

## THE LUCAS CRITIQUE OF POLICY EVALUATION

In his famous paper "Econometric Policy Evaluation: A Critique," Robert Lucas presented an argument that had devastating implications for the usefulness of conventional **econometric models** (models whose equations are estimated with statistical procedures) for evaluating policy.<sup>3</sup> Economists developed these models for two purposes: to forecast economic activity and to evaluate the effects of different policies. Although Lucas's critique had nothing to say about the usefulness of these models as forecasting tools, he argued that they could not be relied on to evaluate the potential impact of particular policies on the economy.

### Econometric Policy Evaluation

To understand Lucas's argument, we must first understand econometric policy evaluation: how econometric models are used to evaluate policy. For example, we can examine how the Federal Reserve uses its econometric model in making decisions about the future course of monetary policy. The model contains equations that describe the relationships among hundreds of variables. These relationships are assumed to remain constant and are estimated using past data. Let's say that the Fed wants to know the effect on unemployment and inflation of a decrease in the fed funds rate from 5% to 4%. It feeds the new, lower fed funds rate into a computer that contains the model, and the model then provides an answer about how much unemployment will fall as a result of the lower fed funds rate and how much the inflation rate will rise. Other possible policies, such as a rise in the fed funds rate by one percentage point, might also be fed into the model. After a series of these policies have been tried out, the policymakers at the Fed can see which policies produce the most desirable outcome for unemployment and inflation.

Lucas's challenge to this procedure for evaluating policies is based on a simple principle of rational expectations theory: *The way in which expectations are formed (the relationship of expectations to past information) changes when the behavior of forecasted variables changes.* So when policy changes, the relationship between expectations and past information will change, and because expectations affect economic behavior, the relationships in the econometric model will change. The econometric model, which has been estimated with past data, is then no longer the correct model for evaluating the response to this policy change and may consequently prove highly misleading.

### Example: The Term Structure of Interest Rates

The best way to understand Lucas's argument is to look at a concrete example involving only one equation typically found in econometric models: the term structure equation. The equation relates the long-term interest rate to current and past values of the short-term interest rate. It is one of the most important equations in macro econometric models because the long-term interest rate, not the short-term rate, is the one believed to have an impact on aggregate demand.

In Chapter 6, we learned that the long-term interest rate is related to an average of expected future short-term interest rates. Suppose that in the past, when the short-term rate rose, it quickly fell back down again; that is, any increase was temporary. Because

<sup>3</sup>Carnegie-Rochester Conference Series on Public Policy 1 (1976): 19-46.

rational expectations theory suggests that any rise in the short-term interest rate is expected to be only temporary, a rise should have only a minimal effect on the average of expected future short-term rates. It will cause the long-term interest rate to rise by a negligible amount. The term structure relationship estimated using past data will then show only a weak effect on the long-term interest rate of changes in the short-term rate.

Suppose the Fed wants to evaluate what will happen to the economy if it pursues a policy that is likely to raise the short-term interest rate from a current level of 5% to a permanently higher level of 8%. The term structure equation that has been estimated using past data will indicate that there will be just a small change in the long-term interest rate. However, if the public recognizes that the short-term rate is rising to a permanently higher level, rational expectations theory indicates that people will no longer expect a rise in the short-term rate to be temporary. Instead, when they see the interest rate rise to 8%, they will expect the average of future short-term interest rates to rise substantially, and so the long-term interest rate will rise greatly, not minimally as the estimated term structure equation suggests. You can see that evaluating the likely outcome of the change in Fed policy with an econometric model can be highly misleading.

The term structure example also demonstrates another aspect of the Lucas critique. The effects of a particular policy depend critically on the public's expectations about the policy. If the public expects the rise in the short-term interest rate to be merely temporary, the response of long-term interest rates, as we have seen, will be negligible. If, however, the public expects the rise to be more permanent, the response of long-term rates will be far greater. *The Lucas critique points out not only that conventional econometric models cannot be used for policy evaluation, but also that the public's expectations about a policy will influence the response to that policy.*

The term structure equation discussed here is only one of many equations in econometric models to which the Lucas critique applies. In fact, Lucas uses the examples of consumption and investment equations in his paper. One attractive feature of the term structure example is that it deals with expectations in a financial market, a sector of the economy for which the theory and empirical evidence supporting rational expectations are very strong. The Lucas critique should also apply, however, to sectors of the economy for which rational expectations theory is more controversial, because the basic principle of the Lucas critique is not that expectations are always rational but rather that the formation of expectations changes when the behavior of a forecasted variable changes. This less stringent principle is supported by the evidence in sectors of the economy other than financial markets.

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## NEW CLASSICAL MACROECONOMIC MODEL

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We now turn to the implications of rational expectations for the aggregate demand and supply analysis we studied in Chapter 22. The first model we examine that views expectations as rational is the *new classical macroeconomic model* developed by Robert Lucas and Thomas Sargent, among others. In the new classical model, all wages and prices are completely flexible with respect to expected changes in the price level; that is, a rise in the expected price level results in an immediate and equal rise in wages and prices because workers try to keep their *real* wages from falling when they expect the price level to rise.

This view of how wages and prices are set indicates that a rise in the expected price level causes an immediate leftward shift in the short-run aggregate supply curve, which

leaves real wages unchanged and aggregate output at the natural rate (full-employment) level if expectations are realized. This model then suggests that anticipated policy has no effect on aggregate output and unemployment; only unanticipated policy has an effect.

### Effects of Unanticipated and Anticipated Policy

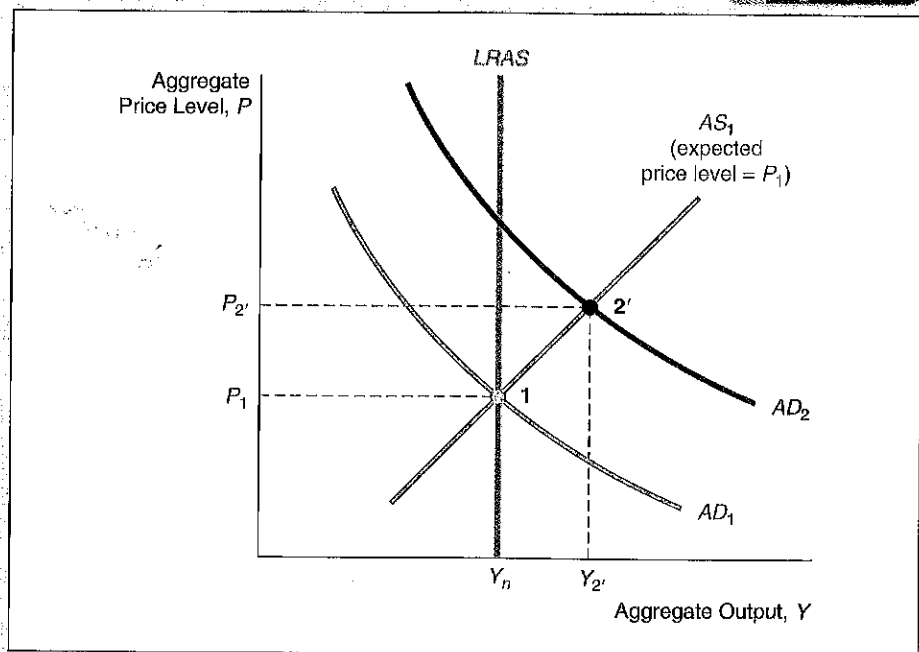
First, let us look at the short-run response to an unanticipated (unexpected) policy such as an unexpected increase in the money supply.

In Figure 1, the short-run aggregate supply curve  $AS_1$  is drawn for an expected price level  $P_1$ . The initial aggregate demand curve  $AD_1$  intersects  $AS_1$  at point 1, where the realized price level is at the expected price level  $P_1$  and aggregate output is at the natural rate level  $Y_n$ . Because point 1 is also on the long-run aggregate supply curve at  $Y_n$ , there is no tendency for the aggregate supply to shift. The economy remains in long-run equilibrium.

Suppose the Fed suddenly decides the unemployment rate is too high and so makes a large bond purchase that is unexpected by the public. The money supply increases, and the aggregate demand curve shifts rightward to  $AD_2$ . Because this shift is unexpected, the expected price level remains at  $P_1$  and the short-run aggregate supply curve remains at  $AS_1$ . Equilibrium is now at point 2', the intersection of  $AD_2$  and  $AS_1$ . Aggregate output increases above the natural rate level to  $Y_{2'}$ , and the realized price level increases to  $P_{2'}$ .

