Oil Prices Strike Back

BY SYLVAIN LEDUC

When oil prices rise, how should monetary policy respond? Or should it respond at all to developments in the oil markets? In this article, Sylvain Leduc argues in favor of a central bank that follows an inflation-targeting rule. To shed some light on the issues involved, he reviews what has happened historically to oil prices and output in the U.S.

It had been a good 10 years since we last saw them appear in the wake of the gulf war and about 20 years since they made it very big on the international scene. But just like in B movies in which the villain never dies, rising oil prices have come back from the dead. Oil prices rose dramatically, both in nominal and in real terms, in the first year of the new millennium. In fact, in 2000, the real price of oil reached a level not seen since 1973, at the time of the first major oil shock. Data like these are given a lot of weight in policy circles because, historically, developments in the oil sector appear to be important for the performance of the U.S. economy.

Indeed, most recessions in the post-WWII era have been preceded by a rise in oil prices. And since the 1980s, there has been a resurgence of the view that changes in gross domestic product (GDP) over the business cycle are mostly driven by supply-side factors, such as oil shocks. Supporting this viewpoint, economists who study business cycles theorize that a large part of these fluctuations in GDP can be accounted for by changes in productivity growth in the business sector, which affects the supply of goods to the marketplace.

This is obviously not the end of the story. Since the law of supply and demand lies at the center of economics, it's not surprising that another camp emphasizes demand-side factors — things that affect total demand for goods and services in the economy — as the driving force behind economic downturns. Economists who support this side of the debate point out that one such factor is monetary policy, which has tightened substantially before most recessions. Many economists on this side of the debate argue that recessions are often a byproduct of a central bank's policy of avoiding outbursts of inflation.[1]

Of course, developments on both the supply and the demand side of the economy can contribute to movements in output, inflation, and other important macroeconomic variables. It's possible that a rise in oil prices initially causes output to fall and inflation to rise and that the central bank, in dealing with these developments, amplifies or alleviates the initial movements in output. So what, then, do rising oil prices imply for the conduct of monetary policy? Should the central bank react in a particular way, if at all, to developments in the oil markets?

This article will argue that movements in output and inflation could be smaller if central banks followed a rule that targets the inflation rate. But to shed some light on these questions, we first need to review what happened historically to oil prices and output (as measured by real GDP) in the United States.

WHAT ARE THE FACTS? THE EFFECTS OF MOVEMENTS IN OIL PRICES ON OUTPUT

There are few reliable relationships in economics; however, there is one between output and oil-price increases. In 1983, James Hamilton, an economist now at the University of San Diego, demonstrated that five of the six recessions between 1947 and 1975 were preceded by a significant increase in the price of oil (the exception was the recession of 1960-61). Since the publication of Hamilton's work, economists have gathered more evidence that rising oil prices are important for the performance of the U.S. economy.

Sylvain Leduc is a senior economist in the Research Department of the Philadelphia Fed.

[1] See the article by Christina Romer.

Figure 1 shows the increase in oil prices and the recessions that the U.S. economy has experienced since World War II, as indicated by the shaded bars.[2] The figure demonstrates that the striking relationship between oil-price increases and the poor performance of the U.S. economy, which Hamilton documented for an earlier period, has continued: eight out of the nine recessions since 1947 were preceded by (or coincided with) a rise in oil prices.

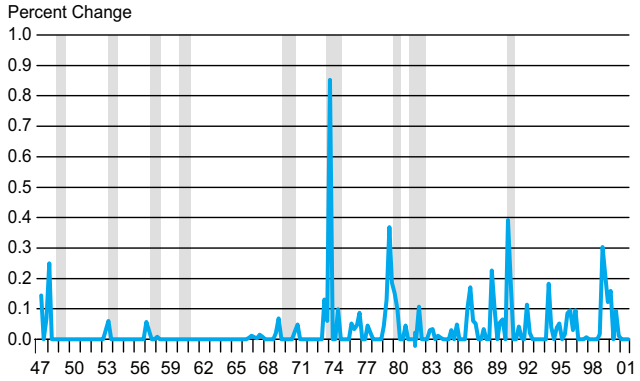
Of course, you may argue that this is not evidence that the rise in oil prices *caused* the U.S. recessions. The relationship could be just a coincidence, or fluctuations in some other economic factor could have caused *both* the increase in oil prices and a recession, *without* any causal link between the two. In fact, you could also point out that since the mid-1980s, there have been many episodes when the price of oil rose and the U.S. economy kept expanding.

