1987–1990 period. With Iraq's invasion of Kuwait and a rise in oil prices in the second half of 1990, the economy again plunged into recession. Subsequent growth in the economy was sluggish at first but eventually sped up, lowering the unemployment rate to below 5% in the late 1990s. In March 2001, the economy slipped into recession, with the unemployment rate climbing to around 6%. In light of large fluctuations in aggregate output (reflected in the unemployment rate) and inflation, and the economic instability that accompanies them, policymakers face the following dilemma: What policy or policies, if any, should be implemented to reduce output and inflation fluctuations in the future?

To answer this question, monetary policymakers must have an accurate assessment of the timing and effect of their policies on the economy. To make this assessment, they need to understand the mechanisms through which monetary policy affects the economy. In this chapter, we examine empirical evidence on the effect of monetary policy on economic activity. We first look at a framework for evaluating empirical evidence and then use this framework to understand why there are still deep disagreements on the importance of monetary policy to the economy. We then go on to examine the transmission mechanisms of monetary policy and evaluate the empirical evidence on them to better understand the role that monetary policy plays in the economy. We will see that these monetary transmission mechanisms emphasize the link between the financial system (which we studied in the first three parts of this book) and monetary theory, the subject of this part.

Framework for Evaluating Empirical Evidence

To develop a framework for understanding how to evaluate empirical evidence, we need to recognize that there are two basic types of empirical evidence in economics and other scientific disciplines: **Structural model evidence** examines whether one

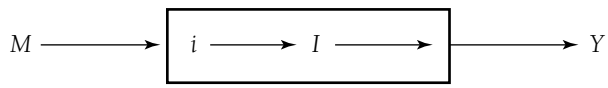
variable affects another by using data to build a model that explains the channels through which this variable affects the other; **reduced-form evidence** examines whether one variable has an effect on another simply by looking directly at the relationship between the two variables.

Suppose that you were interested in whether drinking coffee leads to heart disease. Structural model evidence would involve developing a model that analyzed data on how coffee is metabolized by the human body, how it affects the operation of the heart, and how its effects on the heart lead to heart attacks. Reduced-form evidence would involve looking directly at whether coffee drinkers tend to experience heart attacks more frequently than non–coffee drinkers.

How you look at the evidence—whether you focus on structural model evidence or reduced-form evidence—can lead to different conclusions. This is particularly true for the debate between monetarists and Keynesians. Monetarists tend to focus on reduced-form evidence and feel that changes in the money supply are more important to economic activity than Keynesians do; Keynesians, for their part, focus on structural model evidence. To understand the differences in their views about the importance of monetary policy, we need to look at the nature of the two types of evidence and the advantages and disadvantages of each.

Structural Model Evidence

The Keynesian analysis discussed in Chapter 25 is specific about the channels through which the money supply affects economic activity (called the **transmission mechanisms of monetary policy**). Keynesians typically examine the effect of money on economic activity by building a **structural model**, a description of how the economy operates using a collection of equations that describe the behavior of firms and consumers in many sectors of the economy. These equations then show the channels through which monetary and fiscal policy affect aggregate output and spending. A Keynesian structural model might have behavioral equations that describe the workings of monetary policy with the following schematic diagram:



The model describes the transmission mechanism of monetary policy as follows: The money supply M affects interest rates i, which in turn affect investment spending I, which in turn affects aggregate output or aggregate spending Y. The Keynesians examine the relationship between M and Y by looking at empirical evidence (structural model evidence) on the specific channels of monetary influence, such as the link between interest rates and investment spending.

Reduced-Form Evidence

Monetarists do not describe specific ways in which the money supply affects aggregate spending. Instead, they examine the effect of money on economic activity by looking at whether movements in Y are tightly linked to (have a high correlation with) movements in M. Using reduced-form evidence, monetarists analyze the effect of M on Y as if the economy were a black box whose workings cannot be seen. The monetarist way of looking at the evidence can be represented by the following schematic diagram, in which the economy is drawn as a black box with a question mark:

Now that we have seen how monetarists and Keynesians look at the empirical evidence on the link between money and economic activity, we can consider the advantages and disadvantages of their approaches.

Advantages and Disadvantages of Structural Model Evidence

The structural model approach, used primarily by Keynesians, has the advantage of giving us an understanding of how the economy works. If the structure is correct—if it contains all the transmission mechanisms and channels through which monetary and fiscal policy can affect economic activity, the structural model approach has three major advantages over the reduced-form approach.

1. Because we can evaluate each transmission mechanism separately to see whether it is plausible, we will obtain more pieces of evidence on whether money has an important effect on economic activity. If we find important effects of monetary policy on economic activity, for example, we will have more confidence that changes in monetary policy actually cause the changes in economic activity; that is, we will have more confidence on the direction of causation between *M* and *Y*.

2. Knowing how changes in monetary policy affect economic activity may help us predict the effect of *M* on *Y* more accurately. For example, expansions in the money supply might be found to be less effective when interest rates are low. Then, when interest rates are higher, we would be able to predict that an expansion in the money supply would have a larger impact on *Y* than would otherwise be the case.

3. By knowing how the economy operates, we may be able to predict how institutional changes in the economy might affect the link between *M* and *Y*. For instance, before 1980, when Regulation Q was still in effect, restrictions on interest payments on savings deposits meant that the average consumer would not earn more on savings when interest rates rose. Since the termination of Regulation Q, the average consumer now earns more on savings when interest rates rise. If we understand how earnings on savings affect consumer spending, we might be able to say that a change in monetary policy, which affects interest rates, will have a different effect today than it would have had before 1980. Because of the rapid pace of financial innovation, the advantage of being able to predict how institutional changes affect the link between *M* and *Y* may be even more important now than in the past.

These three advantages of the structural model approach suggest that this approach is better than the reduced-form approach *if we know the correct structure of the model.* Put another way, structural model evidence is only as good as the structural model it is based on; it is best only if all the transmission mechanisms are fully understood. This is a big *if*, as failing to include one or two relevant transmission mechanisms for monetary policy in the structural model might result in a serious underestimate of the impact of *M* on *Y*.

Monetarists worry that many Keynesian structural models may ignore the transmission mechanisms for monetary policy that are most important. For example, if the most important monetary transmission mechanisms involve consumer spending rather than investment spending, the Keynesian structural model (such as the $M\uparrow \Rightarrow i\downarrow \Rightarrow I\uparrow \Rightarrow Y\uparrow$ model we used earlier), which focuses on investment spending for its monetary transmission mechanism, may underestimate the importance of money to economic activity. In other words, monetarists reject the interpretation of evidence from many Keynesian structural models because they believe that the channels of monetary influence are too narrowly defined. In a sense, they accuse Keynesians of wearing blinders that prevent them from recognizing the full importance of monetary policy.

Advantages and Disadvantages of Reduced-Form Evidence

The main advantage of reduced-form evidence over structural model evidence is that no restrictions are imposed on the way monetary policy affects the economy. If we are not sure that we know what all the monetary transmission mechanisms are, we may be more likely to spot the full effect of M on Y by looking at whether movements in Y correlate highly with movements in M. Monetarists favor reduced-form evidence, because they believe that the particular channels through which changes in the money supply affect Y are diverse and continually changing. They contend that it may be too difficult to identify all the transmission mechanisms of monetary policy.

The most notable objection to reduced-form evidence is that it may misleadingly suggest that changes in M cause changes in Y when that is not the case. A basic principle applicable to all scientific disciplines, including economics, states that ***correlation does not necessarily imply causation.*** That movement of one variable is linked to another doesn't necessarily mean that one variable *causes* the other.

Suppose, for example, you notice that wherever criminal activity abounds, more police patrol the street. Should you conclude from this evidence that police patrols cause criminal activity and recommend pulling police off the street to lower the crime rate? The answer is clearly no, because police patrols do not cause criminal activity; criminal activity causes police patrols. This situation is called **reverse causation** and can produce misleading conclusions when interpreting correlations (see Box 1).

The reverse causation problem may be present when examining the link between money and aggregate output or spending. Our discussion of the conduct of monetary policy in Chapter 18 suggested that when the Federal Reserve has an interest-rate or a free reserves target, higher output may lead to a higher money supply. If most of the correlation between M and Y occurs because of the Fed's interest-rate target, controlling the money supply will not help control aggregate output, because it is actually Y that is causing M rather than the other way around.

Another facet of the correlation–causation question is that an outside factor, yet unknown, could be the driving force behind two variables that move together. Coffee drinking might be associated with heart disease not because coffee drinking causes heart attacks but because coffee drinkers tend to be people who are under a lot of stress and the stress causes heart attacks. Getting people to stop drinking coffee, then, would not lower the incidence of heart disease. Similarly, if there is an unknown outside factor that causes M and Y to move together, controlling M will not improve control of Y. (The perils of ignoring an outside driving factor are illustrated in Box 2.)

Box 1

Perils of Reverse Causation

A Russian Folk Tale. A Russian folk tale illustrates the problems that can arise from reverse causation. As the story goes, there once was a severe epidemic in the Russian countryside and many doctors were sent to the towns where the epidemic was at its worst. The peasants in the towns noticed that wherever doctors went, many people were dying. So to reduce the death rate, they killed all the doctors.

Were the peasants better off? Clearly not.

Box 2

Perils of Ignoring an Outside Driving Factor

How to Lose a Presidential Election. Ever since Muncie, Indiana, was dubbed "Middletown" by two sociology studies over half a century ago, it has produced a vote for president that closely mirrors the national vote; that is, in every election, there has been a very high correlation between Muncie's vote and the national vote. Noticing this, a political adviser to a presidential candidate recommends that the candidate's election will be assured if *all* the candidate's campaign funds are spent in Muncie. Should the presidential candidate promote or fire this adviser? Why?

It is very unlikely that the vote in a small town like Muncie drives the vote in a national election. Rather, it is more likely that national preferences are a third driving factor that determines the vote in Muncie and also determines the vote in the national election. Changing the vote in Muncie will thus only break the relationship between that town's vote and national preferences and will have almost no impact on the election. Spending all the campaign money on this town will therefore be a waste of money.

The presidential candidate should definitely fire the adviser.

