Chapter 8

Policy

CHAPTER HIGHLIGHTS

- Uncertainty about the economy places limits on the reach of successful policy.
- Our imperfect knowledge of the economy sometimes argues for a go-slow approach in the application of economic policy.
- Choice of policy targets should be influenced by the limits of our knowledge as well as by the extent of our knowledge.
- Democracies face the difficult problem of structuring policymaking bodies so as to avoid temptation toward an inflationary bias.

This chapter is about policy.

But isn't *everything* in the text either an explanation of macroeconomic outcomes or a study of how we might use policy to change those outcomes? Yes, but while elsewhere in the text we focus on our knowledge of the macroeconomy, in this chapter we ask how wise policymaking can be guided by an understanding of the limits of our knowledge. Policymakers ought to take heed of our uncertainty about the best target for the economy. Once a target is chosen, policymakers need to remember that we are unsure of the exact magnitude and timing of the effects of policy actions. Finally, policymakers must account for the effects that policies have on the public's expectations of the future.

In this chapter we look at how timing issues and specific kinds of uncertainty suggest particular ways of formulating policy. We begin by looking at lags in policymaking and policy implementation. Decisions cannot be made instantaneously, and even after a policy decision is made, implementation can take time. Further, the effect of policy may work its way through the economy slowly and with uncertain speed. New policies change the expectations of economic agents. The changed expectations themselves affect the economy but are hard to predict and hard to measure. For all these reasons, plus ongoing uncertainty about the "right" model for the economy, predictions of what a policy will do are uncertain. This argues for a degree of caution in choosing a policy. In addition to these general points, this chapter emphasizes some of the practical issues in policymaking.

This is the "whoa, not so fast" chapter, in the sense that we explore the limitations of macroeconomic policy. Acknowledging the limits of policy is very different from attempting to avoid policy altogether. *A large country does not have the option of* not *having a macroeconomic policy.* The choices of government spending, of taxation, and of the money supply *will* affect the economy. So in deciding on their budgets and on monetary policy, governments need to consider how best to affect the economy—or at least, how to avoid some common mistakes.

8-1

POLICY: WORKING BACKWARD

In explaining the macroeconomy, we start with an observed shock or proposed policy change; work through the details of the relations underlying aggregate supply and aggregate demand; ask how the *AS* and *AD* curves shift; and then, taking into account the slopes of the *AS* and *AD* curves, calculate output and the price level. Although policymakers use the same tools, they have to run the exercise in reverse. Policymakers begin by asking where output and the price level (or, if you prefer, unemployment and inflation) should be. Then the policymakers ask how much they need to shift *AS* or *AD* to hit those targets. The final calculation is to ask how large a policy change is required to move *AS* or *AD* the necessary distance. Box 8-1 works out an example of this sort of policy formulation.

BOX 8-1 A Policy Exercise—Ah, if Only It Were This Easy

You are in charge of the economy—at least until the end of this box. Right now the economy stands at 5.5 percent unemployment. Your task is to use monetary policy to move the economy to full employment.

STEP-BY-STEP

1. "Full employment" is 4 percent unemployment. How do we know? That's what the law says in the United States. So our target is to reduce unemployment by 1.5 percentage points.
2. According to Okun's law (see Chapter 7), a 1.5 point reduction in unemployment requires a 3 percent increase in output.
3. If you believe that aggregate demand can be completely described by the quantity theory, then a 1 percent increase in the money supply increases nominal GDP by 1 percent. If you also believe that prices are completely fixed in the short run, an increase in nominal GDP translates completely into an increase in real GDP. So each 1 percent increase in the money supply causes a 1 percent increase in real GDP.
4. Our monetary policy answer is to increase the money supply by 3 percent.

INCH-BY-INCH

1. Is this policy easily implemented? We will see in later chapters that the central bank lacks perfect control over the money supply, as it has to work through the banking system. So perhaps you cannot simply, by fiat, increase the money supply by 3 percent (an implementation practicality).

We turn now to look at some of the implications of uncertainty for policymaking as well as some of the practicalities faced in the policymaking process.[1]

8-2 LAGS IN THE EFFECTS OF POLICY

Suppose that the economy is at full employment and has been affected by an aggregate demand disturbance that will reduce the equilibrium level of income below full employment. Suppose further that there was no advance warning of this disturbance

[1]The president of the Federal Reserve Bank of St. Louis, William Poole, presents a hands-on view of these issues in "A Policymaker Confronts Uncertainty," Federal Reserve Bank of St. Louis *Review,* September–October 1998. See also Frederic Mishkin, "What Should Central Banks Do?" Federal Reserve Bank of St. Louis *Review,* November–December 2000.

2. Does the quantity theory link from money to output really work instantaneously? Does it take 10 seconds? 10 weeks? 10 months? (Policy lags matter, and timing is uncertain.)
3. Does money growth really translate proportionately into output growth?* In other words, is the "multiplier" of output on money growth 1.0? (There is multiplier uncertainty.)†
4. Are prices really fixed over the policy horizon? On learning of our proposed policy change, will economic agents raise their expectations of inflation? (What is the reaction to our policy?)
5. You didn't really believe full employment is 4 percent unemployment just because federal law says so, did you? (Target uncertainty.)

SLOWLY I TURN

In the face of uncertainty we should conduct a risk analysis. What can go wrong if we start with the 3 percent increase in the money supply computed above and then just keep increasing the money supply until unemployment hits 4 percent?

If we're persistent we *can* get unemployment down to 4 percent. That's true even if full employment is 5 percent or higher. The hitch is that we can move unemployment below the natural rate—but only temporarily. In the process we pump up the money supply enough to cause inflation. And the inflation may not show up until several quarters *after* our policy move. And if we continue to pump up the money supply, we will generate ever higher prices.

Having the wisdom to abandon an unattainable target is difficult for politicians and technocrats alike.

*Of course not. If life were so simple, macroeconomics texts would be a lot shorter.

†In general, "multiplier" means the effect of one variable on another. For example, if a one unit change in money leads to a one unit change in output the multiplier is one.

and that, consequently, no policy actions were taken in anticipation of its occurrence. Policymakers now have to decide *whether to respond at all* and *how* to respond to the disturbance.

The first concern is to distinguish whether the disturbance is *permanent,* or at least very persistent, or *transitory* and thus short-lived. Suppose the disturbance is only transitory, such as a one-period reduction in consumption spending. When the disturbance is transitory, so that consumption rapidly reverts to its initial level, the best policy may be to do nothing at all. Provided suppliers or producers do not mistakenly interpret the transitory decrease in demand as permanent, they will absorb it by production and inventory changes rather than by capacity adjustments. The disturbance will affect income in this period but will have very little permanent effect. Since today's policy actions take time to have an effect, today's actions would be hitting an economy that would otherwise have been close to full employment, and they would tend to move the economy *away* from the full-employment level. Thus, if a disturbance is temporary

and has no long-lived effects and policy operates with a lag, the best policy is to do nothing.

Figure 8-1 illustrates the main issue. Assume that an aggregate demand disturbance reduces output below potential, starting at time t_0. Without active policy intervention, output declines for a while but then recovers and reaches the full-employment level again at time t_2. Consider next the path of GDP under an active stabilization policy, but one that works with the disadvantage of lags. Thus expansionary policy might be initiated at time t_1 and start taking effect some time after. Output now tends to recover faster as a consequence of the expansion but, because of poor dosage and/or timing, actually overshoots the full-employment level. By time t_3, restrictive policy is initiated, and some time after, output starts turning down toward full employment and may well continue cycling for a while. In this example, "stabilization" policy may actually *destabilize* the economy.

One of the main difficulties of policymaking is establishing whether or not a disturbance is temporary. It was clear enough in the case of World War II that a high level of defense expenditures would be required for some years. However, in the case of the OPEC oil embargo of 1973–1974, it was not at all clear how long the embargo would last or whether the high prices for oil that were established in late 1973 would persist. At the time, there were many who argued that the oil cartel would not survive and that oil prices would soon fall—that is, that the disturbance was temporary. "Soon" turned out to be 12 years.

Let us suppose, however, that it is known that the disturbance will have effects that will last for several quarters and that the level of income will, without intervention, be below the full-employment level for some time. What lags do policymakers encounter?

We now consider the steps required before action can be taken after a disturbance has occurred, and then we examine the process by which that policy action affects the economy. There are delays, or lags, at every stage, and these can be divided into two stages: **an *inside lag*, which is the time period it takes to undertake a policy**

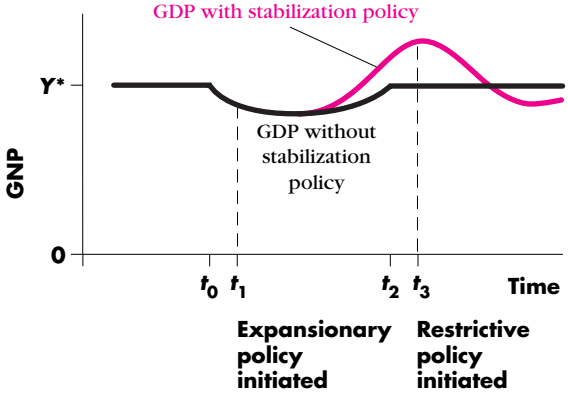

FIGURE 8-1 LAGS AND DESTABILIZING POLICY.

action—such as a tax cut or an increase in the money supply—and an *outside lag,* which describes the timing of the effects of the policy action on the economy. The inside lag, in turn, is divided into recognition, decision, and action lags.