If, by contrast, the public expects that the Fed will make these open market purchases to lower unemployment because they have seen it done in the past, the expansionary policy will be anticipated. The outcome of such anticipated expansionary policy is illustrated in Figure 2. Because expectations are rational, workers and firms recognize

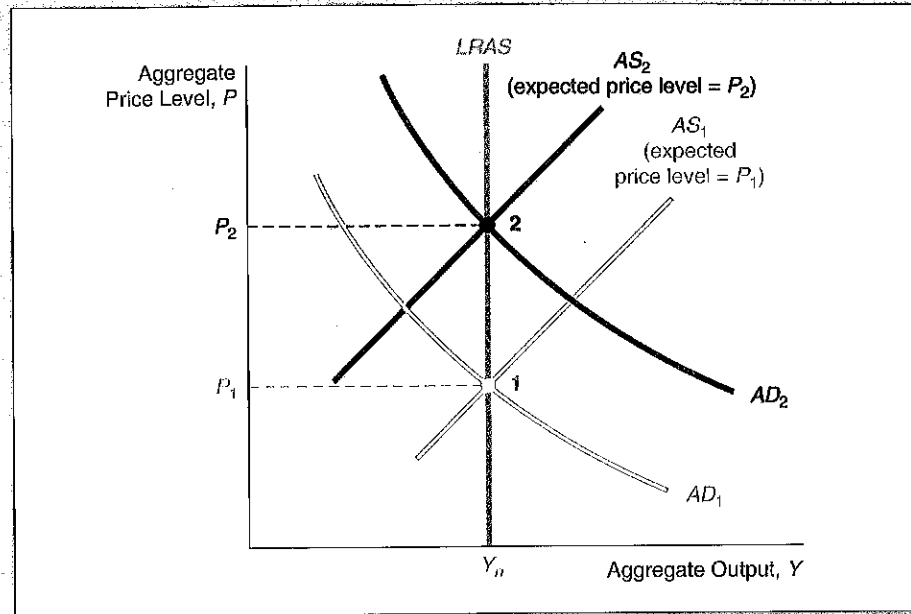
**FIGURE 1**  
**Short-Run Response to Unanticipated Expansionary Policy in the New Classical Model**  
Initially, the economy is at point 1 at the intersection of  $AD_1$  and  $AS_1$  (expected price level =  $P_1$ ). An expansionary policy shifts the aggregate demand curve to  $AD_2$ , but because this is unexpected, the short-run aggregate supply curve remains fixed at  $AS_1$ . Equilibrium now occurs at point 2'—aggregate output has increased above the natural rate level to  $Y_{2'}$ , and the price level has increased to  $P_{2'}$ .





**FIGURE 2**  
**Short-Run Response**  
**to Anticipated**  
**Expansionary Policy in**  
**the New Classical Model**

The expansionary policy shifts the aggregate demand curve rightward to  $AD_2$ , but because this policy is expected, the short-run aggregate supply curve shifts leftward to  $AS_2$ . The economy moves to point 2, where aggregate output is still at the natural rate level but the price level has increased to  $P_2$ .



that an expansionary policy will shift the aggregate demand curve to the right and will expect the aggregate price level to rise to  $P_2$ . Workers will demand higher wages so that their real earnings will remain the same when the price level rises. The short-run aggregate supply curve then shifts leftward to  $AS_2$  and intersects  $AD_2$  at point 2, an equilibrium point where aggregate output is at the natural rate level  $Y_n$  and the price level has risen to  $P_2$ .

The new classical macroeconomic model demonstrates that aggregate output does not increase as a result of anticipated expansionary policy and that the economy immediately moves to a point of long-run equilibrium (point 2) where aggregate output is at the natural rate level. Although Figure 2 suggests why this occurs, we have not yet proved why an anticipated expansionary policy shifts the short-run aggregate supply curve to exactly  $AS_2$  (corresponding to an expected price level of  $P_2$ ) and hence why aggregate output *necessarily* remains at the natural rate level. The proof is somewhat difficult and is dealt with in the FYI box, "Proof of the Policy Ineffectiveness Proposition."

The new classical model has the word *classical* associated with it because when policy is anticipated, the new classical model has a property that is associated with the classical economists of the nineteenth and early twentieth centuries: Aggregate output remains at the natural rate level. Yet the new classical model allows aggregate output to fluctuate away from the natural rate level as a result of *unanticipated* movements in the aggregate demand curve. The conclusion from the new classical model is a striking one: *Anticipated policy has no effect on the business cycle; only unanticipated policy matters.*<sup>4</sup>

<sup>4</sup>The new classical view, in which anticipated policy has no effect on the business cycle, does not imply that anticipated policy has no effect on the overall health of the economy. For example, the new classical analysis does not rule out possible effects of anticipated policy on the natural rate of output  $Y_n$ , which can benefit the public.



## FYI Proof of the Policy Ineffectiveness Proposition

The proof that in the new classical macroeconomic model aggregate output necessarily remains at the natural rate level when there is anticipated expansionary policy is as follows. In the new classical model, the expected price level for the short-run aggregate supply curve occurs at its intersection with the long-run aggregate supply curve (see Figure 2). The optimal forecast of the price level is given by the intersection of the aggregate supply curve with the anticipated aggregate demand curve  $AD_2$ . If the short-run aggregate supply curve is to the right of  $AS_1$  in Figure 2, it will intersect  $AD_2$  at a price level lower than the expected level (which is the intersection of this aggregate supply curve and the long-run aggregate supply

curve). The optimal forecast of the price level will then not equal the expected price level, thereby violating the rationality of expectations. A similar argument can be made to show that when the short-run aggregate supply curve is to the left of  $AS_2$ , the assumption of rational expectations is violated. Only when the short-run aggregate supply curve is at  $AS_2$  (corresponding to an expected price level of  $P_2$ ) are expectations rational because the optimal forecast equals the expected price level. As we see in Figure 2, the  $AS_2$  curve implies that aggregate output remains at the natural rate level as a result of the anticipated expansionary policy.

This conclusion has been called the **policy ineffectiveness proposition**, because it implies that one anticipated policy is just like any other; it has no effect on output fluctuations. You should recognize that this proposition does not rule out output effects from policy changes. If the policy is a surprise (unanticipated), it will have an effect on output.<sup>5</sup>

### Can an Expansionary Policy Lead to a Decline in Aggregate Output?

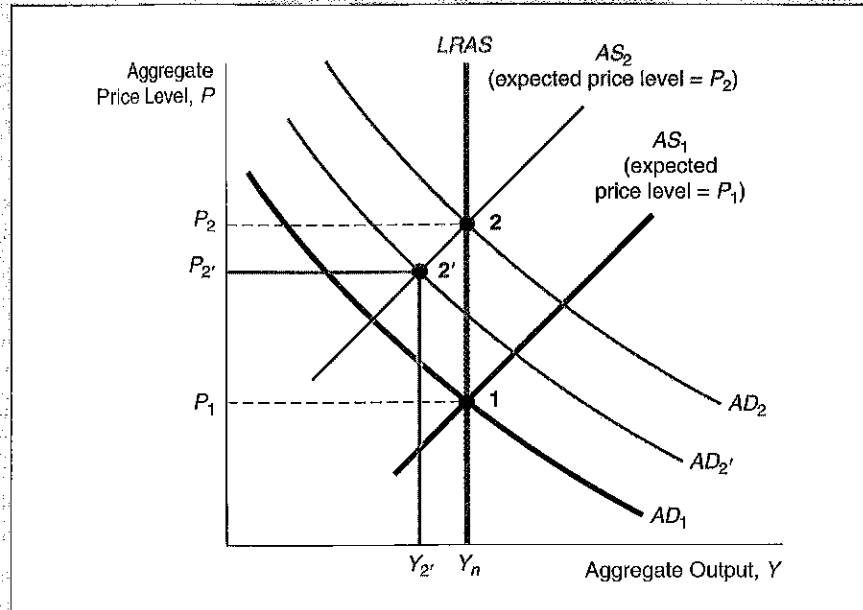
Another important feature of the new classical model is that an expansionary policy, such as an increase in the rate of money growth, can lead to a *decline* in aggregate output if the public expects an even more expansionary policy than the one actually implemented. There will be a surprise in the policy, but it will be negative and drive output down. Policymakers cannot be sure if their policies will work in the intended direction.

To see how an expansionary policy can lead to a decline in aggregate output, let us turn to the aggregate supply and demand diagram in Figure 3. Initially we are at point 1, the intersection of  $AD_1$  and  $AS_1$ ; output is  $Y_n$ , and the price level is  $P_1$ . Now suppose that the public expects the Fed to increase the money supply to shift the aggregate demand curve to  $AD_2$ . As we saw in Figure 2, the short-run aggregate supply curve shifts leftward to  $AS_2$ , because the price level is expected to rise to  $P_2$ . Suppose that the expansionary policy engineered by the Fed actually falls short of what was expected so that the aggregate demand curve shifts only to  $AD_2'$ . The economy will move to point 2', the intersection of the short-run aggregate supply curve  $AS_2$  and the aggregate demand

<sup>5</sup>Thomas Sargent and Neil Wallace, "Rational Expectations, the Optimal Monetary Instrument, and the Optimal Money Supply Rule," *Journal of Political Economy* 83 (1975): 241-254, first demonstrated the full implications of the policy ineffectiveness proposition.