Using statistical techniques, Hamilton showed that the oil-price increases preceding most recessions are of a particular nature: They are mostly due to external factors not immediately related to the U.S. economy.[3] Specifically, Hamilton documented that these increases in the price of oil were mostly the result of political and economic disruptions in the Middle East that were unrelated to developments in the U.S. economy. For instance, the dominant factor underlying the increase in oil prices in 1978-79 was the fall in oil production due to the Iranian revolution. Similarly, the price of oil increased in 1990 mainly because of the gulf war. Since the early 1970s, the decisions of the Organization of Petroleum Exporting Countries, or OPEC, have also been an important factor underlying movements in oil prices. Indeed, the price of oil rose to unprecedented levels in 1973-74 following OPEC's decision to impose an embargo on oil exports to the U.S. (and the Netherlands) to protest their support of Israel in the war against the Arab countries. Although these events did increase the price of oil, it would be hard to argue that they also caused the U.S. recessions without introducing a causal link between oil-price increases and economic performance.

Overall, the empirical evidence indicates that a 10 percent increase in the price of oil due to exogenous factors leads output to contract by about 2 percent four quarters following the shock. Although most economists agree that increases in the price of oil may have a significant impact on real GDP in the U.S., they are still debating the channels through which these effects occur.

FIGURE 1

Oil-Price Increases and Recessions



The net oil-price increase is calculated as the quarterly change in the logarithm of the price of oil. If the quarterly change is negative, the entry is set to zero.

WHY DOES OIL MATTER?

The impact on a firm's cost of production is probably the most obvious way in which developments in the oil market affect the economy. Firms need various forms of energy, including oil, to make their production plants work, and in this sense, a rise in the price of oil acts just like an increase in the price of any other input into the production process. To the extent that a firm's machinery relies on oil to function (and there are few alternative fuel sources), an increase in oil prices will lead firms to decrease their use of oil and to cut back on the use of their machinery, thus causing production to fall.

Moreover, since the United States imports about 50 percent of the oil it consumes, the U.S. economy depends largely on foreign producers to satisfy its energy needs. Thus, a large part of the gains from rising oil prices accrues to foreign producers. Basically, an increase in oil prices acts just like a tax on U.S. consumers and companies. In the case of a tax, we first need to assess how the government spends tax revenues before we can determine the impact of the tax on the economy.

[2] Empirically, the reverse is not true: A fall in the price of oil does not lead to an increase in real GDP. The reasons for this asymmetric relationship between movements in the price of oil and economic activity are still being debated.

[3] Economists refer to shocks stemming from factors outside the economy as exogenous.

Similarly, we need to study how oil-exporting countries spend their revenues from oil sales before we can determine how a rise in oil prices affects the U.S. economy. If oil-exporting countries were to spend all of their oil revenues on U.S. goods, a rise in the price of oil would have only minor effects on the overall level of economic activity in the United States. However, we may realistically assume that only part of oil revenues will be used to buy U.S. products. As a result, demand and production will fall in the U.S., following a rise in oil prices.

Finally, oil-price increases may not affect all firms equally. In response to a rise in oil prices, consumer demand for products that depend on oil, such as cars or air travel, will fall, lowering production and employment levels in these industries. But if it is costly to shift labor across sectors of the economy (for instance, from the car industry to less oil-dependent sectors such as the services sector), employment and production in the U.S. overall will also fall following a rise in oil prices. In a 1988 article, James Hamilton showed that small changes in oil prices may lead to large movements in output if it is costly to relocate workers across industries.

IS OIL REALLY THAT IMPORTANT?

In general, economists agree that a rise in the price of oil can have a negative impact on the level of economic activity. They disagree, however, on the extent of the impact. In particular, they find it unlikely that oil shocks by themselves could explain the severity of the 1974 and 1980 recessions. The price of oil rose dramatically before these two recessions. However, many economists remain unconvinced that gyrations in the price of a factor of production like oil, which accounts for a relatively small share of production costs, can have a significant impact on economic activity. For instance, Julio Rotemberg and Michael Woodford estimated that, for the U.S. economy, oil costs' share of total production costs was only around 2 percent.