Conclusions

No clear-cut case can be made that reduced-form evidence is preferable to structural model evidence or vice versa. The structural model approach, used primarily by Keynesians, offers an understanding of how the economy works. If the structure is correct, it predicts the effect of monetary policy more accurately, allows predictions of the effect of monetary policy when institutions change, and provides more confidence in the direction of causation between M and Y. If the structure of the model is not correctly specified because it leaves out important transmission mechanisms of monetary policy, it could be very misleading.

The reduced-form approach, used primarily by monetarists, does not restrict the way monetary policy affects the economy and may be more likely to spot the full effect of M on Y. However, reduced-form evidence cannot rule out reverse causation, whereby changes in output cause changes in money, or the possibility that an outside factor drives changes in both output and money. A high correlation of money and output might then be misleading, because controlling the money supply would not help control the level of output.

Armed with the framework to evaluate empirical evidence we have outlined here, we can now use it to evaluate the empirical debate between monetarists and Keynesians on the importance of money to the economy.

Early Keynesian Evidence on the Importance of Money

Although Keynes proposed his theory for analyzing aggregate economic activity in 1936, his views reached their peak of popularity among economists in the 1950s and early 1960s, when the majority of economists had accepted his framework. Although Keynesians currently believe that monetary policy has important effects on economic activity, the early Keynesians of the 1950s and early 1960s characteristically held the

view that *monetary policy does not matter at all* to movements in aggregate output and hence to the business cycle.

Their belief in the ineffectiveness of monetary policy stemmed from three pieces of structural model evidence:

1. During the Great Depression, interest rates on U.S. Treasury securities fell to extremely low levels; the three-month Treasury bill rate, for example, declined to below 1%. Early Keynesians viewed monetary policy as affecting aggregate demand solely through its effect on nominal interest rates, which in turn affect investment spending; they believed that low interest rates during the depression indicated that monetary policy was easy (expansionary) because it encouraged investment spending and so could not have played a contractionary role during this period. Seeing that monetary policy was not capable of explaining why the worst economic contraction in U.S. history had taken place, they concluded that changes in the money supply have no effect on aggregate output—in other words, that money doesn't matter.
2. Early empirical studies found no linkage between movements in nominal interest rates and investment spending. Because early Keynesians saw this link as the channel through which changes in the money supply affect aggregate demand, finding that the link was weak also led them to the conclusion that changes in the money supply have no effect on aggregate output.
3. Surveys of businesspeople revealed that their decisions on how much to invest in new physical capital were not influenced by market interest rates. This evidence further confirmed that the link between interest rates and investment spending was weak, strengthening the conclusion that money doesn't matter. The result of this interpretation of the evidence was that most economists paid only scant attention to monetary policy until the mid-1960s.

Study Guide

Before reading about the objections that were raised against early Keynesian interpretations of the evidence, use the ideas on the disadvantages of structural model evidence to see if you can come up with some objections yourself. This will help you learn to apply the principles of evaluating evidence discussed earlier.

Objections to Early Keynesian Evidence

While Keynesian economics was reaching its ascendancy in the 1950s and 1960s, a small group of economists at the University of Chicago, led by Milton Friedman, adopted what was then the unfashionable view that money *does* matter to aggregate demand. Friedman and his disciples, who later became known as *monetarists*, objected to the early Keynesian interpretation of the evidence on the grounds that the structural model used by the early Keynesians was severely flawed. Because structural model evidence is only as good as the model it is based on, the monetarist critique of this evidence needs to be taken seriously.

In 1963, Friedman and Anna Schwartz published their classic monetary history of the United States, which showed that contrary to the early Keynesian beliefs, monetary policy during the Great Depression was not easy; indeed, it had never been more contractionary.[1] Friedman and Schwartz documented the massive bank failures of this

[1]Milton Friedman and Anna Jacobson Schwartz, *A Monetary History of the United States, 1867–1960* (Princeton, N.J.: Princeton University Press, 1963).

period and the resulting decline in the money supply—the largest ever experienced in the United States (see Chapter 16). Hence monetary policy could explain the worst economic contraction in U.S. history, and the Great Depression could not be singled out as a period that demonstrates the ineffectiveness of monetary policy.

A Keynesian could still counter Friedman and Schwartz's argument that money was contractionary during the Great Depression by citing the low level of interest rates. But were these interest rates really so low? Referring to Figure 1 in Chapter 6, you will note that although interest rates on U.S. Treasury securities and high-grade corporate bonds were low during the Great Depression, interest rates on lower-grade bonds, such as Baa corporate bonds, rose to unprecedented high levels during the sharpest part of the contraction phase (1930–1933). By the standard of these lower-grade bonds, then, interest rates were high and monetary policy was tight.

There is a moral to this story. Although much aggregate economic analysis proceeds as though there is only *one* interest rate, we must always be aware that there are *many* interest rates, which may tell different stories. During normal times, most interest rates move in tandem, so lumping them all together and looking at one representative interest rate may not be too misleading. But that is not always so. Unusual periods (like the Great Depression), when interest rates on different securities begin to diverge, do occur. This is exactly the kind of situation in which a structural model (like the early Keynesians') that looks at only the interest rates on a low-risk security such as a U.S. Treasury bill or bond can be very misleading.

There is a second, potentially more important reason why the early Keynesian structural model's focus on nominal interest rates provides a misleading picture of the tightness of monetary policy during the Great Depression. In a period of deflation, when there is a declining price level, low *nominal* interest rates do not necessarily indicate that the cost of borrowing is low and that monetary policy is easy—in fact, the cost of borrowing could be quite high. If, for example, the public expects the price level to decline at a 10% rate, then even though nominal interest rates are at zero, the real cost of borrowing would be as high as 10%. (Recall from Chapter 4 that the real interest rate equals the nominal interest rate, 0, minus the expected rate of inflation, −10%, so the real interest rate equals $0 - (-10\%) = 10\%$.)

You can see in Figure 1 that this is exactly what happened during the Great Depression: Real interest rates on U.S. Treasury bills were far higher during the 1931–1933 contraction phase of the depression than was the case throughout the next 40 years.[2] As a result, movements of *real* interest rates indicate that, contrary to the early Keynesians' beliefs, monetary policy was extremely tight during the Great Depression. Because an important role for monetary policy during this depressed period could no longer be ruled out, most economists were forced to rethink their position regarding whether money matters.

Monetarists also objected to the early Keynesian structural model's view that a weak link between nominal interest rates and investment spending indicates that investment spending is unaffected by monetary policy. A weak link between *nominal*

[2]In the 1980s, real interest rates rose to exceedingly high levels, approaching those of the Great Depression period. Research has tried to explain this phenomenon, some of which points to monetary policy as the source of high real rates in the 1980s. For example, see Oliver J. Blanchard and Lawrence H. Summers, "Perspectives on High World Interest Rates," *Brookings Papers on Economic Activity* 2 (1984): 273–324; and John Huizinga and Frederic S. Mishkin, "Monetary Policy Regime Shifts and the Unusual Behavior of Real Interest Rates," *Carnegie-Rochester Conference Series on Public Policy* 24 (1986): 231–274.

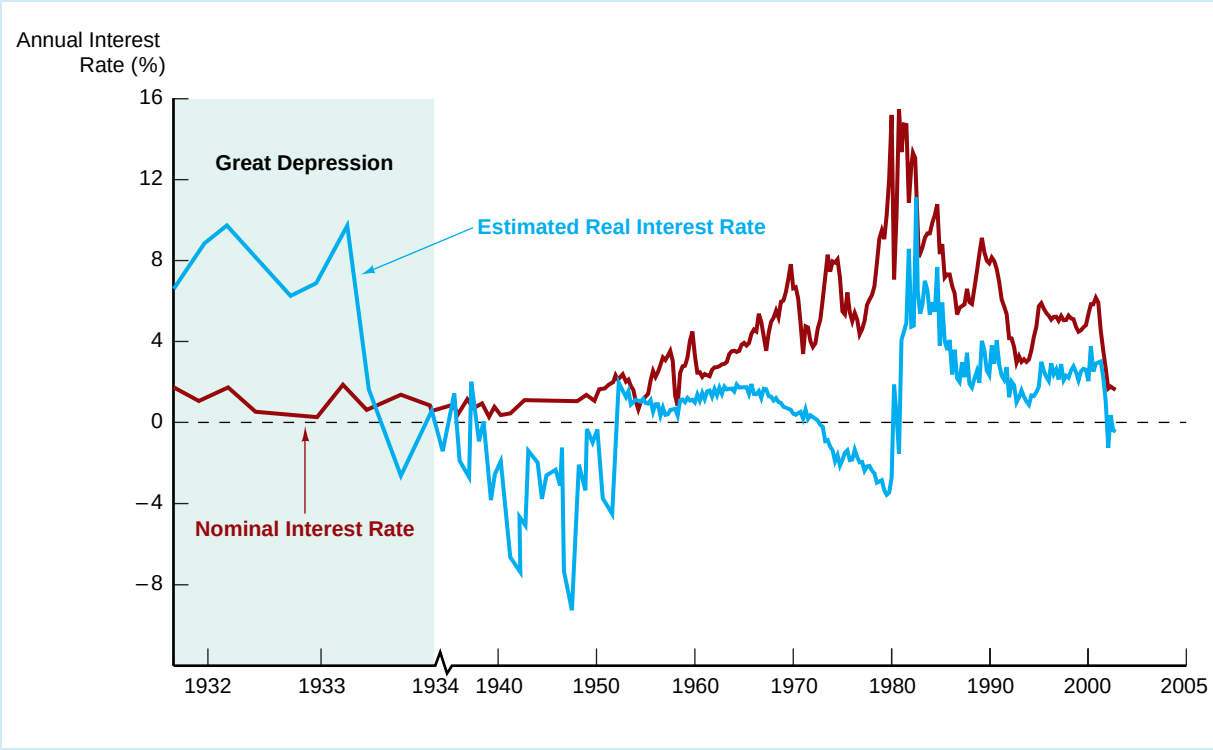


FIGURE 1 Real and Nominal Interest Rates on Three-Month Treasury Bills, 1931–2002

Sources: Nominal rates from www.federalreserve.gov/releases/h15/update/. The real rate is constructed using the procedure outlined in Frederic S. Mishkin, "The Real Interest Rate: An Empirical Investigation," *Carnegie-Rochester Conference Series on Public Policy* 15 (1981): 151–200. This involves estimating expected inflation as a function of past interest rates, inflation, and time trends and then subtracting the expected inflation measure from the nominal interest rate.