**FIGURE 3**  
**Short-Run Response to an**  
**Expansionary Policy That Is**  
**Less Expansionary Than**  
**Expected in the New**  
**Classical Model**

Because the public expects the aggregate demand curve to shift to  $AD_2$ , the short-run aggregate supply curve shifts to  $AS_2$  (expected price level =  $P_2$ ). When the actual expansionary policy falls short of the public's expectation (the aggregate demand curve merely shifts to  $AD_{2'}$ ), the economy ends up at point 2', at the intersection of  $AD_{2'}$  and  $AS_2$ . Despite the expansionary policy, aggregate output falls to  $Y_{2'}$ .



curve  $AD_{2'}$ . The result of the mistaken expectation is that output falls to  $Y_{2'}$ , while the price level rises to  $P_{2'}$ , rather than  $P_2$ . An expansionary policy that is less expansionary than anticipated leads to an output movement directly opposite to that intended.

## STUDY GUIDE

Mastering the new classical macroeconomic model, as well as the new Keynesian model in the next section, requires practice. Make sure that you can draw the aggregate demand and supply curves that explain what happens in each model when there is a contractionary policy that is (1) unanticipated, (2) anticipated, and (3) less contractionary than anticipated.

### Implications for Policymakers

The new classical model, with its policy ineffectiveness proposition, has two important lessons for policymakers: It illuminates the distinction between the effects of anticipated versus unanticipated policy actions, and it demonstrates that policymakers cannot know the outcome of their decisions without knowing the public's expectations regarding them.

At first you might think that policymakers can still use policy to stabilize the economy. Once they figure out the public's expectations, they can know what effect their policies will have. There are two catches to such a conclusion. First, it may be nearly impossible to find out what the public's expectations are, given that the public consists

of close to 300 million U.S. citizens. Second, even if it were possible, policymakers would run into further difficulties, because the public has rational expectations and will try to guess what policymakers plan to do. Public expectations do not remain fixed while policymakers are plotting a surprise—the public will revise its expectations, and policies will have no predictable effect on output.<sup>6</sup>

Where does this lead us? Should the Fed and other policymaking agencies pack up, lock the doors, and go home? In a sense, the answer is yes. The new classical model implies that discretionary (activist) stabilization policy cannot be effective and might have undesirable effects on the economy. Policymakers' attempts to use discretionary policy may create a fluctuating policy stance that leads to unpredictable policy surprises, which in turn cause undesirable fluctuations around the natural rate level of aggregate output. To eliminate these undesirable fluctuations, the Fed and other policymaking agencies should abandon discretionary policy and generate as few policy surprises as possible.

As we have seen in Figure 2, even though anticipated policy has no effect on aggregate output in the new classical model, it *does* have an effect on the price level. The new classical macroeconomists care about anticipated policy and suggest that policy rules be designed so that the price level will remain stable.

## NEW KEYNESIAN MODEL

In the new classical model, all wages and prices are completely flexible with respect to expected changes in the price level; that is, a rise in the expected price level results in an immediate and equal rise in wages and prices. Many economists who accept rational expectations as a working hypothesis do not accept the characterization of wage and price flexibility in the new classical model. These critics of the new classical model, called *new Keynesians*, object to complete wage and price flexibility and identify factors in the economy that prevent some wages and prices from rising fully with a rise in the expected price level.

Long-term labor contracts are one source of rigidity that prevents wages and prices from responding fully to changes in the expected price level (called **wage-price stickiness**). For example, workers might find themselves at the end of the first year of a three-year wage contract that specifies the wage rate for the coming two years. Even if new information appeared that would make them raise their expectations of the inflation rate and the future price level, they could not do anything about it because they are locked into a wage agreement. Even with a high expectation about the price level, the wage rate will not adjust. In two years, when the contract is renegotiated, both workers and firms may build the expected inflation rate into their agreement, but they cannot do so immediately.

Another source of rigidity is that firms may be reluctant to change wages frequently even when there are no explicit wage contracts, because such changes may affect the work effort of the labor force. For example, a firm may not want to lower workers' wages when unemployment is high, because this might result in poorer worker performance. Price stickiness may also occur because firms engage in fixed-price contracts

<sup>6</sup>This result follows from one of the implications of rational expectations: The forecast error of expectations about policy (the deviation of actual policy from expectations of policy) must be unpredictable. Because output is affected only by unpredictable (unanticipated) policy changes in the new classical model, policy effects on output must be unpredictable as well.

with their suppliers or because it is costly for firms to change prices frequently. All of these rigidities (which diminish wage and price flexibility), even if they are not present in all wage and price arrangements, suggest that an increase in the expected price level might not translate into an immediate and complete adjustment of wages and prices.

Although the new Keynesians do not agree with the complete wage and price flexibility of the new classical macroeconomics, they nevertheless recognize the importance of expectations to the determination of short-run aggregate supply and are willing to accept rational expectations theory as a reasonable characterization of how expectations are formed. The model they have developed, the *new Keynesian model*, assumes that expectations are rational but does not assume complete wage and price flexibility; instead, it assumes that wages and prices are sticky. Its basic conclusion is that unanticipated policy has a larger effect on aggregate output than anticipated policy (as in the new classical model). However, in contrast to the new classical model, the policy ineffectiveness proposition does not hold in the new Keynesian model: Anticipated policy *does* affect aggregate output and the business cycle.

### Effects of Unanticipated and Anticipated Policy

In panel (a) of Figure 4, we look at the short-run response to an unanticipated expansionary policy for the new Keynesian model. The analysis is identical to that of the new classical model. We again start at point 1, where the aggregate demand curve  $AD_1$  intersects the short-run aggregate supply curve  $AS_1$  at the natural rate level of output and price level  $P_1$ . When the Fed pursues its expansionary policy of purchasing bonds and raising the money supply, the aggregate demand curve shifts rightward to  $AD_2$ . Because the expansionary policy is unanticipated, the expected price level remains unchanged, leaving the short-run aggregate supply curve unchanged. Thus the economy moves to point U, where aggregate output has increased to  $Y_U$  and the price level has risen to  $P_U$ .

In panel (b), we see what happens when the Fed's expansionary policy that shifts the aggregate demand curve from  $AD_1$  to  $AD_2$  is anticipated. Because the expansionary policy is anticipated and expectations are rational, the expected price level increases, causing wages to increase and the short-run aggregate supply curve to shift to the left. Because of rigidities that do not allow *complete* wage and price adjustment, the short-run aggregate supply curve does not shift all the way to  $AS_2$  as it does in the new classical model. Instead, it moves to  $AS_A$ , and the economy settles at point A, the intersection of  $AD_2$  and  $AS_A$ . Aggregate output has risen above the natural rate level to  $Y_A$ , while the price level has increased to  $P_A$ . ***Unlike the new classical model, in the new Keynesian model anticipated policy does have an effect on aggregate output.***

We can see in Figure 4 that  $Y_U$  is greater than  $Y_A$ , meaning that the output response to unanticipated policy is greater than to anticipated policy. It is greater because the short-run aggregate supply curve does not shift when policy is unanticipated, causing a lower price level and hence a higher level of output. We see that ***like the new classical model, the new Keynesian model distinguishes between the effects of anticipated versus unanticipated policy, with unanticipated policy having a greater effect.***