THE RECOGNITION LAG

The *recognition lag* is the period that elapses between the time a disturbance occurs and the time the policymakers recognize that action is required. This lag could, in principle, be *negative* if the disturbance can be predicted and appropriate policy actions considered *before* it even occurs. For example, we know that seasonal factors affect behavior. Thus, it is known that at Christmas the demand for money is high. Rather than allow this to exert a restrictive effect on the economy, the Fed will accommodate this seasonal demand by an expansion in the supply of money.

In general, however, the recognition lag is positive, so time elapses between the disturbance and the recognition that active policy is required. In a classic work, Kareken and Solow studied the history of policymaking and concluded that on average the recognition lag is about 5 months.[2] The lag was found to be somewhat shorter when the required policy was expansionary and somewhat longer when restrictive policy was required. The speed with which tax cuts follow sharp increases in unemployment was clearly evident when the Bush administration took office in 2001.

THE DECISION AND ACTION LAGS

The *decision lag*—the delay between the recognition of the need for action and the policy decision—differs between monetary and fiscal policy.[3] The Federal Reserve System's Open Market Committee meets frequently to discuss and decide on policy. Thus, once the need for a policy action has been recognized, the decision lag for monetary policy is short. Further, **the *action lag*—the lag between the policy decision and its implementation**—for monetary policy is also short. The major monetary policy actions can be undertaken almost as soon as a decision has been made. Thus, under the existing arrangements of the Federal Reserve System, the decision lag for monetary policy is short and the action lag practically zero.

However, fiscal policy actions are less rapid. Once the need for a fiscal policy action has been recognized, the administration has to prepare legislation for that action. Next, the legislation has to be considered and approved by both houses of Congress before the policy change can be made. That may be a lengthy process. Even after the legislation has been approved, the policy change has still to be put into effect. If the

[2]See John Kareken and Robert Solow, "Lags in Monetary Policy," in *Stabilization Policies,* prepared for the Commission on Money and Credit (Englewood Cliffs, NJ: Prentice Hall, 1963). With regard to monetary policy, see Charles A.E. Goodhart, "Monetary Transmission Lags and the Formulation of the Policy Decision on Interest Rates," Federal Reserve Bank of St. Louis *Review,* July–August 2001.

[3]Monetary policy, actions by the Federal Reserve to change the money supply on interest rates, and fiscal policy, changes in government spending and tax programs, are discussed in detail in Chaps. 9–11.

BOX 8-2 How Fast Can the Fed Move in an Emergency?

New York City is the financial center of the United States and much of the world. Much of the computing and communications facilities for the financial system—and many of the people who keep it running—were located in or near the World Trade Center. The Federal Reserve Bank of New York, which conducts most of the actual financial operations required to implement monetary policy in the United States, is located two blocks from the World Trade Center. When the United States was attacked on September 11, 2001, there was a risk that the financial system could have been brought to its knees.

Within minutes of the attack, security personnel moved New York Fed employees into the inner core of the building and reversed the ventilation system to keep smoke out. Fed officials around the country were in immediate contact with major financial intermediaries to collect information about developments in the financial system. On the day of the attack and over the next few days, the Fed pumped reserves into the financial system—30 billion dollars more on September 12 than on the same day of the preceding week. And the Fed made huge temporary loans to financial institutions—45.5 billion dollars on September 12—nearly 50 times the loans made the previous Wednesday.

Cooperation between the Fed and the private sector in the hours and days immediately following the attack guaranteed that the financial system would have all the liquidity it needed to meet the crisis. The September 11 attacks were the worst on U.S. soil since the Civil War. Because of quick and resolute Fed action, the financial system survived with hardly a ripple.

fiscal policy takes the form of a change in tax rates, it may be some time before the change in tax rates begins to be reflected in paychecks—that is, there may be an action lag. On occasion, though, as in early 1975 when taxes were reduced, the fiscal decision lag may be short; in 1975 it was about 2 months.

AUTOMATIC STABILIZERS

The existence of the inside lag in policymaking focuses attention on the use of automatic stabilizers. **An *automatic stabilizer* is any mechanism in the economy that automatically—that is, without case-by-case government intervention—reduces the amount by which output changes in response to a shock to the economy.** One of the major benefits of automatic stabilizers is that their inside lag is zero. The most important automatic stabilizer is the income tax. It stabilizes the economy by reducing the multiplier effects of any disturbance to aggregate demand. The multiplier for the

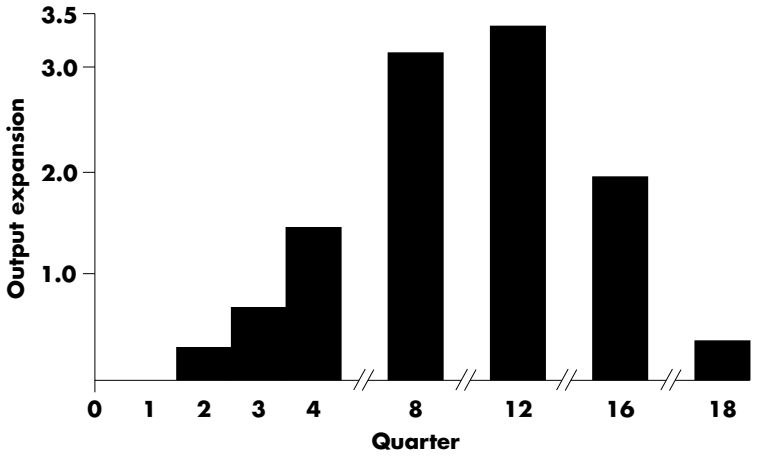

FIGURE 8-2 MONETARY POLICY MULTIPLIER FROM THE DRI MODEL.

effects of changes in autonomous spending on GDP is inversely related to the income tax rate, as we will see in Chapter 9. Unemployment compensation is another automatic stabilizer. When workers become unemployed and reduce their consumption, that reduction in consumption demand tends to have multiplier effects on output. Those multiplier effects are reduced when a worker receives unemployment compensation because disposable income is reduced by less than the loss in earnings.

Although built-in stabilizers have desirable effects, they cannot be carried too far without also affecting the overall performance of the economy. The multiplier could be reduced to 1 by increasing the tax rate to 100 percent, and that would appear to be a stabilizing influence on the economy. But with 100 percent marginal tax rates, who would want to work? There are limits on the extent to which automatic stabilizers are desirable.[4]

THE OUTSIDE LAG

The inside lag of policy is a *discrete lag*—so many months—from recognition to decision and implementation. The outside lag is generally a *distributed lag:* Once the policy action has been taken, its effects on the economy are spread over time. There may be a small immediate effect of a policy action, but other effects occur later.

The idea that policy operates on aggregate demand and income with a distributed lag is illustrated by the dynamic multiplier in Figure 8-2. There we show the effects over time of a once-and-for-all 1 percent increase in the money supply in period zero. The impact is initially very small, but it continues to increase over a long period of time. The lags of monetary policy are represented by the fact that any significant impact of money on spending and output takes several quarters and builds up only gradually.

[4]For a discussion of the history of automatic stabilizers, see Herbert Stein, *The Fiscal Revolution in America: Policy in Pursuit of Reality* (Washington DC: American Enterprise Institute for Public Policy Research, 1996).

What are the policy implications of the distributed lag encountered in the outside lag? If it were necessary to increase the level of employment rapidly to offset a demand disturbance, a large increase in the money supply would be necessary. But in later quarters, the large initial increase would build up large effects on GDP, and those effects would probably overcorrect the unemployment, leading to inflationary pressures.

Why are there such long outside lags? Consider the example of monetary policy, which initially has effects mainly on interest rates and not on income. The interest rates, in turn, affect investment with a lag, and also affect consumption by affecting the value of wealth. When aggregate demand is ultimately affected, the increase in spending itself produces a series of induced adjustments in output and spending. When policy acts slowly, with the impacts of policy building up over time as in Figure 8-2, considerable skill is required of policymakers if their own attempts to correct an initially undesirable situation are not to lead to problems that themselves need correcting.

MONETARY VERSUS FISCAL POLICY LAGS

Fiscal policy and, certainly, changes in government spending—which act directly on aggregate demand—affect income more rapidly than monetary policy. However, while fiscal policy has a shorter outside lag, it has a considerably longer inside lag. The long inside lag makes fiscal policy less useful for stabilization and means that fiscal policy tends to be used relatively infrequently to try to stabilize the economy.

Our analysis of lags indicates one difficulty in undertaking stabilizing short-term policy actions: It takes time to set the policies in action, and then the policies themselves take time to affect the economy. But that is not the only difficulty. Further difficulties arise because policymakers cannot be certain about the size and the timing of the effects of policy actions.