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Click on "charts and data," then on "nominal versus real market rates" to find up-to-the-minute data showing the spread between real rates and nominal rates.

interest rates and investment spending does not rule out a strong link between *real* interest rates and investment spending. As depicted in Figure 1, nominal interest rates are often a very misleading indicator of real interest rates—not only during the Great Depression, but in later periods as well. Because real interest rates more accurately reflect the true cost of borrowing, they should be more relevant to investment decisions than nominal interest rates. Accordingly, the two pieces of early Keynesian evidence indicating that nominal interest rates have little effect on investment spending do not rule out a strong effect of changes in the money supply on investment spending and hence on aggregate demand.

Monetarists also assert that interest-rate effects on investment spending might be only one of many channels through which monetary policy affects aggregate demand. Monetary policy could then have a major impact on aggregate demand even if interest-rate effects on investment spending are small, as was suggested by the early Keynesians.

Study Guide

As you read the monetarist evidence presented in the next section, again try to think of objections to the evidence. This time use the ideas on the disadvantages of reduced-form evidence.

Early Monetarist Evidence on the Importance of Money

In the early 1960s, Milton Friedman and his followers published a series of studies based on reduced-form evidence that promoted the case for a strong effect of money on economic activity. In general, reduced-form evidence can be broken down into three categories: *timing evidence*, which looks at whether the movements in one variable typically occur before another; *statistical evidence*, which performs formal statistical tests on the correlation of the movements of one variable with another; and *historical evidence*, which examines specific past episodes to see whether movements in one variable appear to cause another. Let's look at the monetarist evidence on the importance of money that falls into each of these three categories.

Timing Evidence

Monetarist timing evidence reveals how the rate of money supply growth moves relative to the business cycle. The evidence on this relationship was first presented by Friedman and Schwartz in a famous paper published in 1963.[3] Friedman and Schwartz found that in every business cycle over nearly a century that they studied, the money growth rate always turned down before output did. On average, the peak in the rate of money growth occurred 16 months before the peak in the level of output. However, this lead time could vary, ranging from a few months to more than two years. The conclusion that these authors reached on the basis of this evidence is that money growth causes business cycle fluctuations, but its effect on the business cycle operates with "long and variable lags."

Timing evidence is based on the philosophical principle first stated in Latin as *post hoc, ergo propter hoc*, which means that if one event occurs after another, the second event must have been caused by the first. This principle is valid only if we know that the first event is an *exogenous* event, an event occurring as a result of an independent action that could not possibly be caused by the event following it or by some outside factor that might affect both events. If the first event is exogenous, when the second event follows the first we can be more confident that the first event is causing the second.

An example of an exogenous event is a controlled experiment. A chemist mixes two chemicals; suddenly his lab blows up and he with it. We can be absolutely sure that the cause of his demise was the act of mixing the two chemicals together. The principle of *post hoc, ergo propter hoc* is extremely useful in scientific experimentation.

Unfortunately, economics does not enjoy the precision of hard sciences like physics or chemistry. Often we cannot be sure that an economic event, such as a decline in the rate of money growth, is an exogenous event—it could have been caused, itself, by an outside factor or by the event it is supposedly causing. When another event (such as a decline in output) typically follows the first event (a decline in money growth), we cannot conclude with certainty that one caused the other. Timing evidence is clearly of a reduced-form nature because it looks directly at the relationship of the movements of two variables. Money growth could lead output, or both could be driven by an outside factor.

Because timing evidence is of a reduced-form nature, there is also the possibility of reverse causation, in which output growth causes money growth. How can this

[3]Milton Friedman and Anna Jacobson Schwartz, "Money and Business Cycles," *Review of Economics and Statistics* 45, Suppl. (1963): 32–64.

reverse causation occur while money growth still leads output? There are several ways in which this can happen, but we will deal with just one example.[4]

Suppose that you are in a hypothetical economy with a very regular business cycle movement, plotted in panel (a) of Figure 2, that is four years long (four years from peak to peak). Let's assume that in our hypothetical economy, there is reverse causation from output to the money supply, so movements in the money supply and output are perfectly correlated; that is, the money supply M and output Y move upward and downward at the same time. The result is that the peaks and troughs of the M and Y series in panels (a) and (b) occur at exactly the same time; therefore, no lead or lag relationship exists between them.

Now let's construct the rate of money supply growth from the money supply series in panel (b). This is done in panel (c). What is the rate of growth of the money supply at its peaks in years 1 and 5? At these points, it is not growing at all; the rate of growth is zero. Similarly, at the trough in year 3, the growth rate is zero. When the money supply is declining from its peak in year 1 to its trough in year 3, it has a negative growth rate, and its decline is fastest sometime between years 1 and 3 (year 2). Translating to panel (c), the rate of money growth is below zero from years 1 to 3, with its most negative value reached at year 2. By similar reasoning, you can see that the growth rate of money is positive in years 0 to 1 and 3 to 5, with the highest values reached in years 0 and 4. When we connect all these points together, we get the money growth series in panel (c), in which the peaks are at years 0 and 4, with a trough in year 2.

Now let's look at the relationship of the money growth series of panel (c) with the level of output in panel (a). As you can see, the money growth series consistently has its peaks and troughs exactly one year before the peaks and troughs of the output series. We conclude that in our hypothetical economy, the rate of money growth always decreases one year before output does. This evidence does not, however, imply that money growth *drives* output. In fact, by assumption, we know that this economy is one in which causation actually runs from output to the level of money supply, and there is no lead or lag relationship between the two. Only by our judicious choice of using the *growth rate* of the money supply rather than its *level* have we found a leading relationship.

This example shows how easy it is to misinterpret timing relationships. Furthermore, by searching for what we hope to find, we might focus on a variable, such as a growth rate, rather than a level, which suggests a misleading relationship. Timing evidence can be a dangerous tool for deciding on causation.

Stated even more forcefully, "one person's lead is another person's lag." For example, you could just as easily interpret the relationship of money growth and output in Figure 2 to say that the money growth rate lags output by three years—after all, the peaks in the money growth series occur three years after the peaks in the output series. In short, you could say that output leads money growth.

www.economagic.com/bci_97.htm

A site with extensive data on the factors that define business cycles.

We have seen that timing evidence is extremely hard to interpret. Unless we can be sure that changes in the leading variable are exogenous events, we cannot be sure that the leading variable is actually causing the following variable. And it is all too easy to

[4] A famous article by James Tobin, "Money and Income: *Post Hoc, Ergo Propter Hoc,*" *Quarterly Journal of Economics* 84 (1970): 301–317, describes an economic system in which changes in aggregate output cause changes in the growth rate of money but changes in the growth rate of money have no effect on output. Tobin shows that such a system with reverse causation could yield timing evidence similar to that found by Friedman and Schwartz.

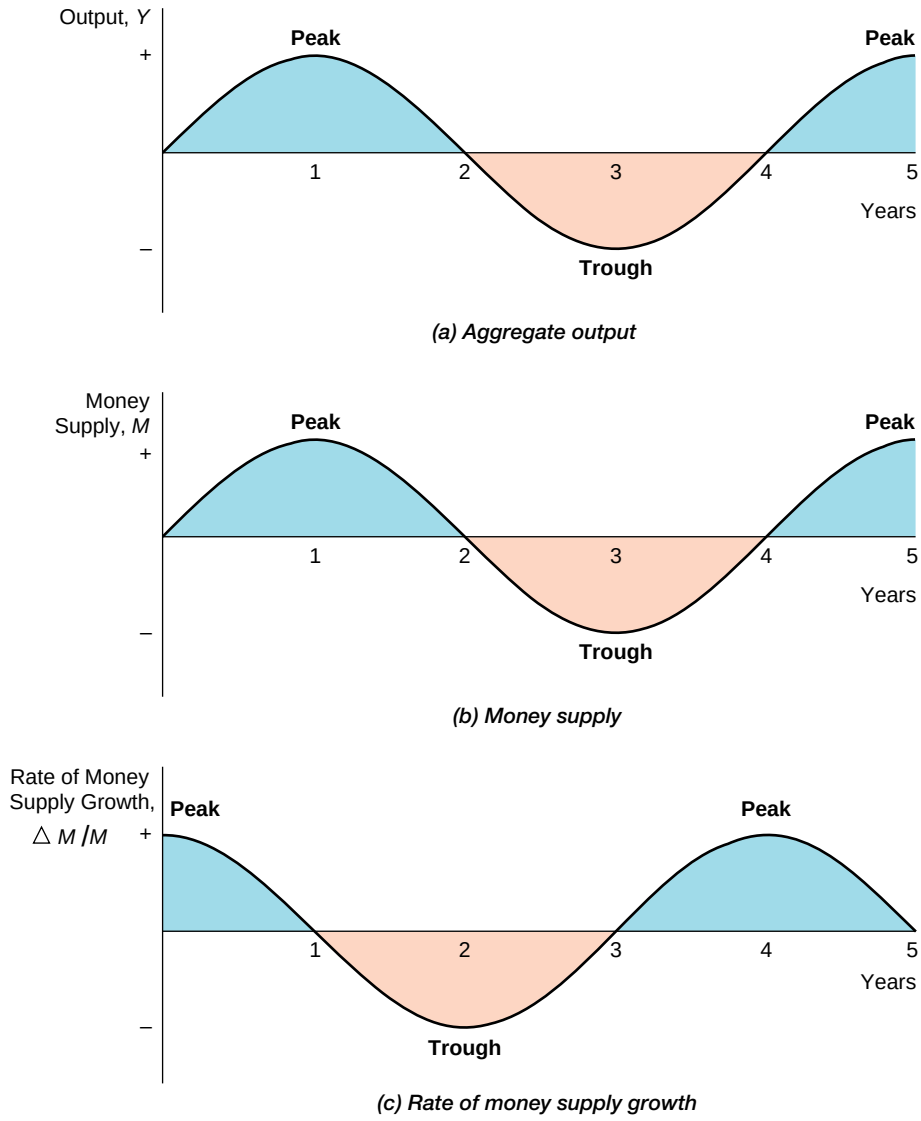

FIGURE 2 Hypothetical Example in Which Money Growth Leads Output

Although neither M nor Y leads the other (that is, their peaks and troughs coincide), $\Delta M/M$ has its peaks and troughs one year ahead of M and Y, thus leading both series. (Note that M and Y in the panels are drawn as movements around a positive average value; a plus sign indicates a value above the average, and a minus sign indicates a value below the average, not a negative value.)

find what we seek when looking for timing evidence. Perhaps the best way of describing this danger is to say that "timing evidence may be in the eyes of the beholder."