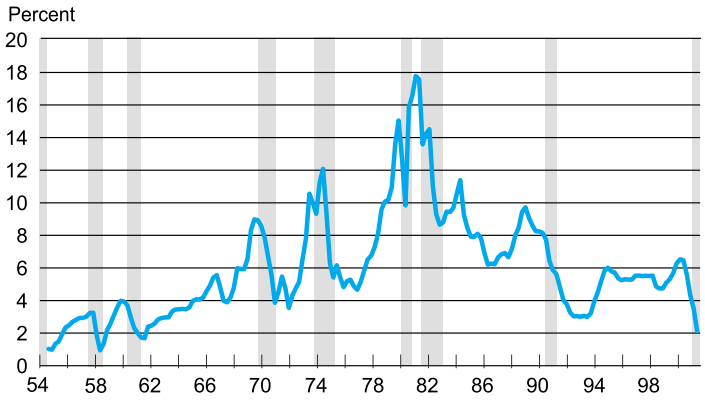
Therefore, economists in this camp argue that it is not the rise in oil prices per se that causes the drop in economic activity, but rather restrictive monetary policies set by the Federal Reserve.[4] Figure 2 shows U.S. recessions since the third quarter of 1954, but this time plotted against movements in the federal funds rate, instead of increases in oil prices.[5] Looking only at this picture, one could argue that most recessions in the U.S. since 1954 were preceded by a rise in the federal funds rate. An increase in the federal funds rate means that monetary policy is tighter and money growth is lower. So, it is possible that tighter monetary policy causes most economic downturns and that oil-price increases play only a minor role.

In a seminal work, Milton Friedman and Anna Schwartz documented the importance of monetary policy for the U.S. business cycle. They showed that contractions in the money supply preceded most major movements in output from 1867 to the 1960s. This extremely influential work has shaped many economists' views on the source of economic fluctuations. Therefore, it's not very surprising that Hamilton's finding that rising oil prices caused most recessions in the post-WW II era was often received with skepticism.

So which view is right? Is it rising oil prices alone that cause most recessions, or is it restrictive monetary policy? Or, as many economists have theorized, is it the way the central bank responds to rising oil prices that ends up triggering economic downturns?

FIGURE 2

Federal Funds Rate



[4] Note that Hamilton's study never argued that monetary policy was not a potentially important channel through which oil-price increases affected the economy.

[5] The federal funds rate is the interest rate that banks charge one another on overnight loans. By injecting dollars into or retiring dollars from the financial system, the Federal Reserve affects the amount of reserves in the banking system, thereby controlling the federal funds rate. A good description of this mechanism can be found online at http://www.frbsf.org/publications/federalreserve/monetary/tools.html.

Indeed, the central bank rarely stays indifferent to current economic developments when considering the future course of monetary policy. Before deciding whether to adjust the federal funds rate, policymakers look at a wide array of economic indicators, such as prices, industrial production, employment, and so on. To the extent that the Fed responds predictably to certain changes in the economy, we may conjecture that movements in the federal funds rate immediately before declines in real GDP were, in part, policymakers' response (directly or indirectly) to the impact of oil prices on output and inflation.

But do we know how the Federal Reserve reacts to movements in output and inflation? Recently, some economists have argued that the Fed's responses to economic developments can be summarized by a simple rule. The rule is often referred to as Taylor's rule because it was first developed by Stanford economist John B. Taylor. Basically, it says that the central bank acts as if it is adjusting the federal funds rate in order to minimize inflation's deviation from a target and current output's deviation from potential output.[6] According to the rule, the federal funds rate rises whenever the inflation rate is above its target or output is above potential. Similarly, the federal funds rate decreases whenever inflation is below its target or output is below potential. Research on Taylor's rule shows that it tracks the Fed's policy actions reasonably well (see John Taylor's article).

Using a methodology different from Taylor's, economists Richard Clarida, Jordi Gali, and Mark Gerlter recently found that the federal funds rate rises more when inflation rises above its target than when the output gap increases. Interestingly, these authors also found that similar Taylor-type rules describe the behavior of many other central banks in industrialized countries.