GRADUALIST VERSUS COLD-TURKEY POLICIES

Faced with a given policy objective—for example, to reduce inflation—a policymaker must choose between gradualist and cold-turkey policies. Gradualist policies move the economy slowly toward the target, while cold-turkey policies are those that try to hit the target as quickly as possible. Cold-turkey policies generate a "shock effect," which can be bad if the shock is disruptive but good if dramatic action adds to the policymaker's credibility. Gradualist policies, in contrast, have the advantage of allowing for the incorporation of new information as the policy plays out.

8-3 EXPECTATIONS AND REACTIONS

Uncertainty about the effects of policies on the economy arise because policymakers do not know the precise values of multipliers. The government is always uncertain about how the economy will react to policy changes. In practice, governments work

with econometric models of the economy in estimating the effects of policy changes. **An *econometric model* is a statistical description of the economy or some part of it.**

Government uncertainty about the effects of policy arises partly because the government does not know the true model of the economy and partly because it does not know what expectations firms and consumers have. In this section we concentrate on the role of expectations.

REACTION UNCERTAINTIES

Suppose that in early 2010, because of weakness in the economy, the government decides to cut taxes. The tax cut is meant to be strictly temporary—a brief shot in the arm to get the economy moving and nothing more.

In figuring out how big a tax cut is needed, the government has to guess how the public will react to a temporary tax cut. One possible answer is that since the tax cut will be temporary, it will not affect long-term income very much and thus not affect spending by much. That suggests that to be useful, a temporary tax cut would have to be large. Alternatively, perhaps consumers will believe that the tax cut will last much longer than the government says—after all, the public knows that raising taxes is difficult. In this case the marginal propensity to spend out of a tax cut announced as temporary would be larger. A smaller tax cut would be enough to raise spending a lot. If the government is wrong in its guess about consumers' reactions, it could destabilize rather than stabilize the economy.

CHANGES IN POLICY REGIME

A special problem emerges when the government changes the way it has traditionally responded to disturbances. For example, a government that has typically cut taxes in recessions and now no longer does so (e.g., because the deficit is large) may find that the cut had been expected and that there is an extra drop in demand when consumers realize taxes will not be cut this time.

It is particularly important to consider the effects of a given policy action itself on expectations, since it is possible that a new type of policy will affect the way in which expectations are formed.[5] Suppose that the Federal Reserve System announced that from now on its policy would be aimed *solely* at maintaining price stability and that in response to any price-level increase it would reduce the money supply (and vice versa). If people believed the announcement, they would not base expectations of money growth and inflation on the past behavior of the inflation rate.

However, people are not likely to fully believe such an announcement immediately. The policymakers are likely to lack full *credibility.* **Policymakers have credibility when their announcements are believed by economic agents.** Typically, policymakers

[5]The interactions of policy and expectations have been the focus of the rational expectations approach to macroeconomics, introduced in Chap. 6. For a very early statement, see Thomas J. Sargent and Neil Wallace, "Rational Expectations and the Theory of Economic Policy," *Journal of Monetary Economics,* April 1976.

BOX 8-3 How Good Are Macroeconomic Forecasts?

In business and finance and in government, knowing what will happen in the economy next quarter and next year is critical as an ingredient for planning, for portfolio selection, and for policymaking. The demand for forecasts is met by a broad group of professional forecasters. The methods used range from informal, almost back-of-the-envelope, calculations to sophisticated macroeconometric models where literally thousands of equations representing the economy are the basis of the outlook.*

How good are the forecasts? Table 1 shows the forecasts and the actual results from three sources. The first is the Congressional Budget Office (CBO), which uses macroeconometric models as the background for revenue and outlay projections. The second is the administration forecasts. The third source is the Blue Chip forecast, a consensus of private forecasters. The projections in the table are obviously sometimes off—the forecasters missed low growth in 1990–1991 and high growth in 1995–2000. From 1993 through 1995, in contrast, the forecasts were right on target.

How can forecasters go wrong? They may not predict disturbances (the Gulf war, for example); they may misread the current state of the economy and hence base their forecasts on a wrong picture of the present situation; and they may misjudge the

*To learn about a large-scale econometric model, see F. Brayton and P. A. Tinsley, "A Guide to FRB/US: A Macroeconomic Model of the United States," Board of Governors of the Federal Reserve System, October 1996.

have to earn credibility, by behaving consistently over long periods, so that people learn to believe what they say.[6]

Earning credibility is likely to be costly. Consider what happens if the Fed announces it will keep inflation low and is not believed. Then the expected inflation rate is above the actual inflation rate, and—as the Phillips curve shows—a recession follows. Only over time, as the new policies are understood, is credibility earned.

As an example, credibility issues are always a problem when governments promise to keep exchange rates fixed. In the 1980s, governments in the European Monetary System of quasi-fixed exchange rates announced that they would no longer respond to increases in wages and prices with devaluations. Initially, the policymakers lacked credibility, and inflation stayed high. But eventually, by holding fast, and with the aid of recessions, policymakers gained credibility and inflation came down. Then in 1992, under the macroeconomic impact of German unification, major devaluations were forced on reluctant governments, and their credibility was seriously dented.

[6]See Alan S. Blinder, "Central Bank Credibility: Why Do We Care? How Do We Build It?" *American Economic Review,* December 2000.

timing or vigor of the government's monetary and fiscal responses to booms or recessions. The fact is that forecasting has not reached perfection, particularly at major turning points in the economy, as illustrated in the table.†

TABLE 1 How Accurate Are Macroeconomic Forecasts? Actual versus Forecast 2-Year Average Growth Rates for Real Output

	ACTUAL	CBO	ADMINISTRATION	BLUE CHIP
1976–1977	5.2	6.2	5.9	—
1986–1987	3.2	3.1	3.7	3.0
1990–1991	0.7	2.0	2.8	1.9
1993–1994	3.3	2.9	2.9	3.0
1994–1995	3.3	2.8	2.9	2.8
1995–1996	3.1	2.4	2.6	2.6
1996–1997	4.0	1.9	2.2	2.1
1997–1998	4.4	2.1	2.1	2.2
1998–1999	4.2	2.3	2.2	2.4
1999–2000	3.9	2.0	2.2	2.3
2000–2001	2.0	3.2	3.0	3.3

Source: *CBO's Economic Forecasting Record,* Table 2, A Supplement to *The Budget and Economic Outlook: Fiscal Years 2003–2012,* Congressional Budget Office, February 2002.

†Stephen K. McNees, "How Large Are Economic Forecast Errors?" *New England Economic Review,* July–August 1992, provides detailed examination of the historical record of forecasters and identifies what they are good at and what they seemingly do not do so well. Also, Christopher A. Sims, "The Role of Models and Probabilities in the Monetary Policy Process," *Brookings Papers on Economic Activity,* 2 (2002).

8-4 UNCERTAINTY AND ECONOMIC POLICY

Uncertainty about the expectations of firms and consumers is one reason that policymakers can go wrong in using active stabilization policy. Another reason is that it is difficult to forecast disturbances, such as changes in the price of oil, that might disturb the economy before policy takes effect.

A third reason is that economists and therefore policymakers do not know enough about the true structure of the economy. We distinguish between uncertainty about the correct model of the economy and uncertainty about the precise values of the parameters or coefficients within a given model of the economy, even though the distinction is not watertight.

First, there is considerable disagreement and therefore uncertainty about the correct model of the economy, as evidenced by the large number of macroeconometric models. Reasonable economists can and do differ about what theory and empirical evidence suggest are the correct behavioral functions of the economy. Generally, each economist will have reasons for favoring one particular form and will use that form.

But, being reasonable, the economist will recognize that the particular formulation being used may not be the correct one and will thus regard its predictions as subject to a margin of error. In turn, policymakers will know that there are different predictions about the effects of a given policy, and they will want to consider the range of predictions that are being made in deciding on policy.

Second, even within a given model there is uncertainty about the values of parameters and multipliers. The statistical evidence does allow us to say something about the likely range of parameters or multipliers, so we can at least get some idea of the type of errors that could result from a particular policy action.[7]

Uncertainty about the size of the effects that will result from any particular policy action—whether because of uncertainty about expectations or about the structure of the economy—is known as *multiplier uncertainty.* For instance, our best estimate of the multiplier of an increase in government spending might be 1.2. If GDP has to be increased by $60 billion, we would increase government spending by $50 billion. But the statistical evidence might be better interpreted as saying only that we can be quite confident that the multiplier is between .9 and 1.5. In that case, when we increase government spending by $50 billion, we expect GDP to rise by some amount between $45 and $75 billion.

How should a policymaker react in the face of these uncertainties? The more precisely policymakers are informed about the relevant parameters, the more activist the policy can afford to be. Conversely, if there is a considerable range of error in the estimate of the relevant parameters—in our example, the multiplier—then policy should be more modest. With poor information, very active policy runs a large danger of introducing unnecessary fluctuations in the economy.

THE POLICY PORTFOLIO UNDER UNCERTAINTY

Consider the choice between monetary policy and fiscal policy when both monetary and fiscal policy multipliers are uncertain. The best procedure is to employ a *portfolio of policy instruments*—use a weaker dose of both monetary and fiscal policies. The reason for practicing *diversification* in this way is that there is at least a chance that the errors in estimating one multiplier will be offset by the errors in estimating the other.[8] With good luck, errors in setting policy will partially cancel one another. Even if we are unlucky, we are no worse off than if we had relied fully on one instrument.[9]

[7]We are discussing here confidence intervals about estimates of parameters; see Robert Pindyck and Daniel Rubinfeld, *Econometric Models and Economic Forecasts* (New York: McGraw-Hill, 1997), for further discussion.