Statistical Evidence

Monetarist statistical evidence examines the correlations between money and aggregate output or aggregate spending by performing formal statistical tests. Again in

1963 (obviously a vintage year for the monetarists), Milton Friedman and David Meiselman published a paper that proposed the following test of a monetarist model against a Keynesian model.[5] In the Keynesian framework, investment and government spending are sources of fluctuations in aggregate demand, so Friedman and Meiselman constructed a "Keynesian" autonomous expenditure variable A equal to investment spending plus government spending. They characterized the Keynesian model as saying that A should be highly correlated with aggregate spending Y, while the money supply M should not. In the monetarist model, the money supply is the source of fluctuations in aggregate spending, and M should be highly correlated with Y, while A should not.

A logical way to find out which model is better would be to see which is more highly correlated with Y: M or A. When Friedman and Meiselman conducted this test for many different periods of U.S. data, they discovered that *the monetarist model wins!*[6] They concluded that monetarist analysis gives a better description than Keynesian analysis of how aggregate spending is determined.

Several objections were raised against the Friedman-Meiselman evidence:

1. The standard criticisms of this reduced-form evidence are the ones we have already discussed: Reverse causation could occur, or an outside factor might drive both series.

2. The test may not be fair because the Keynesian model is characterized too simplistically. Keynesian structural models commonly include hundreds of equations. The one-equation Keynesian model that Friedman-Meiselman tested may not adequately capture the effects of autonomous expenditure. Furthermore, Keynesian models usually include the effects of other variables. By ignoring them, the effect of monetary policy might be overestimated and the effect of autonomous expenditure underestimated.

3. The Friedman-Meiselman measure of autonomous expenditure A might be constructed poorly, preventing the Keynesian model from performing well. For example, orders for military hardware affect aggregate demand before they appear as spending in the autonomous expenditure variable that Friedman and Meiselman used. A more careful construction of the autonomous expenditure variable should take account of the placing of orders for military hardware. When the autonomous expenditure variable was constructed more carefully by critics of the Friedman-Meiselman study, they found that the results were reversed: The Keynesian model won.[7] A more recent postmortem on the appropriateness of various ways of determining autonomous expenditure does not give a clear-cut victory to either the Keynesian or the monetarist model.[8]

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[5]Milton Friedman and David Meiselman, "The Relative Stability of Monetary Velocity and the Investment Multiplier," in *Stabilization Policies,* ed. Commission on Money and Credit (Upper Saddle River, N.J.: Prentice-Hall, 1963), pp. 165–268.

[6]Friedman and Meiselman did not actually run their tests using the Y variable because they felt that this gave an unfair advantage to the Keynesian model in that A is included in Y. Instead, they subtracted A from Y and tested for the correlation of $Y - A$ with M or A.

[7]See, for example, Albert Ando and Franco Modigliani, "The Relative Stability of Monetary Velocity and the Investment Multiplier," *American Economic Review* 55 (1965): 693–728.

[8]See William Poole and Edith Kornblith, "The Friedman-Meiselman CMC Paper: New Evidence on an Old Controversy," *American Economic Review* 63 (1973): 908–917.

Historical Evidence

The monetarist historical evidence found in Friedman and Schwartz's *A Monetary History*, has been very influential in gaining support for the monetarist position. We have already seen that the book was extremely important as a criticism of early Keynesian thinking, showing as it did that the Great Depression was not a period of easy monetary policy and that the depression could be attributed to the sharp decline in the money supply from 1930 to 1933 resulting from bank panics. In addition, the book documents in great detail that the growth rate of money leads business cycles, because it declines before every recession. This timing evidence is, of course, subject to all the criticisms raised earlier.

The historical evidence contains one feature, however, that makes it different from other monetarist evidence we have discussed so far. Several episodes occur in which changes in the money supply appear to be exogenous events. These episodes are almost like controlled experiments, so the *post hoc, ergo propter hoc* principle is far more likely to be valid: If the decline in the growth rate of the money supply is soon followed by a decline in output in these episodes, much stronger evidence is presented that money growth is the driving force behind the business cycle.

One of the best examples of such an episode is the increase in reserve requirements in 1936–1937 (discussed in Chapter 18), which led to a sharp decline in the money supply and in its rate of growth. The increase in reserve requirements was implemented because the Federal Reserve wanted to improve its control of monetary policy; it was not implemented in response to economic conditions. We can thus rule out reverse causation from output to the money supply. Also, it is hard to think of an outside factor that could have driven the Fed to increase reserve requirements and that could also have directly affected output. Therefore, the decline in the money supply in this episode can probably be classified as an exogenous event with the characteristics of a controlled experiment. Soon after this experiment, the very severe recession of 1937–1938 occurred. We can conclude with confidence that in this episode, the change in the money supply due to the Fed's increase in reserve requirements was indeed the source of the business cycle contraction that followed.

A Monetary History also documents other historical episodes, such as the bank panic of 1907 and other years in which the decline in money growth again appears to have been an exogenous event. The fact that recessions have frequently followed apparently exogenous declines in money growth is very strong evidence that changes in the growth rate of the money supply do have an impact on aggregate output. Recent work by Christina and David Romer, both of the University of California, Berkeley, applies the historical approach to more recent data using more sophisticated statistical techniques and also finds that monetary policy shifts have had an important impact on the aggregate economy.[9]

Overview of the Monetarist Evidence

Where does this discussion of the monetarist evidence leave us? We have seen that because of reverse causation and outside-factor possibilities, there are some serious doubts about the conclusions that can be drawn from timing and statistical evidence alone. However, some of the historical evidence in which exogenous declines in

[9] Christina Romer and David Romer, "Does Monetary Policy Matter? A New Test in the Spirit of Friedman and Schwartz," *NBER Macroeconomics Annual, 1989,* 4, ed. Stanley Fischer (Cambridge, Mass.: M.I.T. Press, 1989), 121–170.

Box 3

Real Business Cycle Theory and the Debate on Money and Economic Activity

New entrants to the debate on money and economic activity are advocates of *real business cycle theory*, which states that real shocks to tastes and technology (rather than monetary shocks) are the driving forces behind business cycles. Proponents of this theory are critical of the monetarist view that money matters to business cycles because they believe that the correlation of output with money reflects reverse causation; that is, the business cycle drives money, rather than the other way around. An important piece of evidence they offer to support the reverse causation argument is that almost none of the correlation between money and output comes from the monetary base, which is controlled by the monetary authorities.* Instead, the money–output correlation stems from other sources of money supply movements that, as we saw in Chapters 15 and 16, are affected by the actions of banks, depositors, and borrowers from banks and are more likely to be influenced by the business cycle.

*Robert King and Charles Plosser, "Money, Credit and Prices in a Real Business Cycle," *American Economic Review* 74 (1984): 363–380; Charles Plosser, "Understanding Real Business Cycles," *Journal of Economic Perspectives* 3 (Summer 1989): 51–78.

money growth are followed by business cycle contractions does provide stronger support for the monetarist position. When historical evidence is combined with timing and statistical evidence, the conclusion that money does matter seems warranted.

As you can imagine, the economics profession was quite shaken by the appearance of the monetarist evidence, as up to that time most economists believed that money does not matter at all. Monetarists had demonstrated that this early Keynesian position was probably wrong, and it won them a lot of converts. Recognizing the fallacy of the position that money does not matter does not necessarily mean that we must accept the position that money is *all* that matters. Many Keynesian economists shifted their views toward the monetarist position, but not all the way. Instead, they adopted an intermediate position compatible with the Keynesian aggregate supply and demand analysis described in Chapter 25: They allowed that money, fiscal policy, net exports, and "animal spirits" all contributed to fluctuations in aggregate demand. The result has been a convergence of the Keynesian and monetarist views on the importance of money to economic activity. However, proponents of a new theory of aggregate fluctuations called *real business cycle theory* are more critical of the monetarist reduced-form evidence that money is important to business cycle fluctuations because they believe there is reverse causation from the business cycle to money (see Box 3).

Transmission Mechanisms of Monetary Policy

After the successful monetarist attack on the early Keynesian position, economic research went in two directions. One direction was to use more sophisticated monetarist reduced-form models to test for the importance of money to economic activity.[10]

[10]The most prominent example of more sophisticated reduced-form research is the so-called St. Louis model, which was developed at the Federal Reserve Bank of St. Louis in the late 1960s and early 1970s. It provided support for the monetarist position, but is subject to the same criticisms of reduced-form evidence outlined in the text. The St. Louis model was first outlined in Leonall Andersen and Jerry Jordan, "Monetary and Fiscal Actions: A Test of Their Relative Importance in Economic Stabilization," Federal Reserve Bank of St. Louis *Review* 50 (November 1968): 11–23.

The second direction was to pursue a structural model approach and to develop a better understanding of channels (other than interest-rate effects on investment) through which monetary policy affects aggregate demand. In this section we examine some of these channels, or *transmission mechanisms*, beginning with interest-rate channels, because they are the key monetary transmission mechanism in the Keynesian *ISLM* and *AD/AS* models you have seen in Chapters 23, 24, and 25.

Traditional Interest-Rate Channels

The traditional Keynesian view of the monetary transmission mechanism can be characterized by the following schematic showing the effect of a monetary expansion:

$$M\uparrow \Rightarrow i_r\downarrow \Rightarrow I\uparrow \Rightarrow Y\uparrow \tag{1}$$

where $M\uparrow$ indicates an expansionary monetary policy leading to a fall in real interest rates ($i_r\downarrow$), which in turn lowers the cost of capital, causing a rise in investment spending ($I\uparrow$), thereby leading to an increase in aggregate demand and a rise in output ($Y\uparrow$).

Although Keynes originally emphasized this channel as operating through businesses' decisions about investment spending, the search for new monetary transmission mechanisms recognized that consumers' decisions about housing and **consumer durable expenditure** (spending by consumers on durable items such as automobiles and refrigerators) also are investment decisions. Thus the interest-rate channel of monetary transmission outlined in Equation 1 applies equally to consumer spending, in which I represents residential housing and consumer durable expenditure.