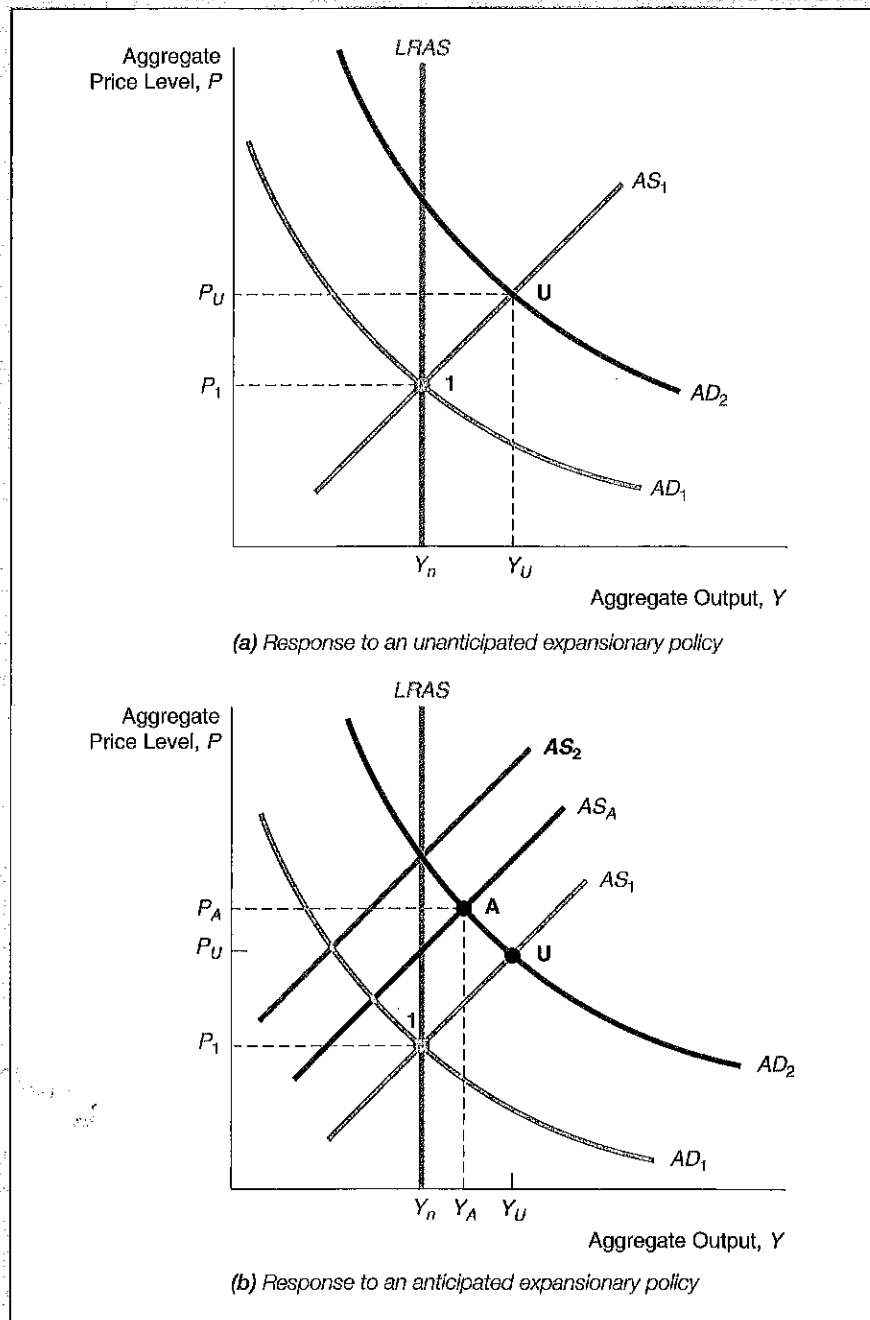
### Implications for Policymakers

Because the new Keynesian model indicates that anticipated policy has an effect on aggregate output, it does not rule out beneficial effects from activist stabilization policy, in contrast to the new classical model. It does warn the policymaker that designing such



**FIGURE 4**  
**Short-Run Response to**  
**Expansionary Policy in the**  
**New Keynesian Model**

The expansionary policy that shifts aggregate demand to  $AD_2$  has a bigger effect on output when it is unanticipated than when it is anticipated. When the expansionary policy is unanticipated in panel (a), the short-run aggregate supply curve does not shift, and the economy moves to point U, so that aggregate output increases to  $Y_U$  and the price level rises to  $P_U$ . When the policy is anticipated in panel (b), the short-run aggregate supply curve shifts to  $AS_A$  (but not all the way to  $AS_2$  because rigidities prevent complete wage and price adjustment), and the economy moves to point A so that aggregate output rises to  $Y_A$  (which is less than  $Y_U$ ) and the price level rises to  $P_A$  (which is higher than  $P_U$ ).



a policy will not be an easy task, because the effects of anticipated and unanticipated policy can be quite different. As in the new classical model, to predict the outcome of their actions, policymakers must be aware of the public's expectations about those actions. Policymakers face similar difficulties in devising successful policies in both the new classical and new Keynesian models.

## COMPARISON OF THE TWO NEW MODELS WITH THE TRADITIONAL MODEL

To obtain a clearer picture of the impact of the rational expectations revolution on our analysis of the aggregate economy, we can compare the two rational expectations models (the new classical macroeconomic model and the new Keynesian model) to a model that we call, for lack of a better name, the *traditional model*. In the traditional model, expectations are *not* rational. That model uses adaptive expectations (mentioned in Chapter 7), expectations based solely on past experience. The traditional model views expected inflation as an average of past inflation rates. This average is not affected by the public's predictions of future policy; hence predictions of future policy do not affect the aggregate supply curve.

First we will examine the short-run output and price responses in the three models. Then we will examine the implications of these models for both stabilization and anti-inflation policies.

### STUDY GUIDE

As a study aid, the comparison of the three models is summarized in Table 1. You may want to refer to the table as we proceed with the comparison.

### Short-Run Output and Price Responses

Figure 5 compares the response of aggregate output and the price level to an expansionary policy in the three models. Initially, the economy is at point 1, the intersection of the aggregate demand curve  $AD_1$  and the short-run aggregate supply curve  $AS_1$ . When the expansionary policy occurs, the aggregate demand curve shifts to  $AD_2$ . If the expansionary policy is *unanticipated*, all three models show the same short-run output response. The traditional model views the short-run aggregate supply curve as given in the short run, while the other two view it as remaining at  $AS_1$  because there is no change in the expected price level when the policy is a surprise. Hence, when policy is *unanticipated*, all three models indicate a movement to point 1', where the  $AD_2$  and  $AS_1$  curves intersect and where aggregate output and the price level have risen to  $Y_1'$  and  $P_1'$  respectively.

The response to the *anticipated* expansionary policy is, however, quite different in the three models. In the traditional model in panel (a), the short-run aggregate supply curve remains at  $AS_1$  even when the expansionary policy is anticipated, because adaptive expectations imply that anticipated policy has no effect on expectations and hence on aggregate supply. It indicates that the economy moves to point 1', which is where it moved when the policy was unanticipated. The traditional model does not distinguish between the effects of anticipated and unanticipated policy: Both have the same effect on output and prices.

In the new classical model in panel (b), the short-run aggregate supply curve shifts leftward to  $AS_2$  when policy is anticipated, because when expectations of the higher price level are realized, aggregate output will be at the natural rate level. Thus it indicates that the economy moves to point 2; aggregate output does not rise, but prices do,

SUMMARY TABLE I The Three Models

Model	Response to Unanticipated Expansionary Policy	Response to Anticipated Expansionary Policy	Can Activist Policy Be Beneficial?	Response to Unanticipated Anti-inflation Policy	Response to Anticipated Anti-inflation Policy	Is Credibility Important to Successful Anti-inflation Policy?
Traditional model	$Y \uparrow, P \uparrow$	$Y \uparrow, P \uparrow$ by same amount as when policy is unanticipated	Yes	$Y \downarrow, \pi \downarrow$	$Y \downarrow, \pi \downarrow$ by same amount as when policy is unanticipated	No
New classical macroeconomic model	$Y \uparrow, P \uparrow$	$Y$ unchanged, $P \uparrow$ by more than when policy is unanticipated	No	$Y \downarrow, \pi \downarrow$	$Y$ unchanged, $\pi \downarrow$ by more than when policy is unanticipated	Yes
New Keynesian model	$Y \uparrow, P \uparrow$	$Y \uparrow$ by less than when policy is unanticipated, $P \uparrow$ by more than when policy is unanticipated	Yes, but designing a beneficial policy is difficult	$Y \downarrow, \pi \downarrow$	$Y \downarrow$ by less than when policy is unanticipated, $\pi \downarrow$ by more than when policy is unanticipated	Yes

Note:  $\pi$  represents the inflation rate.