[8]If you have studied finance, you will be familiar with the notion of picking a *portfolio* of investments in order to reduce risk through *diversification*. The choice of words here is no coincidence—the principles of choosing a policy portfolio are the same as those involved in choosing an investment portfolio.

[9]The practice of coordinating monetary and fiscal policies has an interesting downside for macroeconomists. We are, of course, very interested in separating the effects of one type of policy from those of another. But if two policies are generally used in concert, it is very difficult to use historical data to know which policy was responsible for the observed results.

◆ OPTIONAL ◆

MULTIPLIER UNCERTAINTY AND POLICY: A FORMAL ANALYSIS

Multipliers measure the quantitative effect of policy. The argument that the less certain we are about the size of a multiplier, the more cautious we should be in application of the associated policy instrument is intuitively plausible. This intuition was first given formal expression by William Brainard.[10] We present a simplified version here.

Suppose that our entire knowledge of the effect of monetary policy on the economy can be boiled down to one equation:

$$Y = \beta M \tag{1}$$

where Y is output, M is the money stock, and β is the monetary policy multiplier. Y^* is the target for output. Because we may not be able to hit the target precisely, we need a rule for evaluating the success of policy that measures the damage done when we miss the target. While we hope that Y will hit Y^* exactly, we recognize there will generally be some gap between actual and target outcomes, $Y - Y^*$. We "keep score"; that is, we measure the damage attributable to a "miss" with the *loss function:*

$$L = \tfrac{1}{2}(Y - Y^*)^2 \tag{2}$$

Note that this loss function puts a much larger penalty on large losses than on small losses. We evaluate the success of a policy choice, M, by substituting βM for the realized value of output, Y, in equation (2). The *marginal loss function, ML*(M), measures the change in the loss function from a small change in the policy instrument M. As is usual in economics, one way to think about minimizing losses is to set the marginal loss to zero. The marginal loss function corresponding to equations (1) and (2) is given by[11]

$$ML(M) = (\beta M - Y^*) \times \beta \tag{3}$$

We now work out an example, first when the multiplier is known and then when it is uncertain. Suppose that our target is $Y^* = 3$ and that we somehow know the multiplier is exactly $\beta = \bar{\beta} = 1$. The appropriate policy is obviously to set $M = 3$, but to carry out the formal analysis, we set the marginal loss equal to zero in equation (4) and solve for the optimal policy in equation (5):

$$ML(M) = 0 = (Y - Y^*) \times \bar{\beta} = (\bar{\beta} M - Y^*) \times \bar{\beta} \tag{4}$$

$$M = \frac{Y^*}{\bar{\beta}} \tag{5}$$

So we choose $M = 3/1 = 3$; observe $Y = 1 \times 3 = 3 = Y^*$; hit the target exactly; and according to the rating from equation (2), achieve a perfect, zero-loss, score.

Now, suppose instead that β is either .5 or 1.5, with a 50 percent chance for either value. The average value of β remains $\bar{\beta} = (0.5 + 1.5)/2 = 1.0$, just as in the previous example; the difference is that we have introduced uncertainty. Suppose basing

[10]William Brainard, "Uncertainty and the Effectiveness of Policy," *American Economic Review,* May 1967.

[11]If you are comfortable with calculus, you will see that all we are doing is substituting equation (1) into equation (2) and then taking the derivative with respect to M.

policy on this average value, we again set policy at $M = 3$. (This is called the *certainty-equivalence policy*.) If β is actually .5, we will undershoot the target; if β equals 1.5, we will overshoot. However, we can do a little better by shading in the direction of undershooting rather than overshooting, because a low value of β means that the marginal impact of the policy is lower.

We can work out the optimal choice for M in this case by weighting the marginal loss function with equal chances for each value of β. The weighted marginal loss function is

$$ML(M) = 0 = 50\% \times [(0.5M - Y^*) \times 0.5] + 50\% \times [(1.5M - Y^*) \times 1.5] \quad (6)$$

$$M = \frac{Y^*}{1.25} \quad (7)$$

Equation (7) tells us to set M to 2.4 instead of 3—we are more conservative in our use of policy than we would be under certainty equivalence. Thus Brainard's analysis affirms our intuition that uncertainty should lead to caution.

8-5

TARGETS, INSTRUMENTS, AND INDICATORS: A TAXONOMY

Economic variables play a variety of roles in policy discussions. It is useful to divide variables into *targets, instruments,* and *indicators.*[12]

Targets—Targets are identified goals of policy. While the ultimate target is "the good of society," we focus more specifically on output and prices, unemployment and inflation. Targets are usefully subdivided into *ultimate targets* and *intermediate targets.* An example of an ultimate target is "to achieve zero inflation." As part of overall economic policy, a particular policymaking unit may be assigned the task of hitting a particular intermediate target. For example, the central bank may be instructed to aim for 2 percent annual growth of the money stock. Even though money growth per se is not an ultimate economic goal, targeting money growth may be the appropriate task (intermediate target) to assign to the central bank.

Instruments—Instruments are the tools the policymaker manipulates directly. For example, a central bank might have an exchange-rate target. Its instrument would be the purchase or sale of foreign exchange.

Indicators—Indicators are economic variables that signal us as to whether we are getting closer to our desired targets. As an example, increases in interest rates (an indicator) sometimes signal that the market anticipates increased future inflation (a target). So indicators provide information feedback that allows a policymaker to adjust the instruments in order to do a better job of hitting the target.

[12]See Benjamin M. Friedman, "Targets, Instruments, and Indicators of Monetary Policy," *Journal of Monetary Economics,* October 1975.

Most economists agree that the best way to reach ultimate targets is for policymakers to use indicators to provide additional information in computing the best adjustments to the available instruments.

The categorization of variables into target, instrument, or indicator is sometimes situational. For example, in some years central banks have treated interest rates as intermediate targets. In other years central banks have used interest rates as indicators of the success of money supply policy. Indeed, policymakers often face a choice of whether to use a particular policy tool as an instrument, destroying its value as an indicator, or to keep the tool as an indicator and forgo its use as a direct instrument.

8-6 ACTIVIST POLICY

We look at two questions in this section. First, Should policymakers actively try to offset shocks? In particular, Should they attempt to fine-tune the economy or should they limit themselves to respond only to major shocks? If our answers lean toward activism, we then ask whether responses should be precommitted to specified rules, or whether policymakers should exercise case-by-case discretion.

The list of difficulties in the way of successful policymaking that we have outlined may have raised the question, Why should one believe that policy can do *anything* to reduce fluctuations in the economy?[13]

Indeed, Milton Friedman and others argued that there should be no use of active countercyclical monetary policy and that monetary policy should be confined to making the money supply grow at a constant rate. The precise value of the constant rate of money growth, Friedman suggests, is less important than the fact that monetary growth should be constant and that policy should *not* respond to disturbances. At various times, he has suggested growth rates for money of 2 or 4 or 5 percent. As Friedman has expressed it, "By setting itself a steady course and keeping to it, the monetary authority could make a major contribution to promoting economic stability. By making that course one of steady but moderate growth in the quantity of money, it would make a major contribution to avoidance of either inflation or deflation of prices."[14] Friedman thus advocates a simple monetary rule in which the Fed does not respond to the condition of the economy. Policies that respond to the current or predicted state of the economy are called *activist policies*. Interestingly, Friedman does make an exception to this rule in the face of extreme disturbances.

In discussing the desirability of activist monetary and fiscal policy, we want to distinguish between policy actions taken in response to major disturbances to the economy and *fine tuning,* in which policy variables are continually adjusted in response to small disturbances in the economy. We see no case for arguing that monetary and fiscal

[13]An excellent discussion of the issues is found in Steven Sheffrin, *The Making of Economic Policy* (Oxford, England: Basil Blackwell, 1989).

[14]Milton Friedman, "The Role of Monetary Policy," *American Economic Review,* March 1968. See also his book, *A Program for Monetary Stability* (New York: Fordham University Press, 1959).

BOX 8-4 Fine Tuning and Monetary Policy in the 1980s and 1990s

At the same time as the analytic arguments against fine tuning and discretionary policy were being refined in the 1980s and 1990s, the Fed, under the chairmanship first of Paul Volcker (1979–1987) and then Alan Greenspan (1987–present), was in one of the most successful periods of implementation of monetary policy in its history—and the policies were clearly discretionary.

What happened? Through the 1970s, inflation had been rising from business cycle to business cycle; in each cycle, the peak inflation rate was higher than it had been in the previous cycle. Paul Volcker's priority as chairman was to bring inflation under control. That goal was achieved, albeit at the cost of the recession of 1981–1982, during which the unemployment rate hit the highest level of the post-World War II period, 10.8 percent.

When Alan Greenspan took over in August 1987, the inflation rate was 4.6 percent and the economy was fundamentally at full employment. Two months later, the new chairman of the Fed was faced with a potentially massive crisis, when the stock market crashed on October 19, 1987. The Fed rose to the challenge by providing enough liquidity to make sure there was no financial panic.