What happens when oil prices rise? If we believe the rule describes the central bank's behavior (and this is, of course, a simplification), an increase in oil prices that gets translated immediately into a higher inflation rate should be followed by an increase in the federal funds rate.[7] On the other hand, as I argued above, a rise in the price of oil also causes output to fall below potential, and according to the rule, the Fed should lower the federal funds rate. But, according to the estimates by Clarida, Gali, and Gertler, the Fed responds more to the rise in inflation than to the fall in output following an oil-price shock. Therefore, the federal funds rate tends to increase following a rise in oil prices.[8]

This means that it's possible that a policy that raises the federal funds rate following an oil-price shock ends up amplifying the initial fall in GDP. But is this monetary policy channel really important? To answer that question we need a model to describe how oil prices and monetary policy affect the economy.

OIL SHOCKS VS. MONETARY POLICY

In the aftermath of the two oil shocks of the 1970s, economists developed models to study how monetary policy should respond to rising oil prices. At the end of the 1970s, economists Knut Mork and Robert Hall conducted an interesting early study of the 1973 oil shock's impact on the economy. Mork and Hall built a model in which energy is used as a direct input in the production process. They found that an increase in energy prices can explain up to 75 percent of the 1974-75 recession. More strikingly, they found that the effects of the oil shock on output and employment could have been eliminated through a monetary expansion, but at the cost of generating a significant increase in the inflation rate. However, since one of the Federal Reserve's goals is to achieve price stability, policymakers may find the cost of a monetary expansion too high.

More recently, Keith Sill and I used a slightly different methodology to develop a small macroeconomic model that would identify the respective contributions of rising oil prices and monetary policy to economic downturns. Our model assumes not only that firms need oil for their machinery but also that the more intensively firms use their machinery, the more oil they need.[9] For simplicity, the model assumes that the economy's demand for oil is met entirely by foreign suppliers.

Since we are interested in understanding the contribution of monetary policy to economic downturns, we need to take a stand on the

[6] Potential output is the amount of output that could be produced if all the factors of production, such as labor, plants, and equipment, were used optimally. The difference between current and potential output is called the output gap.

[7] When the Bureau of Labor Statistics (BLS) calculates the price level, it uses two different measures. The first, often referred to as the headline price level, includes energy prices. Therefore, an increase in oil prices will raise that measure of prices. In the second measure, called the core price level, the BLS excludes energy (and food) prices.

[8] Of course, the central bank's reaction to rising oil prices would also depend on whether policymakers think the oil shock is persistent or transitory. If they think the latter more likely, they may prefer to keep the federal funds rate relatively constant and let the price level rise temporarily.

[9] This approach to modeling oil usage was developed by Mary Finn. She shows that this setup is identical to one in which energy enters directly as an input into the production function, as in the research of Robert Rasche and John Tatom as well as that of In-Moo Kim and Prakash Loungani.

monetary transmission mechanism: that is, how movements in the money supply get transmitted to other variables in the economy. In particular, we need to state how monetary policy can affect the real economy, such as investment and production, as opposed to the nominal side of the economy, such as prices. There are many different ways to do this, but we'll focus on one: the banking system.

We assume monetary policy affects real GDP via the banking system because firms need to borrow funds from banks to finance production. By changing the stock of money in circulation, the central bank can affect the interest rate applied to financial transactions and, therefore, the amount of borrowing and production in the economy.[10]

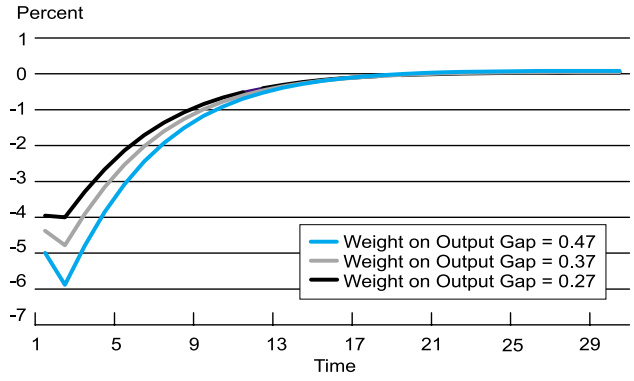
To capture the way the Fed conducts monetary policy, we assume it uses a simple Taylor-type rule, similar to the one estimated by Clarida, Gali, and Gertler. We conduct different exercises in which we assume, in each one of them, that the nominal price of oil initially rises. This would indirectly capture OPEC's decision to cut production to raise prices. We study the extent to which output and inflation in our model are affected by how much the central bank responds to a change in the output gap as opposed to the deviation of inflation from its target — that is, by the weights in the Taylor-type rule we assume the central bank uses. We will try to answer the question: Does output fall less following an oil shock if the monetary authority places a lot of weight on the output gap in its rule?