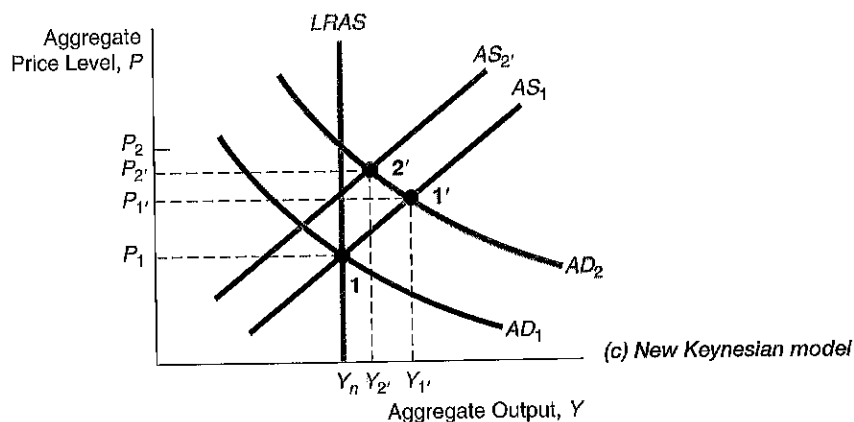
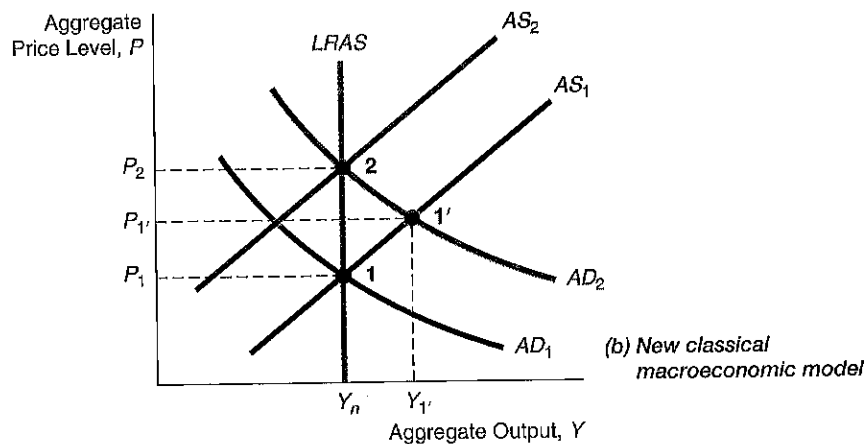
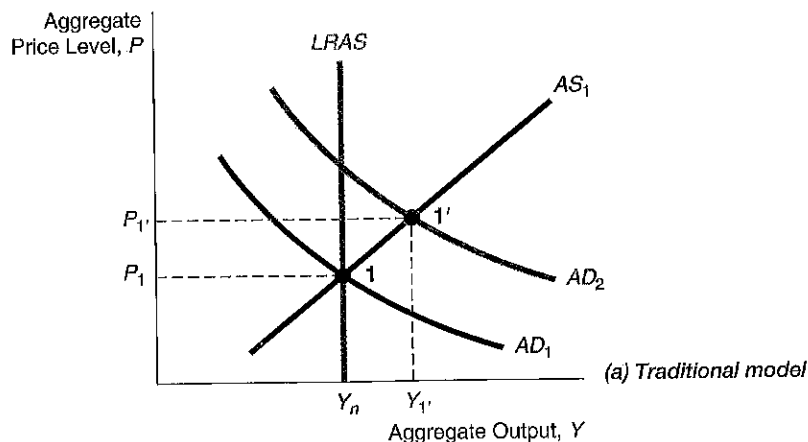
to  $P_2$ . This outcome is quite different from the move to point 1' when policy is unanticipated. The new classical model distinguishes between the short-run effects of anticipated and unanticipated policies: Anticipated policy has no effect on output, but unanticipated policy does. However, anticipated policy has a bigger impact than unanticipated policy on price level movements.

The new Keynesian model in panel (c) is an intermediate position between the traditional and new classical models. It recognizes that anticipated policy affects the aggregate supply curve, but due to rigidities such as long-term contracts, wage and price adjustment is not as complete as in the new classical model. Hence the short-run aggregate supply curve shifts only to  $AS_2'$  in response to anticipated policy, and the economy moves to point 2', where output at  $Y_2'$  is lower than the  $Y_1'$  level reached when the expansionary policy is unanticipated. But the price level at  $P_2'$  is higher than the level  $P_1'$  that resulted from the unanticipated policy. Like the new classical model, the new Keynesian model distinguishes between the effects of anticipated and unanticipated policies: Anticipated policy has a smaller effect on output than unanticipated policy does but a larger effect on the price level. However, in contrast to the new classical model, anticipated policy does affect output fluctuations.



**FIGURE 5**  
**Comparison of the**  
**Short-Run Response to**  
**Expansionary Policy in**  
**the Three Models**

Initially, the economy is at point 1. The expansionary policy shifts the aggregate demand curve from  $AD_1$  to  $AD_2$ . In the traditional model, the expansionary policy moves the economy to point 1' whether the policy is anticipated or not. In the new classical model, the expansionary policy moves the economy to point 1' if it is unanticipated and to point 2 if it is anticipated. In the new Keynesian model, the expansionary policy moves the economy to point 1' if it is unanticipated and to point 2' if it is anticipated.



## Stabilization Policy

The three models have different views of the effectiveness of *stabilization policy*, policy intended to reduce output fluctuations. Because the effects of anticipated and unanticipated policy are identical in the traditional model, policymakers do not have to concern themselves with the public's expectations. This makes it easier for them to predict the outcome of their policy, an essential matter if their actions are to have the intended effect. In the traditional model, it is possible for an activist policy to stabilize output fluctuations.

The new classical model takes the extreme position that activist stabilization policy serves to aggravate output fluctuations. In this model, only unanticipated policy affects output; anticipated policy does not matter. Policymakers can affect output only by surprising the public. Because the public is assumed to have rational expectations, it will always try to guess what policymakers plan to do.

In the new classical model, the conduct of policy can be viewed as a game in which the public and the policymakers are always trying to outfox each other by guessing the other's intentions and expectations. The sole possible outcome of this process is that an activist stabilization policy will have no predictable effect on output and cannot be relied on to stabilize economic activity. Instead, it may create a lot of uncertainty about policy that will increase random output fluctuations around the natural rate level of output. Such an undesirable effect is exactly the opposite of what the activist stabilization policy is trying to achieve. The outcome in the new classical view is that policy should follow a nonactivist rule to promote as much certainty about policy actions as possible.

The new Keynesian model again takes an intermediate position between the traditional and the new classical models. Contrary to the new classical model, it indicates that anticipated policy *does* matter to output fluctuations. Policymakers can count on some output response from their anticipated policies and can use them to stabilize the economy.

In contrast to the traditional model, however, the new Keynesian model recognizes that the effects of anticipated and unanticipated policy will not be the same. Policymakers will encounter more uncertainty about the outcome of their actions, because they cannot be sure to what extent the policy is anticipated. Hence an activist policy is less likely to operate always in the intended direction and is less likely to achieve its goals. The new Keynesian model raises the possibility that an activist policy could be beneficial, but uncertainty about the outcome of policies in this model may make the design of such a beneficial policy extremely difficult.

## Anti-inflation Policies

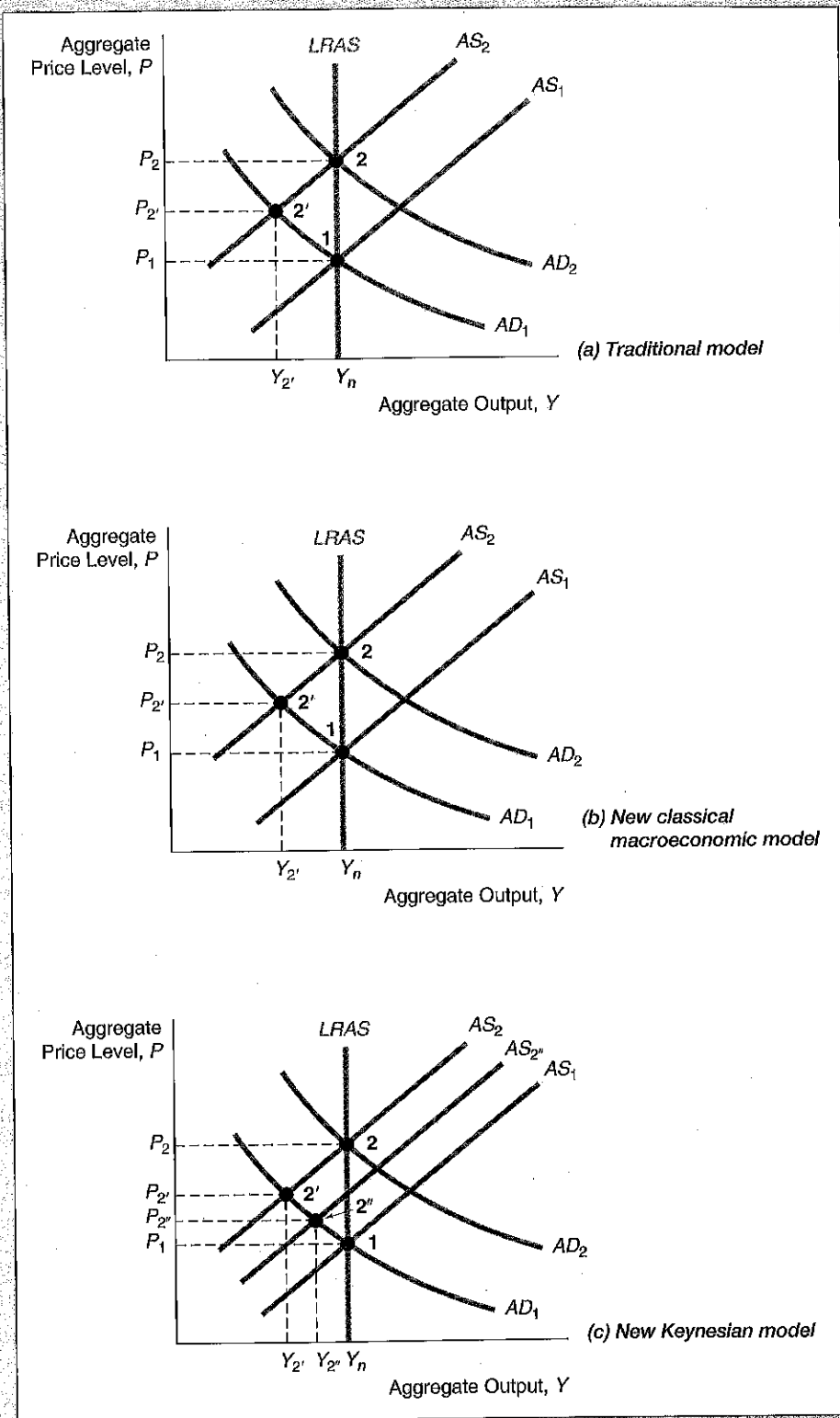
So far we have focused on the implications of these three models for policies whose intent is to eliminate fluctuations in output. By the end of the 1970s, the high inflation rate (then over 10%) helped shift the primary concern of policymakers to the reduction of inflation. What do these models have to say about anti-inflation policies designed to eliminate upward movements in the price level? The aggregate demand and supply diagrams in Figure 6 will help us answer the question.