Perhaps partly as a result of that injection of liquidity, inflationary pressures continued to rise through the end of the decade, and the Fed accordingly tightened monetary policy by raising interest rates. Eventually, in July 1990, a recession began. However, the recession was shallow, with unemployment rising to a maximum of only 7.7 percent. Once the recession was clearly recognized, the Fed cut interest rates, slowly and repeatedly. The recession ended in March 1991, and the recovery continued as inflation declined.

By the end of 1994, the economy was back at full employment, but inflation stayed low. And during the following 2 years the Fed succeeded in keeping both inflation and unemployment low.

There can be no doubt that in the 1990s active and discretionary Fed policy, a fine-tuning policy, helped keep the economy operating better than at any time in the

policy should not be used actively in the face of major disturbances to the economy. Most of the considerations of the previous sections of this chapter indicate some uncertainty about the effects of policy, but sometimes there can be no doubt about which direction policy should take.

For instance, an administration coming to power in 1933 should not have worried about the uncertainties associated with expansionary policy that we have outlined. The economy does not move from 25 percent unemployment to full employment in a short time. Thus, expansionary measures, such as a rapid growth of the money supply,

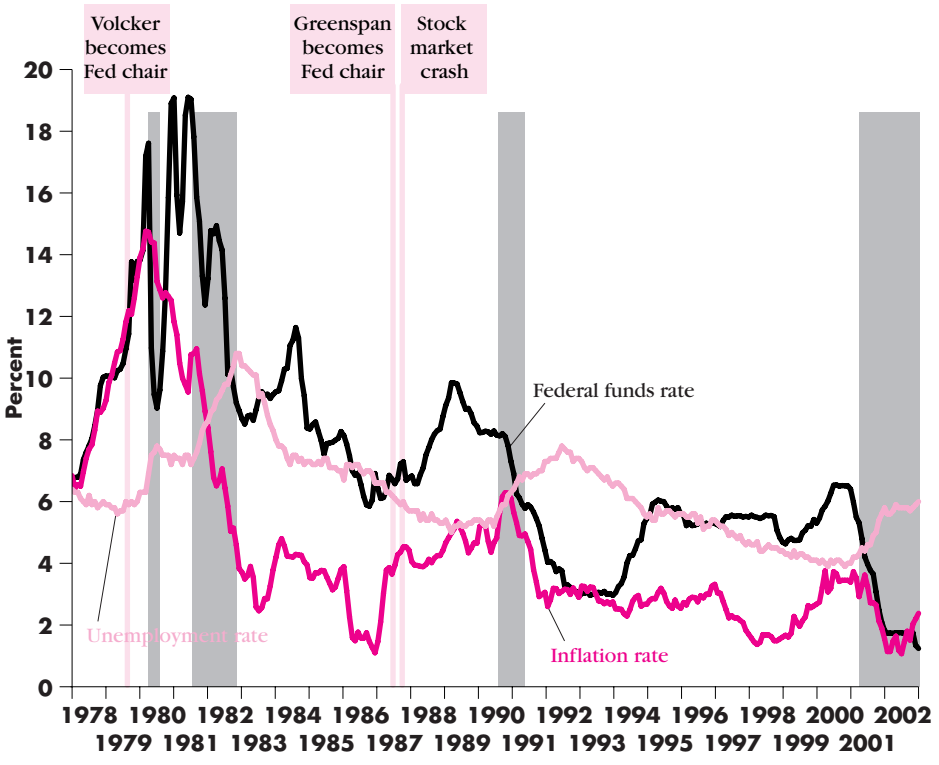

FIGURE 1 INFLATION, UNEMPLOYMENT, AND THE FEDERAL FUNDS INTEREST RATE, 1978–2002.

(Source: Bureau of Labor Statistics and Federal Reserve Economic Data at Federal Reserve Bank of St. Louis.)

previous 30 years. Of course, the Fed was not perfect, and in particular it has been criticized for cutting interest rates too slowly during the 1990–1991 recession and for raising rates too slowly as the economy boomed at the end of the last century. But, on balance, the Fed has done an excellent job.

increased government expenditures, tax reductions, or all three, would have been appropriate policy since there was no chance that the economy would have overshot into a boom. Similarly, contractionary policies for private demand are called for in wartime. In the event of large disturbances in the future, activist monetary or fiscal policy, or both, should once again be used.

Fine tuning presents more complicated issues. In the case of fiscal policy, the long inside lags make discretionary fine tuning virtually impossible, though automatic stabilizers are in fact fine-tuning all the time. But with monetary policy decisions being

made frequently, fine tuning of monetary policy is indeed possible. The question, then, is whether a small increase in the unemployment rate should lead to a small increase in the growth rate of money or whether policy should not respond until the increase in unemployment becomes large, say more than 1 percent.

The problem is that the disturbance that caused the increase in unemployment may be either transitory or permanent. If it is transitory, nothing should be done. If it is permanent, policy should react to a small disturbance in a small way. Given uncertainty over the nature of the disturbance, the technically correct response is a small one, between the zero that is appropriate for a transitory shock and the full response that is appropriate for a permanent disturbance. Accordingly, fine tuning is appropriate provided that policy responses are always kept small in response to small disturbances.

The case for fine tuning is a controversial one. The major argument against it is that in practice policymakers do not in fact behave as suggested—making only small adjustments in response to small disturbances. If allowed to do anything, they may do too much.

The major lesson is not that policy is impossible but that overly ambitious policy is risky. The lesson is to proceed with extreme caution, always bearing in mind the possibility that policy itself may be destabilizing.

RULES VERSUS DISCRETION

If there is a risk that policymakers react to disturbances in unpredictable ways, and in a dosage that is excessively influenced by the perception of the day, and if all this is possibly one of the reasons for macroeconomic instability, why not put policy on automatic pilot? This is the issue of *rules versus discretion*. Should the monetary authority and also the fiscal authority conduct policy in accordance with preannounced rules that describe precisely how their policy variables will be determined in all future situations, or should they be allowed to use their discretion in determining the values of the policy variables at different times?

One example of a rule is the constant-growth-rate rule, say at 4 percent, for monetary policy. The rule is that no matter what happens, the money supply will be kept growing at 4 percent. Another example would be a rule stating that the money supply growth rate will be increased by 2 percent per year for every 1 percent unemployment in excess of an estimate of the natural rate, say 5.5 percent. Algebraically, such a rule would be expressed as

$$\frac{\Delta M}{M} = 4.0 + 2(u - 5.5) \tag{8}$$

where the growth rate of money $\Delta M/M$ is an annual percentage rate, and u is the percentage unemployment rate.[15]

[15]Engineering students will recognize this as an argument between open-loop (set a path in advance) and closed-loop (use feedback) control systems.

BOX 8-5 Fiscal Policy and Fine Tuning—the Side Effects

Fiscal policy can be an inappropriate tool with which to tune the economy because of its side effects. Presumably the best tax rate is one that pays for the government while introducing minimal distortions in private decisions. Presumably the level of unemployment compensation is set so as to balance fairness to the unemployed against lost incentives to work. There is little reason that such choices will coincidentally be just the right ones to move the economy out of a recession.

So even if purely macroeconomic considerations argue for the use of fiscal rather than monetary policy, the existence of side effects limits the availability of fiscal policy for short-run stabilization.

The activist monetary rule of equation (8) implies that at 5.5 percent unemployment, monetary growth is 4 percent. If unemployment rises above 5.5 percent, monetary growth is *automatically* increased. Thus, with 7.5 percent unemployment, monetary growth would be 8 percent, using equation (8). Conversely, if unemployment dropped below 5.5 percent, monetary growth would be lowered below 4 percent. The rule therefore gears the amount of monetary stimulus to an indicator of the business cycle. By linking monetary growth to the unemployment rate, an activist, anticyclical monetary policy is achieved, but this is done without any discretion.

The issue of rules versus discretion has been clouded by the fact that most proponents of rules have been nonactivists, whose preferred monetary rule is a constant-growth-rate rule. Consequently, the argument has tended to center on whether activist policy is desirable or not. The fundamental point to recognize is that we can design *activist rules*. We can design rules that have countercyclical features without, at the same time, leaving any discretion about their actions to policymakers. The point is made by equation (8), which is an activist rule because it expands money growth when unemployment is high and reduces it when unemployment is low. The equation leaves no room for policy discretion and in this respect is a rule.

Given that both the economy and our knowledge of it are changing over time, there is no economic case for stating permanent policy rules that would tie the hands of the monetary and fiscal authorities permanently.[16] Two practical issues, then, arise in the rules-versus-discretion debate. The first is where the authority to change the rule is located. At one extreme, the growth rate of money could be prescribed by the Constitution. At the other it is left to the Fed or the "Fisc" (the equivalent fiscal policymaking

[16]For evidence on this point, see John B. Taylor, "Discretion versus Policy Rules in Practice," *Carnegie-Rochester Conference Series on Public Policy,* December 1993.