An important feature of the interest-rate transmission mechanism is its emphasis on the *real* rather than the nominal interest rate as the rate that affects consumer and business decisions. In addition, it is often the real *long*-term interest rate and not the short-term interest rate that is viewed as having the major impact on spending. How is it that changes in the short-term nominal interest rate induced by a central bank result in a corresponding change in the real interest rate on both short- and long-term bonds? The key is the phenomenon known as *sticky prices*, the fact that the aggregate price level adjusts slowly over time, meaning that expansionary monetary policy, which lowers the short-term nominal interest rate, also lowers the short-term *real* interest rate. The expectations hypothesis of the term structure described in Chapter 6, which states that the long-term interest rate is an average of expected future short-term interest rates, suggests that the lower real short-term interest rate leads to a fall in the real long-term interest rate. These lower real interest rates then lead to rises in business fixed investment, residential housing investment, inventory investment, and consumer durable expenditure, all of which produce the rise in aggregate output.

The fact that it is the real interest rate rather than the nominal rate that affects spending provides an important mechanism for how monetary policy can stimulate the economy, even if nominal interest rates hit a floor of zero during a deflationary episode. With nominal interest rates at a floor of zero, an expansion in the money supply ($M\uparrow$) can raise the expected price level ($P^e\uparrow$) and hence expected inflation ($\pi^e\uparrow$), thereby lowering the real interest rate ($i_r = [i - \pi^e]\downarrow$) even when the nominal interest rate is fixed at zero and stimulating spending through the interest-rate channel:

$$M\uparrow \Rightarrow P^e\uparrow \Rightarrow \pi^e\uparrow \Rightarrow i_r\downarrow \Rightarrow I\uparrow \Rightarrow Y\uparrow \tag{2}$$

This mechanism thus indicates that monetary policy can still be effective even when nominal interest rates have already been driven down to zero by the monetary authorities. Indeed, this mechanism is a key element in monetarist discussions of why the U.S. economy was not stuck in a liquidity trap (in which increases in the money supply

might be unable to lower interest rates, discussed in Chapter 22) during the Great Depression and why expansionary monetary policy could have prevented the sharp decline in output during that period.

Some economists, such as John Taylor of Stanford University, take the position that there is strong empirical evidence for substantial interest-rate effects on consumer and investment spending through the cost of capital, making the interest-rate monetary transmission mechanism a strong one. His position is highly controversial, and many researchers, including Ben Bernanke of Princeton University and Mark Gertler of New York University, believe that the empirical evidence does not support strong interest-rate effects operating through the cost of capital.[11] Indeed, these researchers see the empirical failure of traditional interest-rate monetary transmission mechanisms as having provided the stimulus for the search for other transmission mechanisms of monetary policy.

These other transmission mechanisms fall into two basic categories: those operating through asset prices other than interest rates and those operating through asymmetric information effects on credit markets (the so-called **credit view**). (All these mechanisms are summarized in the schematic diagram in Figure 3.)

Other Asset Price Channels

As we have seen earlier in the chapter, a key monetarist objection to the Keynesian analysis of monetary policy effects on the economy is that it focuses on only one asset price, the interest rate, rather than on many asset prices. Monetarists envision a transmission mechanism in which other relative asset prices and real wealth transmit monetary effects onto the economy. In addition to bond prices, two other asset prices receive substantial attention as channels for monetary policy effects: foreign exchange and equities (stocks).

Exchange Rate Effects on Net Exports. With the growing internationalization of economies throughout the world and the advent of flexible exchange rates, more attention has been paid to how monetary policy affects exchange rates, which in turn affect net exports and aggregate output.

This channel also involves interest-rate effects, because, as we have seen in Chapter 19, when domestic real interest rates fall, domestic dollar deposits become less attractive relative to deposits denominated in foreign currencies. As a result, the value of dollar deposits relative to other currency deposits falls, and the dollar depreciates (denoted by $E\downarrow$). The lower value of the domestic currency makes domestic goods cheaper than foreign goods, thereby causing a rise in net exports ($NX\uparrow$) and hence in aggregate output ($Y\uparrow$). The schematic for the monetary transmission mechanism that operates through the exchange rate is:

$$M\uparrow \Rightarrow i_r\downarrow \Rightarrow E\downarrow \Rightarrow NX\uparrow \Rightarrow Y\uparrow \tag{3}$$

Recent research has found that this exchange rate channel plays an important role in how monetary policy affects the domestic economy.[12]

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[11] See John Taylor, "The Monetary Transmission Mechanism: An Empirical Framework," *Journal of Economic Perspectives* 9 (Fall 1995): 11–26, and Ben Bernanke and Mark Gertler, "Inside the Black Box: The Credit Channel of Monetary Policy Transmission," *Journal of Economic Perspectives* 9 (Fall 1995): 27–48.

[12] For example, see Ralph Bryant, Peter Hooper, and Catherine Mann, *Evaluating Policy Regimes: New Empirical Research in Empirical Macroeconomics* (Washington, D.C.: Brookings Institution, 1993), and John B. Taylor, *Macroeconomic Policy in a World Economy: From Econometric Design to Practical Operation* (New York: Norton, 1993).

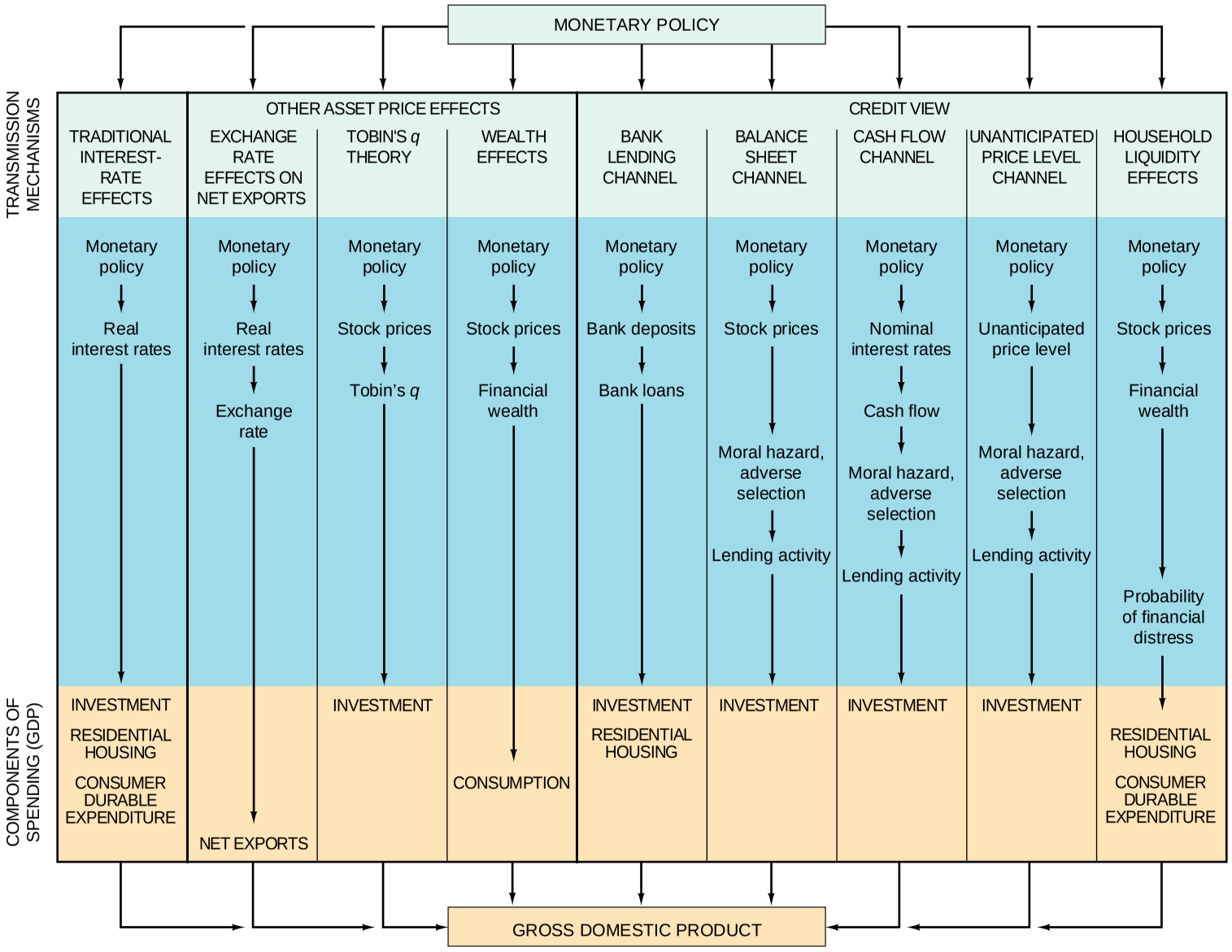

FIGURE 3 The Link Between Monetary Policy and GDP: Monetary Transmission Mechanisms

Tobin's *q* Theory. James Tobin developed a theory, referred to as *Tobin's q Theory*, that explains how monetary policy can affect the economy through its effects on the valuation of equities (stock). Tobin defines q as the market value of firms divided by the replacement cost of capital. If q is high, the market price of firms is high relative to the replacement cost of capital, and new plant and equipment capital is cheap relative to the market value of firms. Companies can then issue stock and get a high price for it relative to the cost of the facilities and equipment they are buying. Investment spending will rise, because firms can buy a lot of new investment goods with only a small issue of stock.

Conversely, when q is low, firms will not purchase *new* investment goods because the market value of firms is low relative to the cost of capital. If companies want to acquire capital when q is low, they can buy another firm cheaply and acquire old capital instead. Investment spending, the purchase of new investment goods, will then be very low. Tobin's q theory gives a good explanation for the extremely low rate of investment spending during the Great Depression. In that period, stock prices collapsed, and by 1933, stocks were worth only one-tenth of their value in late 1929; q fell to unprecedented low levels.