Some Experiments. Figures 3A, 3B, and 3C show how a rise in the price of oil affects output, inflation, and the short-term interest rate in the

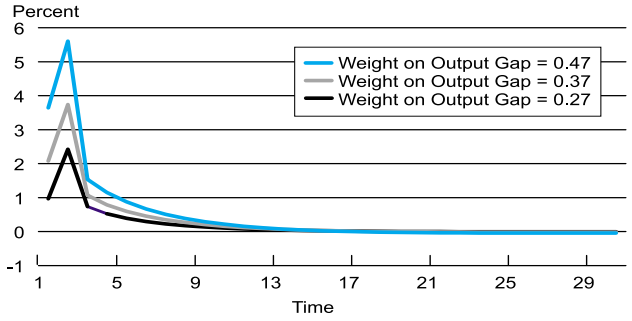
[10] A nice discussion of this channel can be found in the article by Lawrence Christiano.

FIGURES 3A, 3B, AND 3C

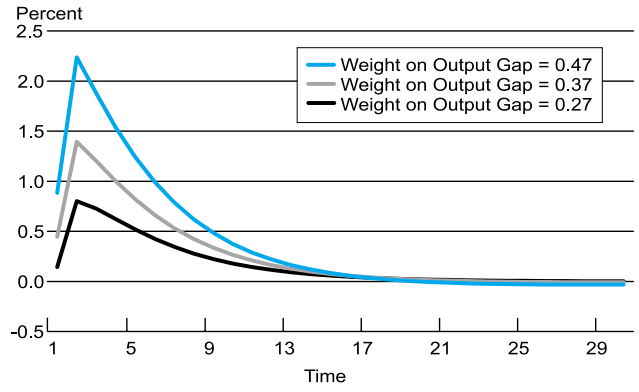
Effect of a Rise in Oil Prices on Output[a]



Effect of a Rise in Oil Prices on Inflation[b]



Effect of a Rise in Oil Prices on the Nominal Interest Rate[c]



[a] The figure describes the response of output in the model to a doubling in the price of oil, when the central bank places different weights on the output gap in the Taylor-type rule.

[b] The figure describes the response of inflation in the model to a doubling in the price of oil, when the central bank places different weights on the output gap in the Taylor-type rule.

[c] The figure describes the response of the nominal interest rate in the model to a doubling in the price of oil, when the central bank places different weights on the output gap in the Taylor-type rule.

model over time. The vertical axis shows the difference between the value of the variable following an oil-price shock and what it would have been absent the shock. Therefore, a negative value on the vertical axis means that following a rise in oil prices, the variable falls below what it otherwise would have been without the oil-price shock. The responses are also plotted for different weights that the central bank places on the output gap in its rule, for a given weight on inflation.[11] For instance, assume that the central bank's rule assigns a weight of 0.27 to the output gap and that the price of oil suddenly doubles before slowly falling back to its initial value. Figure 3A shows that output initially falls approximately 4 percent, relative to what it would have been without the rise in the price of oil. Furthermore, it shows that this difference shrinks as the price of oil returns to its initial value, although it takes some time for the effect to fully dissipate (about four and a half years). Similarly, Figures 3B and 3C show that the inflation rate climbs to about 2.5 percent and that the short-term interest rate increases about 0.8 percent, before each one slowly comes down to the value it would have had, absent the rise in the price of oil.