BOX 8-6 Taylor's Rule

The best known example of an activist rule is Taylor's rule, named for its discoverer/inventor John B. Taylor of Stanford University (and later, undersecretary of the Treasury). Taylor's rule tells the monetary authority how to set interest rates in response to economic activity. Specifically, Taylor's rule is

$$i_t = 2 + \pi_t + 0.5 \times (\pi_t - \pi_t^*) + 0.5 \times \left(100 \times \frac{Y_t - Y_t^*}{Y_t^*}\right)$$

where π_t^* is the target inflation rate, and the constant "2" aproximates the long-run average real interest rate. For example, to hit a 2 percent inflation target at full-employment, the Fed would set the nominal interest rate to be 4 percent. As a second example, if inflation is running at 5 percent with a 2 percent target while GDP is 1 percent above potential, Taylor's rule would tell the Fed to set the nominal interest rate at 9 percent ($2 + 5 + 0.5 \times [5 - 2] + 0.5 \times 1$).

The rule states that when inflation goes up 1 point above the target, the Fed should counteract the increase by raising interest rates by 1.5 points. When the GDP gap rises 1 percent, interest rates are raised by ½ percent. Taylor argued that this rule is both a pretty good rough rule and pretty close to what the Fed actually did.*

Taylor's rule illustrates a critical characteristic of any good policy rule: *negative feedback*. (Positive feedback is best illustrated by putting a live microphone in front of a loudspeaker.) Remember that the nominal interest rate, *i*, equals the real interest rate plus inflation. By increasing nominal interests by more than the increase in inflation, Taylor's rule increases real interest rates—cooling off the economy—when inflation increases.

*John B. Taylor, "Discretion versus Policy Rules in Practice," *Carnegie-Rochester Conference Series on Public Policy,* 1993. For a good discussion, see John P. Judd and Glenn D. Rudebusch, "Taylor's Rule and the Fed: 1970–1997," Federal Reserve Bank of San Francisco *Review,* 1998.

body). In each case policy can be changed, but changing the Constitution takes longer than it takes the Fed to change its policy. In the tradeoff between certainty about future policy and flexibility of policy, activists place a premium on flexibility, and those in favor of rules that are difficult to change place a premium on the fact that the Fed has often made mistakes in the past. Because the financial system responds very quickly to shocks and is so interconnected, we believe it essential that the Fed have considerable discretion and thus flexibility to respond to disturbances. But that is far from a universal judgment.

The second issue is whether the policymakers should announce in advance the policies they will be following for the foreseeable future. Such announcements are in principle desirable because they help private individuals to forecast future policy. In fact, the chairperson of the Fed is required to announce to Congress the Fed's monetary targets. In practice, however, these announcements have not been a great help because

the Fed does not stick to its targets. If the Fed is able to keep output close to potential and inflation low by departing from announced policy, it helps private individuals forecast the variables in which they are really interested—their future incomes and, in the case of firms, the demand for their goods—rather than those, like the money supply, that they need know only as an intermediate step in forecasting.

8-7

WHICH TARGET?—A PRACTICAL APPLICATION

Suppose the primary goal of policy is to keep GDP close to potential GDP and the secondary goal is to achieve a low inflation rate. In this section we consider a series of possible targeting approaches. If we had perfect information, any approach would be suitable. Information is, of course, quite imperfect. For each possible target, we ask what can go wrong.

REAL GDP TARGETING

If we hit potential GDP just right, then *real GDP targeting* is optimal. We achieve our primary goal bang on. Since the Phillips curve has the natural rate of unemployment equal to actual unemployment when actual and anticipated inflation are equal, hitting potential GDP is consistent with low actual and anticipated inflation.

Now suppose we guess too high as to the growth rate of potential GDP. For example, we think potential GDP can grow at 4 percent per year when in fact it grows at only 2 percent. In the short run we will pump up actual GDP growth, hitting 4 percent growth. But this pushes GDP above potential, causing inflation to accelerate. The longer we persist, the faster inflation accelerates. Nor will we be able to maintain the 4 percent growth permanently.

NOMINAL GDP TARGETING

We might adopt a plan to grow *nominal* GDP at 4 percent.[17] If we start at potential GDP and it happens that potential GDP grows at 4 percent, then we hit both primary and secondary targets just right. However, if we start well below potential, then we forgo the chance to move real GDP quickly.

Suppose again that potential GDP really grows at only 2 percent annually. In the long run, 4 percent nominal GDP growth will split into 2 percent real growth and 2 percent inflation. This isn't perfect, but 2 percent long-run inflation sure beats unlimited inflation, which can occur under real GDP targeting.

[17]See Michael D. Bradley and Dennis W. Jansen, "Understanding Nominal GNP Targeting," Federal Reserve Bank of St. Louis *Review,* November–December 1989. See also Jeffrey A. Frankel with Menzie Chinn, "The Stabilizing Properties of a Nominal GNP Rule in an Open Economy," *Journal of Money, Credit, and Banking,* May 1995, for an extension of the analysis to the open economy.

BOX 8-7 Output versus Inflation Targeting: The "Oops" Theory of Picking a Target

For policymakers—just as for the rest of us—there is a natural tendency to target the desired outcome. For the last 20 years, opinion polls have suggested that unemployment, and thus output, are viewed by the population as more important than inflation rates, implying that policymakers should focus on targeting output rather than inflation. But a wise policymaker asks about what can go wrong with a certain policy.

Consider the major pitfall of output targeting. As a policymaker, if you overestimate potential GDP, or equivalently underestimate the natural rate of unemployment, you'll be continually overstimulating the economy, leading to higher and higher inflation rates. While you may hit your output target in the short run, in the long run the Phillips curve will move up and inflation will accelerate . . . and accelerate and accelerate. Eventually, you'll end up with *very* high inflation rates. Even if you know the right level of output, political pressures—from lobbyists or various interest groups—can tend to make you overstimulate.

Suppose you target inflation. Eventually, expected inflation will adjust to the target level and the movement of the Phillips curve will get the economy back to the right level of output. And because you are targeting inflation directly, there is no way for inflation to reach runaway levels. But "eventually" might be a while, since inflation targeters forswear the use of policy to mitigate recessions.

Errors in output targeting can lead to explosive inflation. Use of inflation targeting leaves recession untreated. In balancing these risks, a number of countries have decided to go with inflation targeting, while the United States continues to look at both output and inflation targets.

INFLATION TARGETING

At the opposite end of the spectrum from real GDP targeting is *inflation targeting*.[18] While policymakers may not be able to hit an inflation target exactly, they can certainly

[18]Stanley Fischer, "Why Are Central Banks Pursuing Long-Run Price Stability?" *Achieving Price Stability* (Federal Reserve Bank of Kansas City, 1996), and, by the same author, "Modern Central Banking," in *The Future of Central Banking: The Tercentenary Symposium of the Bank of England* (Cambridge, England: Cambridge University Press, 1994). See also Robert G. King and Alexander L. Wolman, "Inflation Targeting in a St. Louis Model of the 21st Century," Federal Reserve Bank of St. Louis *Review,* May–June 1996; William T. Gavin, "The FOMC in 1995: A Step Closer to Inflation Targeting?" Federal Reserve Bank of St. Louis *Review,* September–October 1996; Ben S. Bernanke et al., "Missing the Mark: The Truth about Inflation Targeting," *Foreign-Affairs,* September–October 1999; Lars O. E. Svensson, "Inflation Targeting: Should It Be Modeled as an Instrument Rule or a Targeting Rule?" NBER working paper no. W8925, December 2001; and Laurence H. Meyer, "Inflation Targets and Inflation Targeting," Federal Reserve Bank of St. Louis *Review,* November–December 2001.

come close. By giving up on the primary goal entirely, policymakers are in a position to do quite well on their secondary goal. Adopted first in New Zealand, inflation targeting is now the rule in Australia, Brazil, Canada, the Czech Republic, Chile, Finland, Iceland, Norway, Sweden, Switzerland, and the United Kingdom.

In the spectrum from focusing entirely on output to entirely on prices, note that real GDP targeting is the best option for hitting our primary goal but also holds the greatest risk of a big miss on our secondary goal. Not surprisingly, economists who think that the macroeconomy is largely self-correcting (i.e., those who think the Phillips curve is vertical over a fairly short time horizon) prefer nominal targets. Why risk high inflation if real GDP will largely take care of itself? Economists who believe that a flat Phillips curve persists for some time think the benefit of hitting output and unemployment goals outweighs the risk of inflation.

8-8

DYNAMIC INCONSISTENCY AND RULES VERSUS DISCRETION

The case for modest, activist, discretionary policy seems clear. Why then do countries, such as the United States, that follow such procedures sometimes seem to have a bias toward too much inflation? After all, once the inflation-expectations-augmented Phillips curve is understood we would hope policymakers would keep inflation low on average, which would also keep expected inflation low. Since there is no long-run tradeoff between unemployment and inflation, there is no unemployment-reducing benefit from keeping inflation high.

Is there any way to restructure stabilization policy to avoid this inflationary bias? The answer to these questions is found in an examination of the idea of *dynamic inconsistency*. Essentially, the argument is that policymakers who have discretion will be tempted to take short-run actions that are inconsistent with the economy's best long-run interests.[19] What's more, this is the natural outcome with rational, well-intentioned policymakers. In fact, the analysis of dynamic inconsistency begins with the assumption that the policymaker shares the public's dislike of both inflation and unemployment.