The crux of this discussion is that a link exists between Tobin's q and investment spending. But how might monetary policy affect stock prices? Quite simply, when monetary policy is expansionary, the public finds that it has more money than it wants and so gets rid of it through spending. One place the public spends is in the stock market, increasing the demand for stocks and consequently raising their prices.[13] Combining this with the fact that higher stock prices (P_s) will lead to a higher q and thus higher investment spending I leads to the following transmission mechanism of monetary policy:[14]

$$M\uparrow \Rightarrow P_s\uparrow \Rightarrow q\uparrow \Rightarrow I\uparrow \Rightarrow Y\uparrow \tag{4}$$

Wealth Effects. In their search for new monetary transmission mechanisms, researchers also looked at how consumers' balance sheets might affect their spending decisions. Franco Modigliani was the first to take this tack, using his famous life cycle hypothesis of consumption. **Consumption** is spending by consumers on nondurable goods and services.[15] It differs from *consumer expenditure* in that it does not include spending on consumer durables. The basic premise of Modigliani's theory is that consumers smooth out their consumption over time. Therefore, what determines consumption spending is the lifetime resources of consumers, not just today's income.

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[13]See James Tobin, "A General Equilibrium Approach to Monetary Theory," *Journal of Money, Credit, and Banking* 1 (1969): 15–29. A somewhat more Keynesian story with the same outcome is that the increase in the money supply lowers interest rates on bonds so that the yields on alternatives to stocks fall. This makes stocks more attractive relative to bonds, so demand for them increases, raises their price, and thereby lowers their yield.

[14]An alternative way of looking at the link between stock prices and investment spending is that higher stock prices lower the yield on stocks and reduce the cost of financing investment spending through issuing equity. This way of looking at the link between stock prices and investment spending is formally equivalent to Tobin's q approach; see Barry Bosworth, "The Stock Market and the Economy," *Brookings Papers on Economic Activity* 2 (1975): 257–290.

[15]Consumption also includes another small component, the services that a consumer receives from the ownership of housing and consumer durables.

An important component of consumers' lifetime resources is their financial wealth, a major component of which is common stocks. When stock prices rise, the value of financial wealth increases, thereby increasing the lifetime resources of consumers, and consumption should rise. Considering that, as we have seen, expansionary monetary policy can lead to a rise in stock prices, we now have another monetary transmission mechanism:

$$M\uparrow \Rightarrow P_s\uparrow \Rightarrow \text{wealth} \uparrow \Rightarrow \text{consumption} \uparrow \Rightarrow Y\uparrow \tag{5}$$

Modigliani's research found this relationship to be an extremely powerful mechanism that adds substantially to the potency of monetary policy.[16]

The wealth and Tobin's q channels allow for a general definition of equity, so the Tobin q framework can also be applied to the housing market, where housing is equity. An increase in house prices, which raises their prices relative to replacement cost, leads to a rise in Tobin's q for housing, thereby stimulating its production. Similarly, housing and land prices are extremely important components of wealth, and so rises in these prices increase wealth, thereby raising consumption. Monetary expansion, which raises land and housing prices through the Tobin's q and wealth mechanisms described here, thus leads to a rise in aggregate demand.

Credit View

Dissatisfaction with the conventional stories that interest-rate effects explain the impact of monetary policy on expenditures on durable assets has led to a new explanation based on the problem of asymmetric information in financial markets (see Chapter 8). This explanation, referred to as the *credit view*, proposes that two types of monetary transmission channels arise as a result of information problems in credit markets: those that operate through effects on bank lending and those that operate through effects on firms' and households' balance sheets.[17]

Bank Lending Channel. The bank lending channel is based on the analysis in Chapter 8, which demonstrated that banks play a special role in the financial system because they are especially well suited to solve asymmetric information problems in credit markets. Because of banks' special role, certain borrowers will not have access to the credit markets unless they borrow from banks. As long as there is no perfect substitutability of retail bank deposits with other sources of funds, the bank lending channel of monetary transmission operates as follows. Expansionary monetary policy, which increases bank reserves and bank deposits, increases the quantity of bank loans available. Because many borrowers are dependent on bank loans to finance their activities, this increase in loans will cause investment (and possibly consumer) spending to rise. Schematically, the monetary policy effect is:

$$M\uparrow \Rightarrow \text{bank deposits} \uparrow \Rightarrow \text{bank loans} \uparrow \Rightarrow I\uparrow \Rightarrow Y\uparrow \tag{6}$$

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[16]See Franco Modigliani, "Monetary Policy and Consumption," in *Consumer Spending and Money Policy: The Linkages* (Boston: Federal Reserve Bank, 1971), pp. 9–84.

[17]Surveys of the credit view can be found in Ben Bernanke, "Credit in the Macroeconomy," Federal Reserve Bank of New York *Quarterly Review*, Spring 1993, pp. 50–70; Ben Bernanke and Mark Gertler, "Inside the Black Box: The Credit Channel of Monetary Policy Transmission," *Journal of Economic Perspectives* 9 (Fall 1995): 27–48; Stephen G. Cecchetti, "Distinguishing Theories of the Monetary Transmission Mechanism," Federal Reserve Bank of St. Louis *Review* 77 (May–June 1995): 83–97; and R. Glenn Hubbard, "Is There a 'Credit Channel' for Monetary Policy?" Federal Reserve Bank of St. Louis *Review* 77 (May–June 1995): 63–74.

An important implication of the credit view is that monetary policy will have a greater effect on expenditure by smaller firms, which are more dependent on bank loans, than it will on large firms, which can access the credit markets directly through stock and bond markets (and not only through banks).

Though this result has been confirmed by researchers, doubts about the bank lending channel have been raised in the literature, and there are reasons to suspect that the bank lending channel in the United States may not be as powerful as it once was.[18] The first reason this channel is not as powerful is that the current U.S. regulatory framework no longer imposes restrictions on banks that hinder their ability to raise funds (see Chapter 9). Prior to the mid-1980s, certificates of deposit (CDs) were subjected to reserve requirements and Regulation Q deposit rate ceilings, which made it hard for banks to replace deposits that flowed out of the banking system during a monetary contraction. With these regulatory restrictions abolished, banks can more easily respond to a decline in bank reserves and a loss of retail deposits by issuing CDs at market interest rates that do not have to be backed up by required reserves. Second, the worldwide decline of the traditional bank lending business (see Chapter 10) has rendered the bank lending channel less potent. Nonetheless, many economists believe that the bank lending channel played an important role in the slow recovery in the U.S. from the 1990–91 recession.

Balance Sheet Channel. Even though the bank lending channel may be declining in importance, it is by no means clear that this is the case for the other credit channel, the balance sheet channel. Like the bank lending channel, the balance sheet channel also arises from the presence of asymmetric information problems in credit markets. In Chapter 8, we saw that the lower the net worth of business firms, the more severe the adverse selection and moral hazard problems in lending to these firms. Lower net worth means that lenders in effect have less collateral for their loans, and so potential losses from adverse selection are higher. A decline in net worth, which raises the adverse selection problem, thus leads to decreased lending to finance investment spending. The lower net worth of businesses also increases the moral hazard problem because it means that owners have a lower equity stake in their firms, giving them more incentive to engage in risky investment projects. Since taking on riskier investment projects makes it more likely that lenders will not be paid back, a decrease in businesses' net worth leads to a decrease in lending and hence in investment spending.

Monetary policy can affect firms' balance sheets in several ways. Expansionary monetary policy ($M\uparrow$), which causes a rise in stock prices ($P_s\uparrow$) along lines described earlier, raises the net worth of firms and so leads to higher investment spending ($I\uparrow$) and aggregate demand ($Y\uparrow$) because of the decrease in adverse selection and moral hazard problems. This leads to the following schematic for one balance sheet channel of monetary transmission:

$$M\uparrow \Rightarrow P_s\uparrow \Rightarrow \text{adverse selection}\downarrow, \text{moral hazard}\downarrow \Rightarrow \text{lending}\uparrow \Rightarrow I\uparrow \Rightarrow Y\uparrow \qquad (7)$$

Cash Flow Channel. Another balance sheet channel operates through its effects on *cash flow*, the difference between cash receipts and cash expenditures. Expansionary

[18]For example, see Valerie Ramey, "How Important Is the Credit Channel in the Transmission of Monetary Policy?" *Carnegie-Rochester Conference Series on Public Policy* 39 (1993): 1–45, and Allan H. Meltzer, "Monetary, Credit (and Other) Transmission Processes: A Monetarist Perspective," *Journal of Economic Perspectives* 9 (Fall 1995): 49–72.

monetary policy, which lowers nominal interest rates, also causes an improvement in firms' balance sheets because it raises cash flow. The rise in cash flow causes an improvement in the balance sheet because it increases the liquidity of the firm (or household) and thus makes it easier for lenders to know whether the firm (or household) will be able to pay its bills. The result is that adverse selection and moral hazard problems become less severe, leading to an increase in lending and economic activity. The following schematic describes this additional balance sheet channel:

$$M\uparrow \Rightarrow i\downarrow \Rightarrow \text{cash flow}\uparrow \Rightarrow \text{adverse selection}\downarrow, \text{moral hazard}\downarrow \Rightarrow \text{lending}\uparrow \Rightarrow I\uparrow \Rightarrow Y\uparrow \quad (8)$$

An important feature of this transmission mechanism is that it is *nominal* interest rates that affect firms' cash flow. Thus this interest-rate mechanism differs from the traditional interest-rate mechanism discussed earlier, in which it is the real rather than the nominal interest rate that affects investment. Furthermore, the short-term interest rate plays a special role in this transmission mechanism, because it is interest payments on short-term rather than long-term debt that typically have the greatest impact on households' and firms' cash flow.

A related mechanism involving adverse selection through which expansionary monetary policy that lowers interest rates can stimulate aggregate output involves the credit-rationing phenomenon. As we discussed in Chapter 9, credit rationing occurs in cases where borrowers are denied loans even when they are willing to pay a higher interest rate. This is because individuals and firms with the riskiest investment projects are exactly the ones who are willing to pay the highest interest rates, for if the high-risk investment succeeds, they will be the primary beneficiaries. Thus higher interest rates increase the adverse selection problem, and lower interest rates reduce it. When expansionary monetary policy lowers interest rates, less risk-prone borrowers make up a higher fraction of those demanding loans, and so lenders are more willing to lend, raising both investment and output, along the lines of parts of the schematic in Equation 8.