Although it might seem counterintuitive, when the central bank increases the weight on the output gap, it actually ends up magnifying the economic downturn.[12] For example, as seen in Figure 3A, when the central bank places a weight of 0.27 on the output gap in its rule, the drop in output is much smaller than when that weight equals 0.47. Why does this happen? In our framework, when the central bank wants to alleviate the drop in output caused by the rise in oil prices by lowering the interest rate, it must increase the growth rate of money. This puts upward pressure on the inflation rate.[13] Since inflation increases a lot following such a policy and since the Fed reacts more strongly to inflation than the output gap in the Taylor-type rule, it ends up having to reverse course and raise the interest rate. Firms that have to borrow to finance production then decide to borrow less and produce less, amplifying the initial drop in output. The result of this analysis suggests that in our model a central bank using a Taylor-type rule could achieve both a lower output gap and lower inflation by placing a lot of weight on inflation and a small weight on the output gap.[14]

An Inflation-Targeting Rule. This finding suggests that adopting a monetary policy rule that targets the inflation rate may be beneficial. In fact, the literature has proposed a wide array of policies as alternatives to the type of interest-rate rule that the Fed seemingly follows. Among these alternatives, inflation targeting is a popular candidate. Under inflation targeting, the central bank lets the money supply change in order to keep the inflation rate constant.[15] In a recent book, economists Ben Bernanke, Thomas Laubach, Frederic Mishkin, and Adam Posen argue in favor of the Federal Reserve's adopting an inflation-targeting rule. The goal of the Federal Reserve would then be clearer: keep inflation within a small bracket around, say, 2 percent. They argue that this would have the virtue, among others, of stabilizing people's expectations about the Fed's policies and, therefore, lead to a simpler decision process for investors who must take into account the central bank's next move.

Would the typical drop in output following a rise in oil prices be alleviated if the central bank followed an inflation-targeting rule instead of the Taylor-type rule estimated by Clarida, Gali, and Gertler? We found that in our model, economic downturns are indeed much less severe when the central bank targets the inflation rate.

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[11] We set a weight of 2.15 on inflation, meaning that for each basis point that inflation deviates from its target, the central bank would respond by raising the fed funds rate by 2.15 basis points. Note that 2.15 is the estimate used by Clarida, Gertler, and Gali.

[12] Notice that the weights in the Taylor-type rule measure the degree to which a central bank would respond to an output gap and to a *(continued)*

[12] *(continued)* deviation from inflation from its target if it were to follow the rule in setting policy. The weights, however, do not measure the central bank's preferences over output and inflation. Indeed, our results show that by putting more weight on inflation in the rule, the central bank achieves a better outcome with respect to output and inflation.

[13] Following an increase in the money stock, inflation increases in the long run because these extra dollars ultimately end up being spent on goods and services, thus raising the price level and the inflation rate. If firms do not adjust prices, inflation may not rise that much in the short run.

[14] Remember, though, that this happens in our model and may not happen in the real world. Empirically, in the real world, the inflation rate responds with a long lag to movements in monetary policy. But in our model, inflation jumps immediately following an increase in the growth rate of money. To determine whether this difference between the model and reality is significant, we introduced price stickiness into our framework, which dampens movements in inflation following a change in monetary policy. *(continued)*

[14] *(continued)* Price stickiness occurs when the prices of some goods are slow to respond to changes in the economy. We found that our results are not significantly changed by the introduction of this new feature. See my working paper with Keith Sill for details.

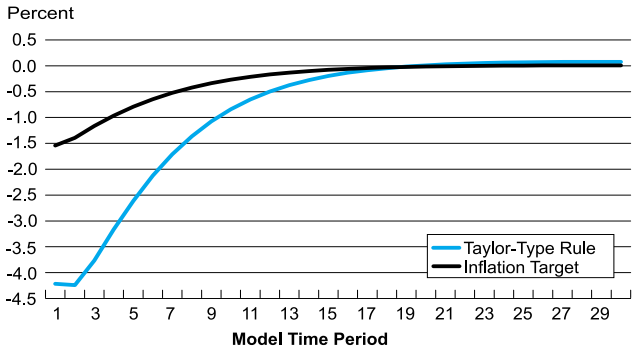
[15] We assume that the central bank uses only the money supply to keep inflation from deviating from its target. Note that this strategy allows the nominal interest rate to fluctuate. It differs from a Taylor-type rule with no weight on output and a very high weight on inflation, since under the Taylor-type rule the central bank sets an interest-rate target.