The key to understanding dynamic inconsistency lies in remembering that there is a short-run tradeoff between inflation and unemployment given by the short-run Phillips curve but there is no long-run tradeoff because of the adjustment of inflationary expectations. The best long-run position for the economy is full employment with zero (or at least low) inflation. However, a policymaker who announces a

[19]The basic reference is Finn Kydland and Edward Prescott, "Rules Rather than Discretion: The Inconsistency of Optimal Plans," *Journal of Political Economy,* June 1977. This is very difficult reading. See also V. V. Chari, "Time Consistency and Optimal Policy Design," Federal Reserve Bank of Minneapolis *Quarterly Review,* Fall 1988. See also Robert J. Barro and David B. Gordon, "A Positive Theory of Monetary Policy in a Natural Rate Model," *Journal of Political Economy,* August 1983, and "Rules, Discretion and Reputation in a Model of Monetary Policy," *Journal of Monetary Economics,* July 1983.

full-employment–zero-inflation policy will immediately be led to "cheat" by seeking lower unemployment and slightly higher inflation. It is this split between announced and executed plans that gives rise to the name "dynamic inconsistency."

One can model the interaction between policymaker and the economy as occurring in three sequential steps:

1. The policymaker announces a policy, say 0 percent inflation.
2. Economic decision makers choose a level of anticipated inflation consistent with the announced policy, implying the economy will be positioned on the short-run Phillips curve at full employment.
3. The policymaker implements the best possible policy. Since the short-run Phillips curve is now fixed, the policymaker can reduce unemployment at the expense of a little inflation. This policy is *optimal,* although it is *inconsistent* with the policy announced in step 1.

We use Figure 8-3 to illustrate the interactions between the policymaker and economic decision makers. The figure shows the Phillips curve tradeoff between unemployment and inflation. Everyone, policymaker and public, prefers to be at point *A*,

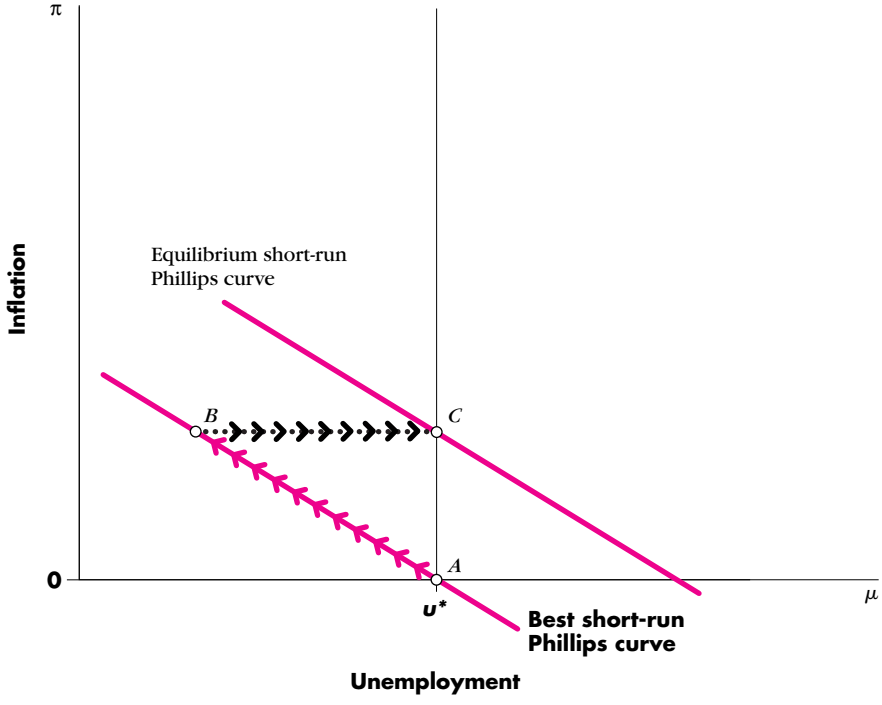

FIGURE 8-3 THE PHILLIPS CURVE AND ECONOMIC POLICY.

with full employment and zero inflation. At point *A*, the policymaker promises and the public expects zero inflation, so the economy operates on the lower short-run Phillips curve. Suppose, through good fortune, that the economy reached the preferred point, *A*. What will the policymaker do? At zero inflation, everyone, policymaker and public, is willing to accept a small amount of increased inflation in order to reduce unemployment. So the right thing for the policymaker to do is to increase inflation a little in order to reduce unemployment, sliding up and to the left along the lower short-run Phillips curve. The policymaker will push the economy to point *B*, where inflation is just high enough so that the marginal loss from more inflation equals the marginal benefit from lower unemployment.

At point *B*, inflation is greater than anticipated. Decision makers will come to anticipate higher inflation, and the short-run Phillips curve will move up to the equilibrium Phillips curve. Eventually, the economy reaches equilibrium at point *C*, at full employment but with positive inflation. (At point *C*, the marginal loss from inflation is high enough that the policymaker is unwilling to increase inflation further to reduce unemployment; that is, there is no temptation to move further to the left along the equilibrium Phillips curve.)

In equilibrium, the economy ends up with high inflation at point *C*, even though everyone prefers point *A*. The policymaker will gladly promise to return to zero inflation and stay at point *A*; but the promise isn't *credible,* because if the economy returned to point *A*, *everyone* would again agree to inflate back to *B*. It would be better if the policymaker kept her promises, but as soon as low-inflation promises are believed, it is then in everyone's best interest to "cheat."

How can the temptation to engage in dynamic inconsistency be avoided, or at least minimized? First, a forward-looking policymaker will realize the value of maintaining a *reputation* for consistency. The difficulty is that there will always be outside pressures pushing for a short-run inflationary bias. Second, the government can choose a policymaker whose personal tastes are more anti-inflationary than those of the public at large, so that the policymaker will lean against inflationary pressures. Third, the policymaker can be given a contract with payments that reward low inflation. Fourth, low-inflation "rules" can be adopted to prevent the policymaker from making the discretionary choices that lead to dynamic inconsistency. All these ideas have merit and all have been used to some extent. The problem remains that in a democracy there is always a temptation to lower unemployment at the cost of higher inflation "just this one time."

THE INDEPENDENCE OF THE CENTRAL BANK

One solution to the problem of dynamic inconsistency is to require that the central bank follow a monetary rule, for instance, to increase the money supply at a low, constant rate. However, because the monetary rule may be wrong and because there are good reasons for monetary policy to respond to some shocks, such as a supply shock, no country has adopted a rigid form of rule.

BOX 8-8 Central Bank Independence and Democracy—without Further Comment

I know there's the myth of the autonomous Fed . . . [short laugh] and when you go up for confirmation some Senator may ask you about your friendship with the President. Appearances are going to be important, so you can call Ehrlichman to get messages to me, and he'll call you.

—Richard Nixon to about-to-be Fed chairman Arthur Burns

Source: Cited in J. Bradford De Long, "America's Only Peacetime Inflation: The 1970s," NBER Historical Paper 84, May 1996, referencing John Ehrlichman, *Witness to Power* (New York: Simon & Schuster, 1982).

Another solution to the inflationary bias of discretionary policy is to set up a central bank that is independent of the electoral cycle and that has a clear mandate to fight inflation. The Fed is in principle independent of the administration, though it does report to Congress.[20] In Germany, the central bank, the Bundesbank, was fiercely independent and a fierce inflation fighter. As twelve European countries, including Germany, have given up their currencies and created a new currency, the euro, the Bundesbank no longer makes monetary policy. That is done by the European Central Bank, which is very independent. There is strong empirical evidence showing that the more independent the central bank, the lower the inflation rate in a country.[21]

The question of the optimal degree of independence of the central bank is a complicated one. There *are* short-run tradeoffs, and there is always a question of just how fast a central bank should try to reduce inflation. Thus, central banks end up exercising judgment, which ultimately depends on their evaluation of what the public's real interests are. But there is no way of knowing what those interests are without some democratic input. Whenever the Fed shows its independence, typically by refusing to expand as fast as the administration or Congress wants, there are calls to clip its wings. This is one way the Fed gets the message.

[20]See Alan S. Blinder, "Central Banking in a Democracy," Federal Reserve Bank of Atlanta *Economic Quarterly,* Fall 1996.

[21]Vittorio Grilli, Donato Masciandaro, and Guido Tabellini, in "Political and Monetary Institutions and Public Financial Policies in the Industrial Countries," *Economic Policy,* October 1991, show this result as well as results on the relationship between institutions and fiscal policy.

◆ OPTIONAL ◆

DYNAMIC INCONSISTENCY—A FORMAL APPROACH

In this section we present an algebraic version of the model of dynamic inconsistency illustrated in Figure 8-3. We assume that the policymaker chooses the level of inflation, although in practice the policymaker actually chooses monetary or fiscal policy and inflation is a result rather than a direct choice. The choice of inflation leads to the unemployment rate given by the short-run Phillips curve in equation (9):

$$\pi = \pi^e - \epsilon(u - u^*) \tag{9}$$

The policymaker, and the public, prefers low unemployment and zero inflation. We "keep score" by specifying a loss function for the policymaker in equation (10):

$$L = a(u - u^*) + \pi^2 \tag{10}$$

The loss function in equation (10) says that high unemployment is bad and that any deviation from zero inflation is bad. The higher the coefficient a, the greater the relative weight given to lowering unemployment.