Unanticipated Price Level Channel. A third balance sheet channel operates through monetary policy effects on the general price level. Because in industrialized countries debt payments are contractually fixed in nominal terms, an unanticipated rise in the price level lowers the value of firms' liabilities in real terms (decreases the burden of the debt) but should not lower the real value of the firms' assets. Monetary expansion that leads to an unanticipated rise in the price level ($P\uparrow$) therefore raises real net worth, which lowers adverse selection and moral hazard problems, thereby leading to a rise in investment spending and aggregate output as in the following schematic:

$$M\uparrow \Rightarrow \text{unanticipated } P\uparrow \Rightarrow \text{adverse selection}\downarrow, \text{moral hazard}\downarrow \Rightarrow \text{lending}\uparrow \Rightarrow I\uparrow \Rightarrow Y\uparrow \quad (9)$$

The view that unanticipated movements in the price level have important effects on aggregate demand has a long tradition in economics: It is the key feature in the debt-deflation view of the Great Depression we outlined in Chapter 8.

Household Liquidity Effects. Although most of the literature on the credit channel focuses on spending by businesses, the credit view should apply equally well to consumer spending, particularly on consumer durables and housing. Declines in bank

Box 4

Consumers' Balance Sheets and the Great Depression

The years between 1929 and 1933 witnessed the worst deterioration in consumers' balance sheets ever seen in the United States. The stock market crash in 1929, which caused a slump that lasted until 1933, reduced the value of consumers' wealth by $692 billion (in 1996 dollars), and as expected, consumption dropped sharply (by over $100 billion). Because of the decline in the price level in that period, the level of real debt consumers owed also increased sharply (by over 20%). Consequently, the value of financial assets relative to the amount of debt declined sharply, increasing the likelihood of financial distress. Not surprisingly, spending on consumer durables and housing fell precipitously: From 1929 to 1933, consumer durable expenditure declined by over 50%, while expenditure on housing declined by 80%.*

*For further discussion of the effect of consumers' balance sheets on spending during the Great Depression, see Frederic S. Mishkin, "The Household Balance Sheet and the Great Depression," *Journal of Economic History* 38 (1978): 918–937.

lending induced by a monetary contraction should cause a decline in durables and housing purchases by consumers who do not have access to other sources of credit. Similarly, increases in interest rates cause a deterioration in household balance sheets, because consumers' cash flow is adversely affected.

Another way of looking at how the balance sheet channel may operate through consumers is to consider liquidity effects on consumer durable and housing expenditures—found to have been important factors during the Great Depression (see Box 4). In the liquidity effects view, balance sheet effects work through their impact on consumers' desire to spend rather than on lenders' desire to lend. Because of asymmetric information about their quality, consumer durables and housing are very illiquid assets. If, as a result of a bad income shock, consumers needed to sell their consumer durables or housing to raise money, they would expect a big loss because they could not get the full value of these assets in a distress sale. (This is just a manifestation of the lemons problem described in Chapter 8.) In contrast, if consumers held financial assets (such as money in the bank, stocks, or bonds), they could easily sell them quickly for their full market value and raise the cash. Hence if consumers expect a higher likelihood of finding themselves in financial distress, they would rather be holding fewer illiquid consumer durable or housing assets and more liquid financial assets.

A consumer's balance sheet should be an important influence on his or her estimate of the likelihood of suffering financial distress. Specifically, when consumers have a large amount of financial assets relative to their debts, their estimate of the probability of financial distress is low, and they will be more willing to purchase consumer durables or housing. When stock prices rise, the value of financial assets rises as well; consumer durable expenditure will also rise because consumers have a more secure financial position and a lower estimate of the likelihood of suffering financial distress. This leads to another transmission mechanism for monetary policy, operating through the link between money and stock prices:[19]

$$M\uparrow \Rightarrow P_s\uparrow \Rightarrow \text{financial assets} \uparrow \Rightarrow \text{likelihood of financial distress} \downarrow$$
$$\Rightarrow \text{consumer durable and housing expenditure} \uparrow \Rightarrow Y\uparrow \qquad (10)$$

[19]See Frederic S. Mishkin, "What Depressed the Consumer? The Household Balance Sheet and the 1973–1975 Recession," *Brookings Papers on Economic Activity* 1 (1977): 123–164.

The illiquidity of consumer durable and housing assets provides another reason why a monetary expansion, which lowers interest rates and thereby raises cash flow to consumers, leads to a rise in spending on consumer durables and housing. A rise in consumer cash flow decreases the likelihood of financial distress, which increases the desire of consumers to hold durable goods or housing, thus increasing spending on them and hence aggregate output. The only difference between this view of cash flow effects and that outlined in Equation 8 is that it is not the willingness of lenders to lend to consumers that causes expenditure to rise but the willingness of consumers to spend.

Why Are Credit Channels Likely to Be Important?

There are three reasons to believe that credit channels are important monetary transmission mechanisms. First, a large body of evidence on the behavior of individual firms supports the view that credit market imperfections of the type crucial to the operation of credit channels do affect firms' employment and spending decisions.[20] Second, there is evidence that small firms (which are more likely to be credit-constrained) are hurt more by tight monetary policy than large firms, which are unlikely to be credit-constrained.[21] Third, and maybe most compelling, the asymmetric information view of credit market imperfections at the core of the credit channel analysis is a theoretical construct that has proved useful in explaining many other important phenomena, such as why many of our financial institutions exist, why our financial system has the structure that it has, and why financial crises are so damaging to the economy (all topics discussed in Chapter 8). The best support for a theory is its demonstrated usefulness in a wide range of applications. By this standard, the asymmetric information theory supporting the existence of credit channels as an important monetary transmission mechanism has much to recommend it.

Application

Corporate Scandals and the Slow Recovery from the March 2001 Recession

The collapse of the tech boom and the stock market slump led to a decline in investment spending that triggered a recession starting in March 2001. Just as the recession got under way, the Fed rapidly lowered the federal funds rate. At first it appeared that the Fed's actions would keep the recession mild and stimulate a recovery. However, the economy did not bounce back as quickly as the Fed had hoped. Why was the recovery from the recession so sluggish?

One explanation is that the corporate scandals at Enron, Arthur Andersen, and several other large firms caused investors to doubt the quality of the information about corporations. Doubts about the quality of corporate information meant that asymmetric information problems worsened, so that it became harder for an investor to screen out good firms from bad firms when making investment decisions. Because of the potential for increased adverse selection, as described in the credit view, individuals and financial

[20] For a survey of this evidence, see Hubbard, "Is There a 'Credit Channel' for Monetary Policy?" (note 17).

[21] See Mark Gertler and Simon Gilchrist, "Monetary Policy, Business Cycles, and the Behavior of Small Manufacturing Firms," *Quarterly Journal of Economics* 109 (May 1994): 309–340.

institutions were less willing to lend. This reluctance to lend in turn led to a decline in investment and aggregate output.

In addition, as we saw in Chapter 7, the corporate scandals caused investors to be less optimistic about earnings growth and to think that stocks were riskier, an effect leading to a further drop in the stock market. The decline in the stock market also weakened the economy, because it lowered household wealth. In turn, the decrease in household wealth led not only to restrained consumer spending, but also to weaker investment, because of the resulting drop in Tobin's q. In addition, the stock market decline weakened corporate balance sheets. This weakening increased asymmetric information problems and decreased lending and investment spending.

Corporate scandals have not only decreased our confidence in business leaders, but have also created a drag on the economy that has hindered the recovery from recession.

Lessons for Monetary Policy

What useful implications for central banks' conduct of monetary policy can we draw from the analysis in this chapter? There are four basic lessons to be learned.

1. ***It is dangerous always to associate the easing or tightening of monetary policy with a fall or a rise in short-term nominal interest rates.*** Because most central banks use short-term nominal interest rates—typically, the interbank rate—as the key operating instrument for monetary policy, there is a danger that central banks and the public will focus too much on short-term nominal interest rates as an indicator of the stance of monetary policy. Indeed, it is quite common to see statements that always associate monetary tightenings with a rise in the interbank rate and monetary easings with a decline in the rate. This view is highly problematic, because—as we have seen in our discussion of the Great Depression period—movements in nominal interest rates do not always correspond to movements in real interest rates, and yet it is typically the real and not the nominal interest rate that is an element in the channel of monetary policy transmission. For example, we have seen that during the contraction phase of the Great Depression in the United States, short-term interest rates fell to near zero and yet real interest rates were extremely high. Short-term interest rates that are near zero therefore do not indicate that monetary policy is easy if the economy is undergoing deflation, as was true during the contraction phase of the Great Depression. As Milton Friedman and Anna Schwartz have emphasized, the period of near-zero short-term interest rates during the contraction phase of the Great Depression was one of highly contractionary monetary policy rather than the reverse.

2. ***Other asset prices besides those on short-term debt instruments contain important information about the stance of monetary policy because they are important elements in various monetary policy transmission mechanisms.*** As we have seen in this chapter, economists have come a long way in understanding that other asset prices besides interest rates have major effects on aggregate demand. The view in Figure 3 that other asset prices, such as stock prices, foreign exchange rates, and housing and land prices, play an important role in monetary transmission mechanisms is held by both monetarists and Keynesians. Furthermore, the discussion of such additional channels as those operating through the exchange rate, Tobin's q, and

wealth effects provides additional reasons why other asset prices play such an important role in the monetary transmission mechanisms. Although there are strong disagreements among economists about which channels of monetary transmission are the most important—not surprising, given that economists, particularly those in academia, always like to disagree—they do agree that other asset prices play an important role in the way monetary policy affects the economy.

The view that other asset prices besides short-term interest rates matter has important implications for monetary policy. When we try to assess the stance of policy, it is critical that we look at other asset prices besides short-term interest rates. For example, if short-term interest rates are low or even zero and yet stock prices are low, land prices are low, and the value of the domestic currency is high, monetary policy is clearly tight, *not* easy.

3. ***Monetary policy can be highly effective in reviving a weak economy even if short-term interest rates are already near zero.*** We have recently entered a world where inflation is not always the norm. Japan, for example, recently experienced a period of deflation, when the price level was actually falling. One common view is that when a central bank has driven down short-term nominal interest rates to near zero, there is nothing more that monetary policy can do to stimulate the economy. The transmission mechanisms of monetary policy described here indicate that this view is false. As our discussion of the factors that affect the monetary base in Chapter 15 indicated, expansionary monetary policy to increase liquidity in the economy can be conducted with open market purchases, which do not have to be solely in short-term government securities. For example, purchases of foreign currencies, like purchases of government bonds, lead to an increase in the monetary base and in the money supply. This increased liquidity helps revive the economy by raising general price-level expectations and by reflating other asset prices, which then stimulate aggregate demand through the channels outlined here. Therefore, monetary policy can be a potent force for reviving economies that are undergoing deflation and have short-term interest rates near zero. Indeed, because of the lags inherent in fiscal policy and the political constraints on its use, expansionary monetary policy is the key policy action required to revive an economy experiencing deflation.