Suppose that the economy has settled into a sustained 10% inflation rate caused by a high rate of money growth that shifts the aggregate demand curve so that it moves up by 10% every year. If this inflation rate has been built into wage and price contracts, the short-run aggregate supply curve shifts and rises at the same rate. We see this in Figure 6 as a shift in the aggregate demand curve from  $AD_1$  in year 1 to  $AD_2$  in year 2, while the short-run aggregate supply curve moves from  $AS_1$  to  $AS_2$ . In year 1, the economy is



**FIGURE 6**  
**Anti-inflation Policy in the Three Models**

With an ongoing inflation in which the economy is moving from point 1 to point 2, the aggregate demand curve is shifting from  $AD_1$  to  $AD_2$  and the short-run aggregate supply curve from  $AS_1$  to  $AS_2$ . The anti-inflation policy, when implemented, prevents the aggregate demand curve from rising, holding it at  $AD_1$ . (a) In the traditional model, the economy moves to point 2' whether the anti-inflation policy is anticipated or not. (b) In the new classical model, the economy moves to point 2' if the policy is unanticipated and to point 1 if it is anticipated. (c) In the new Keynesian model, the economy moves to point 2' if the policy is unanticipated and to point 2'' if it is anticipated.



at point 1 (intersection of  $AD_1$  and  $AS_1$ ); in the second year, the economy moves to point 2 (intersection of  $AD_2$  and  $AS_2$ ), and the price level has risen 10%, from  $P_1$  to  $P_2$ . (Note that the figure is not drawn to scale.)

Now suppose that a new Federal Reserve chairman is appointed who decides that inflation must be stopped. He convinces the FOMC to stop the high rate of money growth so that the aggregate demand curve will not rise from  $AD_1$ . The policy of halting money growth immediately could be costly if it led to a fall in output. Let's use our three models to explore the degree to which aggregate output will fall as a result of an anti-inflation policy.

First, look at the outcome of this policy in the traditional model's view of the world in panel (a). The movement of the short-run aggregate supply curve to  $AS_2$  is already set in place and is unaffected by the new policy of keeping the aggregate demand curve at  $AD_1$  (whether the effort is anticipated or not). The economy moves to point 2' (the intersection of the  $AD_1$  and  $AS_2$  curves), and the inflation rate slows down because the price level increases only to  $P_2'$  rather than  $P_2$ . The reduction in inflation has not been without cost: Output has declined to  $Y_2'$ , which is well below the natural rate level.

In the traditional model, estimates of the cost in terms of lost output for each 1% reduction in the inflation rate are around 4% of a year's real GDP. The high cost of reducing inflation in the traditional model is one reason why some economists are reluctant to advocate an anti-inflation policy of the sort tried here. They question whether the cost of high unemployment is worth the benefits of a reduced inflation rate.

If you adhere to the new classical philosophy, you would not be as pessimistic about the high cost of reducing the inflation rate. If the public *expects* the monetary authorities to stop the inflationary process by ending the high rate of money growth, it will occur without any output loss. In panel (b), the aggregate demand curve will remain at  $AD_1$ , but because this is expected, wages and prices can be adjusted so that they will not rise, and the short-run aggregate supply curve will remain at  $AS_1$  instead of moving to  $AS_2$ . The economy will stay put at point 1 (the intersection of  $AD_1$  and  $AS_1$ ), and aggregate output will remain at the natural rate level while inflation is stopped because the price level is unchanged.

An important element in the story is that the anti-inflation policy be anticipated by the public. If the policy is *not* expected, the aggregate demand curve remains at  $AD_1$ , but the short-run aggregate supply curve continues its shift to  $AS_2$ . The outcome of the unanticipated anti-inflation policy is a movement of the economy to point 2'. Although the inflation rate slows in this case, it is not entirely eliminated as it was when the anti-inflation policy was anticipated. Even worse, aggregate output falls below the natural rate level to  $Y_2'$ . An anti-inflation policy that is unanticipated, then, is far less desirable than one that is anticipated.

The new Keynesian model in panel (c) also leads to the conclusion that an unanticipated anti-inflation policy is less desirable than an anticipated one. If the policy of keeping the aggregate demand curve at  $AD_1$  is *not* expected, the short-run aggregate supply curve will continue its shift to  $AS_2$ , and the economy moves to point 2' at the intersection of  $AD_1$  and  $AS_2$ . The inflation rate slows, but output declines to  $Y_2'$ , well below the natural rate level.

If, by contrast, the anti-inflation policy is *expected*, the short-run aggregate supply curve will not move all the way to  $AS_2$ . Instead it will shift only to  $AS_2'$  because some wages and prices (but not all) can be adjusted, so wages and the price level will not rise at their previous rates. Instead of moving to point 2' (as occurred when the anti-inflation policy was not expected), the economy moves to point 2'', the intersection of

the  $AD_1$  and  $AS_2'$  curves. The outcome is more desirable than when the policy is unanticipated—the inflation rate is lower (the price level rises only to  $P_2'$  and not  $P_2$ ), and the output loss is smaller as well ( $Y_2'$  is higher than  $Y_2$ ).

### Credibility in Fighting Inflation

Both the new classical and new Keynesian models indicate that for an anti-inflation policy to be successful in reducing inflation at the lowest output cost, the public must believe (expect) that it will be implemented. In the new classical view of the world, the best anti-inflation policy (when it is credible) is to go “cold turkey.” The rise in the aggregate demand curve from  $AD_1$  should be stopped immediately. Inflation would be eliminated at once with no loss of output *if the policy is credible*. In a new Keynesian world, the cold-turkey policy, *even if credible*, is not as desirable, because it will produce some output loss.

John Taylor, a proponent of the new Keynesian model, has demonstrated that a more gradual approach to reducing inflation may be able to eliminate inflation without producing a substantial output loss.<sup>7</sup> An important catch here is that this gradual policy must somehow be made credible, which may be harder to achieve than a cold-turkey anti-inflation policy, which demonstrates immediately that the policymakers are serious about fighting inflation. Taylor's contention that inflation can be reduced with little output loss may be overly optimistic.

Incorporating rational expectations into aggregate supply and demand analysis indicates that a successful anti-inflation policy must be credible. Evidence that credibility plays an important role in successful anti-inflation policies is provided by the dramatic end of the Bolivian hyperinflation in 1985 (see the Global box). But establishing credibility is easier said than done. You might think that an announcement by policymakers at the Federal Reserve that they plan to pursue an anti-inflation policy might do the trick. The public would expect this policy and would act accordingly. However, that conclusion implies that the public will believe the policymakers' announcement. Unfortunately, that is not how the real world works.

Our historical review of Federal Reserve policymaking in the appendix to Chapter 16 suggests that the Fed has not always done what it set out to do. In fact, during the 1970s, the chairman of the Federal Reserve Board, Arthur Burns, repeatedly announced that the Fed would pursue a vigorous anti-inflation policy. The actual policy pursued, however, had quite a different outcome: The rate of growth of the money supply increased rapidly during the period, and inflation soared. Such episodes reduced the credibility of the Federal Reserve in the eyes of the public and, as predicted by the new classical and new Keynesian models, had serious consequences. The reduction of inflation that occurred from 1981 to 1984 was bought at a very high cost; the 1981–1982 recession that helped bring the inflation rate down was the most severe recession in the post–World War II period.

The U.S. government can play an important role in establishing the credibility of anti-inflation policy. We have seen that large budget deficits may help stimulate inflationary monetary policy, and when the government and the Fed announce that they will pursue a restrictive anti-inflation policy, it is less likely that they will be believed *unless* the federal government demonstrates fiscal responsibility. Another way to say this is to

<sup>7</sup>John Taylor, “The Role of Expectations in the Choice of Monetary Policy,” in *Monetary Policy Issues in the 1980s* (Kansas City: Federal Reserve Bank, 1982), pp. 47–76.