The three steps in the "game" played by the policymaker are as follows: (1) The policymaker chooses and announces an inflation policy (point *A* in Figure 8-3); (2) "the economy" picks anticipated policy, π^e (point *B*); (3) the policymaker implements an actual policy, π, that minimizes the loss function in equation (10) (point C). In step 2, the decision makers look forward, guessing what the policymaker will do in step 3. In step 1, the policymaker is also looking forward, guessing what the economy will do in step 2 as it looks toward step 3. **So early choices by the policymaker must anticipate later stages, which themselves depend on the choices made earlier. Decision makers work out their choices by starting at the end and working backward. This choice method is a simple example of *dynamic programming*.**

The final score is calculated by inserting the actual policy, π, and anticipated inflation, π^e, into the loss function using the Phillips curve relation to compute the deviation of unemployment from the natural rate. The final "score" is

$$L(\pi) = a\left[-\frac{1}{\epsilon}(\pi - \pi^e)\right] + \pi^2 \tag{11}$$

The policymaker minimizes the loss in equation (11) by setting the marginal loss function in (12) equal to zero, giving the black line in Figure 8-3:

$$ML(\pi) = -\frac{a}{\epsilon} + 2\pi = 0 \tag{12}$$

So the optimal policy is

$$\pi = \frac{a}{2\epsilon} \tag{13}$$

Note that the result in equation (13) holds for *any* level value of π^e.

Everyone desires zero inflation, but in the last stage of the game it always pays for the policymaker to choose a positive inflation rate. In fact, since anticipated

inflation equals $a/2\epsilon$, if the policymaker chooses in the last step to set inflation below $a/2\epsilon$, a recession will result. The problem is that society has no way to *commit* to zero inflation.

Note, in equation (13), that a loss function weighted heavily against unemployment—one with a high a—results in more inflation. This perverse result occurs because a high a increases the incentive in the last step to raise inflation to lower unemployment. But if society can cede power to a policymaker who cares less about unemployment, one with a lower a, lower inflation will result.

SUMMARY

1. The potential need for stabilizing policy actions arises from economic disturbances. Some of these disturbances, such as changes in money demand, consumption spending, or investment demand, arise from within the private sector. Others, such as wars, may arise for noneconomic reasons.
2. Wise policymakers work with what we know about the economy while also recognizing the limits of our knowledge. Good policy design includes an assessment of the risks associated with unforeseen errors.
3. The three key difficulties of stabilization policy are that (*a*) policy works with lags; (*b*) the outcome of policy depends very much on private sector expectations, which are difficult to predict and may react to policy; and (*c*) there is uncertainty about both the structure of the economy and the shocks that hit the economy.
4. When forming economic policy, policymakers must choose between sudden policy changes and gradual changes. Sudden policy changes may enhance the policymakers' credibility but are based on limited information. Gradual changes allow policymakers to incorporate new information as the economy moves toward its target.
5. For the purposes of policy, economic variables can be classified as targets (identified goals of policy), instruments (the tools of policy), and indicators (economic variables that signal whether we are getting close to our policy targets).
6. There are clearly occasions on which active monetary and fiscal policy actions should be taken to stabilize the economy. These are situations in which the economy has been affected by major disturbances.
7. Fine tuning—continuous attempts to stabilize the economy in the face of small disturbances—is more controversial. If fine tuning is undertaken, it calls for small policy responses in an attempt to moderate the economy's fluctuations, rather than to remove them entirely. A very active policy in response to small disturbances is likely to destabilize the economy.
8. In the rules-versus-discretion debate, it is important to recognize that activist rules are possible. The two important issues in the debate are how difficult it should be to change policy and whether policy should be announced as far ahead as possible. There is a tradeoff between the certainty about future policy that comes from rules and the flexibility of the policymakers in responding to shocks.
9. Central bank independence is one avenue democracies use to add to the credibility of policy and to help mitigate the problem of dynamic inconsistency.

KEY TERMS

action lag
activist policies
activist rules
automatic stabilizer
certainty-equivalence policy
credibility
decision lag
discrete lag
distributed lag
dynamic inconsistency
dynamic programming
econometric model
fine tuning
indicators
inflation targeting
inside lag
instruments
loss function
marginal loss function
multiplier uncertainty
outside lag
portfolio of policy instruments (diversification)
real GDP targeting
recognition lag
rules versus discretion
targets

PROBLEMS

Conceptual

1.* Suppose there was a small, negative shock to demand. You—a policymaker—have a stack of papers in front of you detailing the magnitude of the shock and its devastating effects on the people of your country. You are tempted to use an active policy to offset these effects. Your advisers have estimated its impact on the economy, in both the long and short runs. What questions should you ask yourself before committing to this course of action? Why?

2. **a.** What is an inside lag?
b. We can divide inside lags into three smaller, sequential lags. What are these, and in what order do they occur?
c. Which has the smaller inside lag—fiscal or monetary policy? Why?
d. What is the inside lag for automatic stabilizers?

3. **a.** What is an outside lag?
b. Why does it generally take the form of a distributed lag?
c. Which has the smaller outside lag—fiscal or monetary policy?

4. Which would you recommend be used to offset the effect of a temporary shock to output—fiscal or monetary policy? Why?

5. **a.** What is an econometric model?
b. How might one be used?
c. There is always some uncertainty with respect to predictions based on such models. Why? What is the source of this uncertainty?

6. Evaluate the argument that monetary policy should be determined by a rule rather than discretion. How about fiscal policy?

7. Evaluate the arguments for a constant-growth-rate rule for money.

8. What is dynamic inconsistency? Explain intuitively how it might arise in the case of the short-run tradeoff between inflation and unemployment.

9. How does nominal GDP targeting differ from real GDP targeting? Why is real GDP targeting the riskier of the two strategies?

*An asterisk denotes a more difficult problem.

Technical

1. Suppose that GDP is $40 billion below its potential level. It is expected that next-period GDP will be $20 billion below potential and that two periods from now it will be back at its potential level. You are told that the multiplier for government spending is 2 and that the effects of the increased government spending are immediate. What policy actions can be taken to put GDP back on target each period?
2. The basic facts about the path of GDP are as in problem 1. But there is now a one-period outside lag for government spending. Decisions to spend today are translated into actual spending only tomorrow. The multiplier for government spending is still 2 in the period that the spending takes place.
   a. What is the best that can be done to keep GDP as close to target as possible each period?
   b. Compare the path of GDP in this question with the path in problem 1 after policy actions have been taken.
3. Life has become yet more complicated. Government spending works with a distributed lag. Now when $1 billion is spent today, GDP increases by $1 billion this period and $1.5 billion next period.
   a. What happens to the path of GDP if government spending rises enough this period to put GDP back to its potential level this period?
   b. Suppose fiscal policy actions are taken to put GDP at its potential level this period. What fiscal policy will be needed to put GDP on target next period?
   c. Explain why the government has to be so active in keeping GDP on target in this case.
4. Suppose that you knew that the multiplier for government spending was between 1 and 2.5 but that its effects ended in the period in which spending was increased. How would you run fiscal policy if GDP would, without policy, behave as in problem 1?
5.* Suppose that, as the chair of the Fed, you decided to "put policy on automatic pilot" and require that monetary policy follow an established rule. When might each of the following two rules be appropriate? (*a*) Maintain a constant interest rate. (*b*) Maintain a constant money supply.

Empirical

1. Check the *Federal Reserve Bulletin* (www.federalreserve.gov/fomc), where the forecasts of the Federal Reserve Board are presented twice a year following the February and July monetary policy report to Congress.
   a. How well did the Fed anticipate the economic performance of 2002?
   b. Explain why economic forecasts are not totally accurate.
2. Box 8-6 presents Taylor's rule, specifically,

$$i_t = 2 + \pi_t + 0.5 \times (\pi_t - \pi_t^*) + 0.5 \times \left(100 \times \frac{Y_t - Y_t^*}{Y_t^*}\right)$$

The purpose of this exercise is to see whether this simple rule can explain the evolution of interest rates in the United States over the last 40 years or so. We will assume that the target inflation rate π_t^* is equal to 2 percent.

Option a. Pick a few years, for example 1978, 1988, 2001, and 2002. Go to www.economagic.com and get data for potential RGDP, actual RGDP, annual inflation rate, and the Fed funds

rate (short-term interest rate controlled by the Fed). Calculate the output gap ($gap = [RGDP_{actual} - RGDP_{potential}]/RGDP_{potential} \times 100$). Once you have the output gap, calculate the interest rate implied by Taylor's rule by plugging in the numbers into the equation given above. Compare the value you obtained with the observed Fed funds rate for the given years. Are the numbers close?

Option b. If you know how to use EXCEL, go to www.economagic.com, and download annual data for the period 1960–2002, for potential RGDP, actual RGDP, annual inflation, and the Fed funds rate. Setting up the appropriate formula in EXCEL, calculate the output gap and the interest rate implied by Taylor's rule. Create a graph that includes both the actual short-term interest rate (the Fed funds rate) and the value implied by Taylor's rule. Is there a period for which Taylor's rule seems to fit the data particularly well?