4. ***Avoiding unanticipated fluctuations in the price level is an important objective of monetary policy, thus providing a rationale for price stability as the primary long-run goal for monetary policy.*** As we saw in Chapter 18, central banks in recent years have been putting greater emphasis on price stability as the primary long-run goal for monetary policy. Several rationales have been proposed for this goal, including the undesirable effects of uncertainty about the future price level on business decisions and hence on productivity, distortions associated with the interaction of nominal contracts and the tax system with inflation, and increased social conflict stemming from inflation. The discussion here of monetary transmission mechanisms provides an additional reason why price stability is so important. As we have seen, unanticipated movements in the price level can cause unanticipated fluctuations in output, an undesirable outcome. Particularly important in this regard is the knowledge that, as we saw in Chapter 8, price deflation can be an important factor leading to a prolonged financial crisis, as occurred during the Great Depression. An understanding of the monetary transmission mechanisms thus makes it clear that the goal of price stability is desirable, because it reduces uncertainty about the future price level. Thus the price stability goal implies that a negative inflation rate is at least as undesirable as too high an inflation rate. Indeed, because of the threat of financial crises, central banks must work very hard to prevent price deflation.

Application

Applying the Monetary Policy Lessons to Japan

Until 1990, it looked as if Japan might overtake the United States in per capita income. Since then, the Japanese economy has been stagnating, with deflation and low growth. As a result, Japanese living standards have been falling farther and farther behind those in the United States. Many economists take the view that Japanese monetary policy is in part to blame for the poor performance of the Japanese economy. Could applying the four lessons outlined in the previous section have helped Japanese monetary policy perform better?

The first lesson suggests that it is dangerous to think that declines in interest rates always mean that monetary policy has been easing. In the mid-1990s, when short-term interest rates began to decline, falling to near zero in the late 1990s and early 2000s, the monetary authorities in Japan took the view that monetary policy was sufficiently expansionary. Now it is widely recognized that this view was incorrect, because the falling and eventually negative inflation rates in Japan meant that real interest rates were actually quite high and that monetary policy was tight, not easy. If the monetary authorities in Japan had followed the advice of the first lesson, they might have pursued a more expansionary monetary policy, which would have helped boost the economy.

The second lesson suggests that monetary policymakers should pay attention to other asset prices in assessing the stance of monetary policy. At the same time interest rates were falling in Japan, stock and real estate prices were collapsing, thus providing another indication that Japanese monetary policy was not easy. Recognizing the second lesson might have led Japanese monetary policymakers to recognize sooner that they needed a more expansionary monetary policy.

The third lesson indicates that monetary policy can still be effective even if short-term interest rates are near zero. Officials at the Bank of Japan have frequently claimed that they have been helpless in stimulating the economy, because short-term interest rates had fallen to near zero. Recognizing that monetary policy can still be effective even when interest rates are near zero, as the third lesson suggests, would have helped them to take monetary policy actions that would have stimulated aggregate demand by raising other asset prices and inflationary expectations.

The fourth lesson indicates that unanticipated fluctuations in the price level should be avoided. If the Japanese monetary authorities had adhered to this lesson, they might have recognized that allowing deflation to occur could be very damaging to the economy and would be inconsistent with the goal of price stability. Indeed, critics of the Bank of Japan have suggested that the bank should announce an inflation target in order to promote the price stability objective, but the bank has resisted this suggestion.

Heeding the advice from the four lessons in the previous section might have led to a far more successful conduct of monetary policy in Japan in recent years.

Summary

1. There are two basic types of empirical evidence: reduced-form evidence and structural model evidence. Both have advantages and disadvantages. The main advantage of structural model evidence is that it provides us with an understanding of how the economy works and gives us more confidence in the direction of causation between money and output. However, if the structure is not correctly specified, because it ignores important monetary transmission mechanisms, it could seriously underestimate the effectiveness of monetary policy. Reduced-form evidence has the advantage of not restricting the way monetary policy affects economic activity and so may be more likely to capture the full effects of monetary policy. However, reduced-form evidence cannot rule out the possibility of reverse causation or an outside driving factor, which could lead to misleading conclusions about the importance of money.
2. The early Keynesians believed that money does not matter, because they found weak links between interest rates and investment and because low interest rates on Treasury securities convinced them that monetary policy was easy during the worst economic contraction in U.S. history, the Great Depression. Monetarists objected to this interpretation of the evidence on the grounds that (a) the focus on nominal rather than real interest rates may have obscured any link between interest rates and investment, (b) interest-rate effects on investment might be only one of many channels through which monetary policy affects aggregate demand, and (c) by the standards of real interest rates and interest rates on lower-grade bonds, monetary policy was extremely contractionary during the Great Depression.
3. Early monetarist evidence falls into three categories: timing, statistical, and historical. Because of reverse causation and outside-factor possibilities, some serious doubts exist regarding conclusions that can be drawn from timing and statistical evidence alone. However, some of the historical evidence in which exogenous declines in money growth are followed by recessions provides stronger support for the monetarist position that money matters. As a result of empirical research, Keynesian and monetarist opinion has converged to the view that money does matter to aggregate economic activity and the price level. However, Keynesians do not agree with the monetarist position that money is *all* that matters.
4. The transmission mechanisms of monetary policy include traditional interest-rate channels that operate through the cost of capital and affect investment; other asset price channels such as exchange rate effects, Tobin's *q* theory, and wealth effects; and the credit view channels—the bank lending channel, the balance sheet channel, the cash flow channel, the unanticipated price level channel, and household liquidity effects.
5. Four lessons for monetary policy can be drawn from this chapter: (a) It is dangerous always to associate monetary policy easing or tightening with a fall or a rise in short-term nominal interest rates; (b) other asset prices besides those on short-term debt instruments contain important information about the stance of monetary policy because they are important elements in the monetary policy transmission mechanisms; (c) monetary policy can be highly effective in reviving a weak economy even if short-term interest rates are already near zero; and (d) avoiding unanticipated fluctuations in the price level is an important objective of monetary policy, thus providing a rationale for price stability as the primary long-run goal for monetary policy.

Key Terms

consumer durable expenditure, p. 617
consumption, p. 620
credit view, p. 618
reduced-form evidence, p. 604
reverse causation, p. 606
structural model, p. 604
structural model evidence, p. 603
transmission mechanisms of monetary policy, p. 604

Questions and Problems

Questions marked with an asterisk are answered at the end of the book in an appendix, "Answers to Selected Questions and Problems."

1. Suppose that a researcher is trying to determine whether jogging is good for a person's health. She examines this question in two ways. In method A, she looks to see whether joggers live longer than nonjoggers. In method B, she looks to see whether jogging reduces cholesterol in the bloodstream and lowers blood pressure; then she asks whether lower cholesterol and blood pressure prolong life. Which of these two methods will produce reduced-form evidence and which will produce structural model evidence?
2. If research indicates that joggers do not have lower cholesterol and blood pressure than nonjoggers, is it still possible that jogging is good for your health? Give a concrete example.
3. If research indicates that joggers live longer than nonjoggers, is it possible that jogging is not good for your health? Give a concrete example.

*4. Suppose that you plan to buy a car and want to know whether a General Motors car is more reliable than a Ford. One way to find out is to ask owners of both cars how often their cars go into the shop for repairs. Another way is to visit the factory producing the cars and see which one is built better. Which procedure will provide reduced-form evidence and which structural model evidence?

*5. If the GM car you plan to buy has a better repair record than a Ford, does this mean that the GM car is necessarily more reliable? (GM car owners might, for example, change their oil more frequently than Ford owners.)

*6. Suppose that when you visit the Ford and GM car factories to examine how the cars are built, you have time only to see how well the engine is put together. If Ford engines are better built than GM engines, does that mean that the Ford will be more reliable than the GM car?

7. How might bank behavior (described in Chapter 16) lead to causation running from output to the money supply? What does this say about evidence that finds a strong correlation between money and output?

*8. What operating procedures of the Fed (described in Chapter 18) might explain how movements in output might cause movements in the money supply?

9. "In every business cycle in the past 100 years, the rate at which the money supply is growing always decreases before output does. Therefore, the money supply causes business cycle movements." Do you agree? What objections can you raise against this argument?

*10. How did the research strategies of Keynesian and monetarist economists differ after they were exposed to the earliest monetarist evidence?

11. In the 1973–1975 recession, the value of common stocks in real terms fell by nearly 50%. How might this decline in the stock market have affected aggregate demand and thus contributed to the severity of this recession? Be specific about the mechanisms through which the stock market decline affected the economy.

*12. "The cost of financing investment is related only to interest rates; therefore, the only way that monetary policy can affect investment spending is through its effects on interest rates." Is this statement true, false, or uncertain? Explain your answer.

13. Predict what will happen to stock prices if the money supply rises. Explain why you are making this prediction.

*14. Franco Modigliani found that the most important transmission mechanisms of monetary policy involve consumer expenditure. Describe how at least two of these mechanisms work.

15. "The monetarists have demonstrated that the early Keynesians were wrong in saying that money doesn't matter at all to economic activity. Therefore, we should accept the monetarist position that money is all that matters." Do you agree? Why or why not?

Web Exercises

1. Figure 1 shows the relationship between estimated real interest rates and nominal interest rates. Go to www.martincapital.com/ and click on "charts and data" then on "nominal versus real market rates" to find data showing the spread between real interest and nominal interest rates. Discuss how the current spread differs from that shown most recently in Figure 1. What are the implications of this change?
2. Figure 2 discusses business cycles. While peaks and troughs of economic activity are a normal part of the business cycle, recessions are not. They represent a failure of economic policy. Go to www.econlib.org/library/Enc/Recessions.html and review the material reported on recessions.
   a. What is the formal definition of a recession?
   b. What are the problems with the definition?
   c. What are the three Ds used by the National Bureau of Economic Research (NBER) to define a recession?
   d. Review Chart 1. What trend is apparent about the length of recessions?