## Global Ending the Bolivian Hyperinflation: A Successful Anti-inflation Program

The most remarkable anti-inflation program in recent times was implemented in Bolivia. In the first half of 1985, Bolivia's inflation rate was running at 20,000% and rising. Indeed, the inflation rate was so high that the price of a movie ticket often rose while people waited in line to buy it. In August 1985, Bolivia's new president announced his anti-inflation program, the New Economic Policy. To rein in money growth and establish credibility, the new government took drastic actions to slash the budget deficit by shutting down many state-owned enterprises, eliminating subsidies, freezing public sector salaries, and collecting a new wealth tax. The finance ministry was put on a new footing; the budget was balanced on a day-by-day basis. Without exceptions, the finance minister would not authorize spending in excess of the amount of tax revenue that had been collected the day before.

The rule of thumb that a reduction of 1% in the inflation rate requires a 4% loss of a year's aggregate output indicates that ending the Bolivian hyperinflation would have required halving Bolivian aggregate output for 1,600 years! Instead, the Bolivian inflation was stopped in its tracks within one month, and the output loss was minor (less than 5% of GDP).

Certain hyperinflations before World War II were also ended with small losses of output using policies similar to Bolivia's,\* and a more recent anti-inflation program in Israel that also involved substantial reductions in budget deficits sharply reduced inflation without any clear loss of output. There is no doubt that credible anti-inflation policies can be highly successful in eliminating inflation.

\*For an excellent discussion of the end of four hyperinflations in the 1920s, see Thomas Sargent, "The Ends of Four Big Inflations," in *Inflation: Causes and Consequences*, ed. Robert E. Hall (Chicago: University of Chicago Press, 1982), pp. 41-93.

use the old adage, "Actions speak louder than words." When the government takes actions that will help the Fed adhere to anti-inflation policy, the policy will be more credible. Unfortunately, this lesson has sometimes been ignored by politicians in the United States and in other countries.

## APPLICATION Credibility and the Reagan Budget Deficits

The Reagan administration was strongly criticized for creating huge budget deficits by cutting taxes in the early 1980s. In the aggregate supply and demand framework, we usually think of tax cuts as stimulating aggregate demand and increasing aggregate output. Could the expectation of large budget deficits have helped create a more severe recession in 1981-1982 after the Federal Reserve implemented an anti-inflation monetary policy?

Some economists answer yes, using diagrams like panels (b) and (c) of Figure 6. They claim that the prospect of large budget deficits made it harder for the public to believe that an anti-inflationary policy would actually be pursued when the Fed announced its intention to do so. Consequently, the short-run aggregate supply curve would continue to rise from  $AS_1$  to  $AS_2$  as in panels (b) and (c). When the Fed actually kept the aggregate demand curve from rising to  $AD_2$  by slowing the rate of money growth in 1980-1981 and allowing interest rates to rise, the economy moved to a point like 2' in panels (b) and (c), and much unemployment resulted. As our analysis in panels (b)

and (c) of Figure 6 predicts, the inflation rate did slow substantially, falling below 5% by the end of 1982, but this was very costly: Unemployment reached a peak of 10.7%.

If the Reagan administration had actively tried to reduce deficits instead of raising them by cutting taxes, what might have been the outcome of the anti-inflation policy? Instead of moving to point 2', the economy might have moved to point 2" in panel (c)—or even to point 1 in panel (b), if the new classical macroeconomists are right. Reduction of budget deficits thus could have led to an even more rapid reduction in inflation and a smaller loss of output.

Reagan is not the only head of state who ran large budget deficits while espousing an anti-inflation policy. Britain's Prime Minister Margaret Thatcher preceded Reagan in this activity, and economists such as Thomas Sargent assert that the reward for her policy was a climb of unemployment in Britain to unprecedented levels.<sup>8</sup>

Although many economists agree that the Fed's anti-inflation program lacked credibility, especially in its initial phases, not all of them agree that the Reagan budget deficits were the cause of that lack of credibility. The conclusion that the Reagan budget deficits helped create a more severe recession in 1981–1982 is controversial.

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## IMPACT OF THE RATIONAL EXPECTATIONS REVOLUTION

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The theory of rational expectations has caused a revolution in the way most economists now think about the conduct of monetary and fiscal policies and their effects on economic activity. One result of this revolution is that economists are now far more aware of the importance of expectations to economic decision making and to the outcome of particular policy actions. Although the rationality of expectations in all markets is still controversial, most economists now accept the following principle suggested by rational expectations: Expectations formation will change when the behavior of forecasted variables changes. As a result, the Lucas critique of policy evaluation using conventional econometric models is now taken seriously by most economists. The Lucas critique also demonstrates that the effect of a particular policy depends critically on the public's expectations about that policy. This observation has made economists much less certain that policies will have their intended effect. An important result of the rational expectations revolution is that economists are no longer as confident in the success of activist stabilization policies as they once were.

Has the rational expectations revolution convinced economists that there is no role for activist stabilization policy? Those who adhere to the new classical macroeconomics think so. Because anticipated policy does not affect aggregate output, activist policy can lead only to unpredictable output fluctuations. Pursuing a nonactivist policy in which there is no uncertainty about policy actions is then the best we can do. Such a position is not accepted by many economists, because the empirical evidence on the policy ineffectiveness proposition is mixed. Some studies find that only unanticipated policy matters

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<sup>8</sup>Thomas Sargent, "Stopping Moderate Inflation: The Methods of Poincaré and Thatcher," in *Inflation, Debt, and Indexation*, ed. Rudiger Dornbusch and M. H. Simonsen (Cambridge, Mass.: MIT Press, 1983), pp. 54–96, discusses the problems that Thatcher's policies caused and contrasts them with more successful anti-inflation policies pursued by the Poincaré government in France during the 1920s.

to output fluctuations, while other studies find a significant impact of anticipated policy on output movements.<sup>9</sup> In addition, some economists question whether the degree of wage and price flexibility required in the new classical model actually exists.

The result is that many economists take an intermediate position that recognizes the distinction between the effects of anticipated versus unanticipated policy but believe that anticipated policy can affect output. They are still open to the possibility that activist stabilization policy can be beneficial, but they recognize the difficulties of designing it.

The rational expectations revolution has also highlighted the importance of credibility to the success of anti-inflation policies. Economists now recognize that if an anti-inflation policy is not believed by the public, it may be less effective in reducing the inflation rate when it is actually implemented and may lead to a larger loss of output than is necessary. Achieving credibility (not an easy task in that policymakers often say one thing but do another) should then be an important goal for policymakers. To achieve credibility, policymakers must be consistent in their course of action.

The rational expectations revolution has caused major rethinking about the way economic policy should be conducted and has forced economists to recognize that we may have to accept a more limited role for what policy can do for us. Rather than attempting to fine-tune the economy so that all output fluctuations are eliminated, we may have to settle for policies that create less uncertainty and thereby promote a more stable economic environment.

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<sup>9</sup>Studies with findings that only unanticipated policy matters include Thomas Sargent, "A Classical Macroeconomic Model for the United States," *Journal of Political Economy* 84 (1976): 207-237; Robert J. Barro, "Unanticipated Money Growth and Unemployment in the United States," *American Economic Review* 67 (1977): 101-115; and Robert J. Barro and Mark Rush, "Unanticipated Money and Economic Activity," in *Rational Expectations and Economic Policy*, ed. Stanley Fischer (Chicago: University of Chicago Press, 1980), pp. 23-48. Studies that find a significant impact of anticipated policy are Frederic S. Mishkin, "Does Anticipated Monetary Policy Matter? An Econometric Investigation," *Journal of Political Economy* 90 (1982): 22-51; and Robert J. Gordon, "Price Inertia and Policy Effectiveness in the United States, 1890-1980," *Journal of Political Economy* 90 (1982): 1087-1117.

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## SUMMARY

1. The simple principle (derived from rational expectations theory) that expectation formation changes when the behavior of forecasted variables changes led to the famous Lucas critique of econometric policy evaluation. Lucas argued that when policy changes, expectations formation changes; hence the relationships in an econometric model will change. An econometric model that has been estimated on the basis of past data will no longer be the correct model for evaluating the effects of this policy change and may prove to be highly misleading. The Lucas critique also points out that the effects of a particular policy depend critically on the public's expectations about the policy.
2. The new classical macroeconomic model assumes that expectations are rational and that wages and prices are completely flexible with respect to the expected price level. It leads to the policy ineffectiveness proposition that anticipated policy has no effect on output; only unanticipated policy matters.
3. The new Keynesian model also assumes that expectations are rational but views wages and prices as sticky. Like the new classical model, the new Keynesian model distinguishes between the effects from anticipated and unanticipated policy: Anticipated policy has a smaller effect on aggregate output than unanticipated policy. However, anticipated policy does matter to output fluctuations.