Figure 4 compares output's response to a rise in oil prices when the Fed targets the inflation rate versus when it follows the Taylor-type rule estimated by Clarida, Gali, and Gertler. The picture clearly shows that the recession is not as deep under an inflation-targeting rule. This happens because the rise in the price of oil makes a firm's machinery more expensive to use. As a result, the firm cuts its production. Since we have assumed that firms need to borrow funds from banks to finance production, the fall in production leads to a lower demand for banks' financing. This, in turn, puts downward pressure on the interest rate banks charge on their loans. Since under an inflation-targeting rule the money supply and the nominal interest rate change as necessary to keep inflation steady, the central bank lets the nominal interest rate fall, following the rise in the price of oil, instead of raising it to fight inflationary pressures, as the Taylor-type rule dictates. The fall in the interest rate then alleviates the financing cost of the firm and, thereby, attenuates the drop in output.

Monetary Policy's Response Matters. So it appears that monetary policy in our framework can contribute to economic downturns or it can alleviate the bad effects of oil-price shocks, depending on which strategy the central bank uses. Our results suggest that placing too much weight on the output gap may be counter-productive. Other authors have also found that placing too much weight on the output gap may lead to unwanted economic developments (see *Bad Mandate or Bad Measurement?*). Our results, like those of Mork and Hall, also suggest that monetary policy can be used to alleviate the impact of oil shocks on output if the central bank targets the inflation rate. Moreover, by definition, an inflation target has the additional benefit of checking a dramatic rise in inflation, as Mork and Hall found when they allowed for a large increase in the money supply in their experiment.

FIGURE 4

Downturn Following an Oil-Price Increase Under Different Monetary Policies



Interestingly, a recent study by economist Athanasios Orphanides shows that since 1979, the Fed has acted as if it were assigning a much lower weight to the output gap in its Taylor-type rule than it did previously, in other words, that the Fed has operated with different Taylor-type rules before and after 1979.[16] Since the first two oil shocks of the 1970s, the U.S. economy appears more resilient to increases in the price of oil, and we conjecture that this change in the way the Fed conducts monetary policy (along with the adoption of more energy-efficient technologies) contributed significantly to this development. Using Orphanides' estimates of the Fed's Taylor-type rules, we found that in our model, the total impact of an oil-price increase on output is approximately halved when we assume that the central bank follows a post-1979 Taylor-type rule compared with the more activist rule of the early 1970s.

[16] For details on Orphanides' research, see *Bad Mandate or Bad Measurement?*

CONCLUSION

Over the last decade, the Federal Reserve has often been praised and, to a certain extent, credited for the longest expansion in the country's history. However, the Fed is not without its critics. An important branch of macroeconomics, including such prominent economists as Milton Friedman, assigns a significant role to the central bank in causing the ups and the downs of the economy. However, since the beginning of the 1980s, other influential economists have minimized the Fed's role in causing changes in GDP over the business cycle. In their view, movements in the economy are the results of changes in supply-side factors such as the growth rate of productivity or oil shocks.

As we've discussed, both oil prices and the federal funds rate have risen before most recessions. But the rise in the federal funds rate was likely due to the central bank's reaction to inflationary pressures resulting from these oil shocks. This systematic response of policymakers to developments in the economy can play an important role in determining the business cycle — different strategies have different effects.

Bad Mandate or Bad Measurement?

The 1970s were plagued not only by important recessions but also by an extremely large increase in the inflation rate (Figure). Recently, different economists have tried to understand the reasons underlying this historical episode. When Milton Friedman said, "Inflation is always and everywhere a monetary phenomenon," he meant that if one is interested in understanding the growth rate of prices in the economy, one should look at the behavior of the growth rate of money. Most authors have found empirical evidence that over long periods, an increase in the growth rate of money leads, approximately, to a one-for-one increase in the inflation rate, with no effect on the level of economic activity.[a] Another way to say this is that in the long run, the only variable that the central bank can control is the inflation rate. The central bank's impact on output can only be short-lived.

So, one should look at the growth rate of the money supply to understand inflation. However, a more interesting question is: Why would a central bank let the money supply grow to such an extent that it leads to an increase in long-run inflation? Recently, two different views have been proposed: an expectations trap and measurement problems.

Expectations Trap. Theoretical work by V.V. Chari, Lawrence Christiano, and Martin Eichenbaum demonstrated that this can occur if a country does not assign the right mandate to the central bank. Economists Lawrence Christiano and Christopher Gust used Chari, Christiano, and Eichenbaum's insights to make sense of the 1970s.