4. The new classical model indicates that activist policy can be only counterproductive, while the new Keynesian model suggests that activist policy might be beneficial. However, because both models indicate that there is uncertainty about the outcome of a particular policy, the design of a beneficial activist policy may be very difficult. A traditional model in which expectations about policy have no effect on the short-run aggregate supply curve does not distinguish between the effects of anticipated or unanticipated policy. This model favors activist policy, because the outcome of a particular policy is less uncertain.
5. If expectations about policy affect the short-run aggregate supply curve, as they do in the new classical and new Keynesian models, an anti-inflation policy will be more successful (will produce a faster reduction in inflation with smaller output loss) if it is credible.
6. The rational expectations revolution has forced economists to be less optimistic about the effective use of activist stabilization policy and has made them more aware of the importance of credibility to successful policymaking.

## KEY TERMS

econometric models, p. 640

policy ineffectiveness proposition, p. 644

wage-price stickiness, p. 646

## QUESTIONS AND PROBLEMS

Questions marked with an asterisk are answered at the end of the book in an appendix, "Answers to Selected Questions and Problems." Questions marked with a blue circle indicate the question is available in MyEconLab at [www.myeconlab.com/mishkin](http://www.myeconlab.com/mishkin).

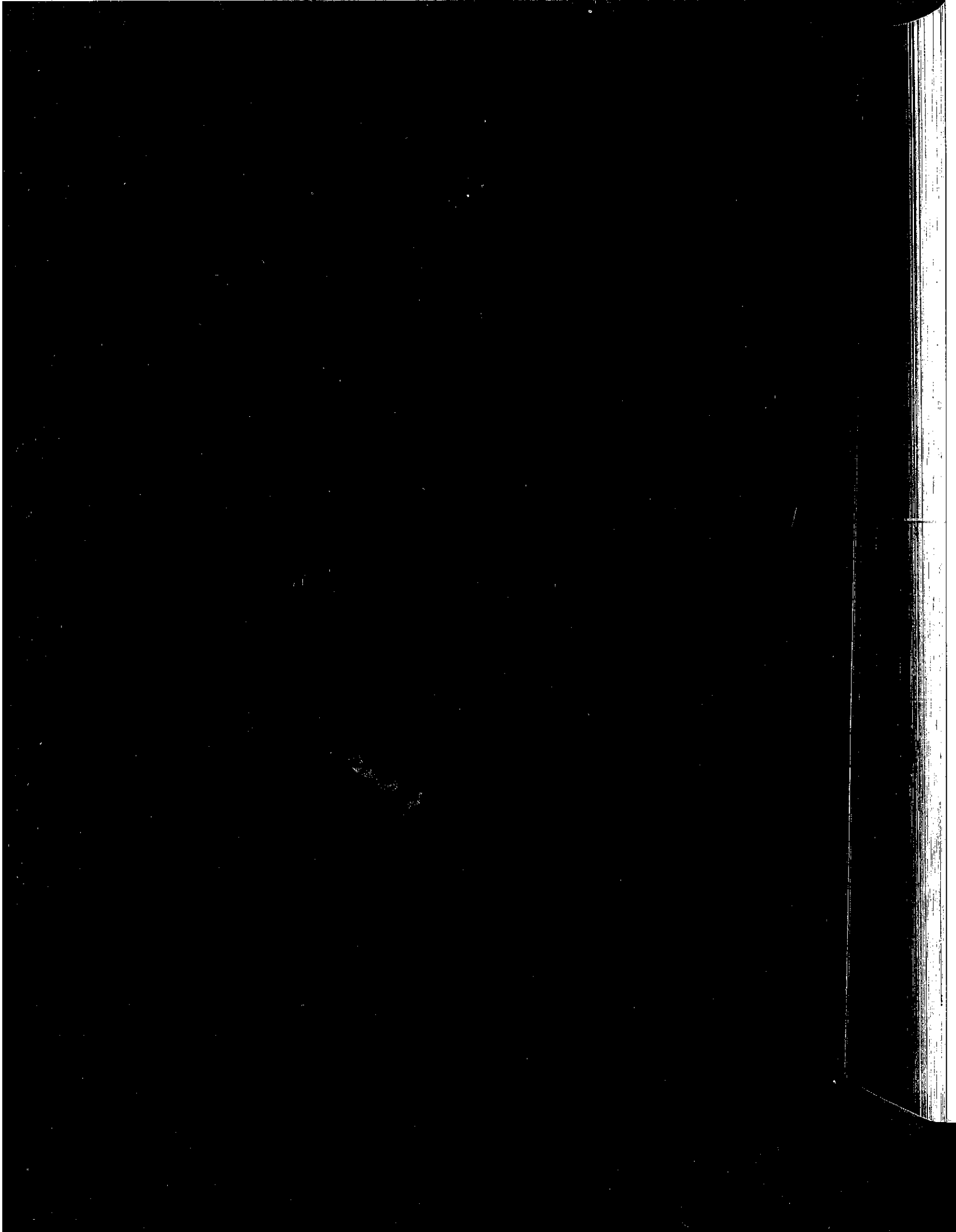
- 1 If the public expects the Fed to pursue a policy that is likely to raise short-term interest rates permanently to 12% but the Fed does not go through with this policy change, what will happen to long-term interest rates? Explain your answer.
- \* 2 If consumer expenditure is related to consumers' expectations of their average income in the future, will an income tax cut have a larger effect on consumer expenditure if the public expects the tax cut to last for one year or for ten years?

Use an aggregate supply and demand diagram to illustrate your answer in all the following questions.

3. Having studied the new classical model, the new chairman of the Federal Reserve Board has thought up a surefire plan for reducing inflation and lowering unemployment. He announces that the Fed will lower the rate of money growth from 10% to 5% and then persuades the FOMC to keep the rate of money growth at 10%. If the new classical view of the world is correct, can his plan achieve the goals of lowering infla-

tion and unemployment? How? Do you think his plan will work? If the traditional model's view of the world is correct, will the Fed chairman's surefire plan work?

- \* 4. "The costs of fighting inflation in the new classical and new Keynesian models are lower than in the traditional model." Is this statement true, false, or uncertain? Explain your answer.
- 5 The new classical model is an offshoot of the non-activist analysis because it has a similar view of aggregate supply. What are the differences and similarities between the non-activist and new classical views of aggregate supply?
- \* 6. "The new classical model does not eliminate policymakers' ability to reduce unemployment because they can always pursue policies that are more expansionary than the public expects." Is this statement true, false, or uncertain? Explain your answer.
- 7 Which principle of rational expectations theory is used to prove the proposition that stabilization policy can have no predictable effect on aggregate output in the new classical model?
- \* 8. "The Lucas critique by itself casts doubt on the ability of activist stabilization policy to be beneficial." Is this statement true, false, or uncertain? Explain your answer.



9. "The more credible the policymakers who pursue an anti-inflation policy, the more successful that policy will be." Is this statement true, false, or uncertain? Explain your answer.
- \*10 Many economists are worried that a high level of budget deficits may lead to inflationary monetary policies in the future. Could these budget deficits have an effect on the current rate of inflation?

### Using Economic Analysis to Predict the Future

11. Suppose that a treaty is signed limiting armies throughout the world. The result of the treaty is that the public expects military and hence government spending to be reduced. If the new classical view of the economy is correct and government spending does affect the aggregate demand curve, predict what will happen to aggregate output and the price level when government spending is reduced in line with the public's expectations.
12. How would your prediction differ in Problem 11 if the new Keynesian model provides a more realistic description of the economy? What if the traditional model provides the most realistic description of the economy?
- \*13. The chairman of the Federal Reserve Board announces that over the next year, the rate of money growth will be reduced from its current rate of 10% to a rate of 2%. If the chairman is believed by the public but the Fed actually reduces the rate of money growth to 5%, predict what will happen to the inflation rate and aggregate output if the new classical view of the economy is correct.
- \*14. How would your prediction differ in Problem 13 if the new Keynesian model provides a more accurate description of the economy? What if the traditional model provides the most realistic description of the economy?
- 15 If, in a surprise victory, a new administration is elected to office that the public believes will pursue inflationary policy, predict what might happen to the level of output and inflation even before the new administration comes into power. Would your prediction differ depending on which of the three models—traditional, new classical, and new Keynesian—you believed in?

## WEB EXERCISES

1. Robert Lucas won the Nobel Prize in economics. Go to <http://nobelprize.org/economics/> and locate the press release on Robert Lucas. What was his Nobel Prize awarded for? When was it awarded?

## WEB REFERENCES

<http://cepa.newschool.edu/het/profiles/lucas.htm>

A brief biography of Robert Lucas, including a list of his publications.

[www.federalreserve.gov/pubs/feds/2001/200113/200113pap.pdf](http://www.federalreserve.gov/pubs/feds/2001/200113/200113pap.pdf)

The Federal Reserve recently published a paper discussing the new Keynesian model and price stickiness.



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