The theory argues that without the right mandate, the central bank can be stuck in an *expectations trap*, a state in which people's expectations about inflation force the central bank to act in a certain way.

The reasoning is as follows. Suppose that people expect a rise in the inflation rate, for reasons possibly *not* related to economic events. Since they expect higher future inflation, workers would like higher wages to keep up with the cost of living. Firms must then decide if they can agree to these demands. Since firms also expect the inflation rate to rise in the future, they will probably agree to increase wages: Higher inflation makes it easier for firms to pass on the increase in wages to consumers by raising prices.

Now, the central bank faces a dilemma. On the one hand, it can increase the supply of money and create more inflation, just as people in the economy initially expected. Or it can contract the supply of money (and, as a result, raise short-term interest rates) to fight the rise in expected inflation. If the central bank chooses the former avenue, the economy is stuck in an expectations trap. That is, the inflation rate increases just because people initially *believed* that it would increase. If the central bank chooses the second avenue, it may create a recession, a path that it may find difficult to follow.

Christiano and Gust showed that a similar line of argument can explain monetary policy and the run-up in inflation in the 1970s. The reason for the expectations trap resides in the dual mandate assigned by Congress to the Federal Reserve System: price stability and full employment. Because of the second mandate, the Fed is likely to accommodate a sudden rise in expected inflation to avoid risking the chance of a recession.

Moreover, Christiano and Gust argue that by making price stability the sole goal of monetary policy, policymakers could avoid these expectations traps. As long as the central bank can credibly commit to keeping the inflation rate within a preannounced range, people

[a] See the article by George McCandless, Jr., and Warren Weber for an empirical study of the relationship between the growth rate of money, inflation, and output.

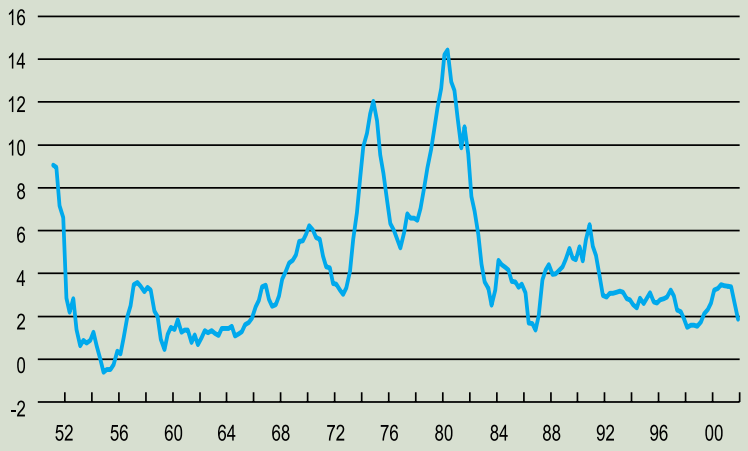
will assume that the inflation rate will not move outside this range. Christiano and Gust's analysis, like ours, suggests that too much emphasis on the output gap may lead to worse economic outcomes.

Measurement Problems. Another view that has received a lot of attention is the one proposed by economist Athanasios Orphanides. He argues that the increase in the inflation rate in the 1970s was not so much due to an expectations trap but to a mismeasured level of economic activity. Orphanides argues that the output gap was badly measured in the early 1970s, in part, because of the beginning of the productivity slowdown.[b] The slowdown in productivity meant that potential output was lower: The economy could produce less than before using the same amount of inputs. Initially, however, economists did not perceive the slowdown, so they assumed that potential output was higher than it really was. Since the output gap is the difference between current and potential output, the mismeasurement of potential output translated into a larger output gap.

Using these statistics, the Fed necessarily thought that the output gap was worse than it was and responded by reducing the federal funds rate (and increasing the money supply) by more than would have been dictated by a correctly measured output gap. In Orphanides' view, the result was the huge increase in inflation depicted in the figure. As in our analysis, Orphanides also showed that by placing a lower weight on the output gap, the Fed could have avoided some of the problems it faced in the 1970s.

[b] Labor productivity (output per hour) in the nonfarm private business sector fell from 2.63 percent over the period 1950-72 to 1.13 percent over the period 1972-95. See the article by Robert Gordon.

Figure
Inflation Rate



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