

Central Bank Credibility and Consistency: The Analytics

Central banks around the world jealously guard their credibility as inflation-fighters, and seek as hard as they can to acquire a reputation for consistency in following low-inflation policies. The principal reasons that they do this are twofold:

- First, they fear the consequences should workers, managers, and financiers conclude that the central bank will not follow low-inflation policies—and should expected inflation in the economy rise.
- Second, they fear that their credibility and reputation for consistency is very fragile—for there are always very strong pressures on central banks to abandon low-inflation policies.

If you are comfortable with calculus, considerable insight into these issues can be gained through mathematics: constructing an analytical model of the pressures on the Federal Reserve and the consequences of its decisions.

Central Bank Objectives and the Phillips Curve

Let us begin by making the idea that the central bank dislikes inflation and dislikes unemployment more formal. Let us assume that the central bank tries to arrange matters—the economy's rates of inflation and unemployment—in order to make a *social welfare function* as

large as possible. And for analytical convenience let us assume that the social welfare function takes a particular form:

$$SWF = -u - \frac{\omega}{2} \times \pi^2$$

Social welfare—in the central bank’s conception, at least—is equal to minus the rate of unemployment u (for higher unemployment is a bad thing, and lowers social welfare) minus a parameter $\omega/2$ times the square of the rate of inflation (minus because higher inflation is a bad thing, squared because the economic harm done by inflation increases more than proportionately with increases in the inflation rate). The parameter ω represents and models the central bank’s preferences: how willing is it to trade higher unemployment off for lower inflation, or higher inflation for lower unemployment?

Let us also ruthlessly simplify the whole process by which macroeconomic policy is made and aggregate demand is determined, and simply assume that the central bank gets to choose what the rate of inflation π will be. But the central bank’s choice of a monetary policy that generates its particular chosen value of the inflation rate has consequences, for inflation and unemployment are linked by the Phillips Curve:

$$\pi = \pi^e - \beta(u - u^*)$$

where u^* is the economy’s natural rate of unemployment, π^e is the expected rate of inflation in the economy, and β is a parameter that determines the slope of the Phillips Curve—how much extra inflation will be generated by a small reduction in unemployment. This

equation says that the actual rate of inflation is equal to expected inflation, minus the parameter β times the difference between the actual unemployment rate and the economy's natural rate of unemployment.

Notice that at the time the central bank makes its decisions—actually chooses the policies that will produce its target rate of inflation (and the associated rate of unemployment), the determinants of the position of the Phillips Curve are fixed. The economy's workers, managers, and financiers have already formed their expectations of what inflation will be. The institutional and other factors that determine the natural rate of unemployment have already had their effects. So the current position of the Phillips Curve gives the central bank its menu of attainable combinations of unemployment and inflation.

What Will the Central Bank Do?

From this menu of choices offered by the current position of the Phillips Curve, the central bank will try to pick that combination of inflation and unemployment that maximizes the economy's welfare. What point on the Phillips Curve maximizes social welfare? The most straightforward way to answer this question is to flip the Phillips Curve equation around:

$$u = u^* + \frac{\pi^e - \pi}{\beta}$$

And then to substitute in for unemployment in the social welfare function:

$$SWF = -\left(u^* + \frac{\pi^e}{\beta} - \frac{\pi}{\beta}\right) - \frac{\omega}{2} \times \pi^2$$

Rearranging this equation produces:

$$SWF = -\left(u^* + \frac{\pi^e}{\beta}\right) + \frac{\pi}{\beta} - \frac{\omega}{2} \times \pi^2$$

In this form, social welfare depends on two things that the central bank's decisions do not control and cannot affect—the natural rate of unemployment u^* and the expected inflation rate π^e —and on the inflation rate. To find out what choice of inflation maximizes social welfare, we take the derivative of the social welfare function with respect to the inflation rate and look for the point at which this derivative is zero:

$$0 = \frac{d(SWF)}{d\pi} = \frac{1}{\beta} - \omega \times \pi$$

which is the (relatively high) level of inflation:

$$\pi_{\max} = \frac{1}{\omega\beta}$$

At this (relatively high) level of inflation π_{\max} —called “max” because it maximizes the social welfare function—an infinitesimal increase or decrease in inflation does not change the social welfare function, and finite changes of inflation either upward or downward reduce social welfare. So this (relatively high) π_{\max} is the best that the central bank can do. At this value for inflation, the social welfare function is:

$$SWF_{\max} = -\left(u^* + \frac{\pi^e}{\beta}\right) + \frac{1}{2\omega\beta^2}$$

And the economy's unemployment rate is:

$$u = u^* + \frac{\pi^e}{\beta} - \left(\frac{1}{\omega\beta^2}\right)$$

Expected Inflation

The economy's social welfare function depends not just on how the central bank balances off the costs of unemployment and inflation, but on two predetermined variables—the economy's natural rate of unemployment u^* , and the predetermined expected rate of inflation π^e . Assume that the natural rate of unemployment is fixed and predetermined. Nevertheless, we still have to figure out what the expected rate of inflation π^e is in order to complete our understanding of the situation.

Now workers, managers, and financiers understand the existence of the Phillips Curve. They understand the central bank's objectives. They understand the structure of the economy. And they understand the chain of reasoning that will lead a benevolent, social welfare-maximizing central bank to choose inflation equal to:

$$\pi_{\max} = \frac{1}{\omega\beta}$$

So it seems plausible that their expectations of inflation will be:

$$\pi^e = \frac{1}{\omega\beta}$$

If so, then the Phillips Curve tells us that the unemployment rate will then be equal to u^* , and thus that the level of the social welfare function will be:

$$SWF_{\max} = -u^* - \frac{1}{2\omega\beta^2}$$

The Value of Central Bank Credibility

But suppose that the central bank had “credibility”: suppose that the central bank announced that it was going to pick an inflation rate of zero, suppose that because workers, managers, and investors found it credible that it was believed, and suppose that the central bank was consistent and followed through on its commitment to a zero-inflation policy.

Then the Phillips Curve tells us that the unemployment rate will then be equal to u^* , and thus that the level of the social welfare function will be:

$$SWF_{\max} = -u^*$$

This is a clear improvement over what takes place if the central bank sets inflation at $\pi=(1/\omega\beta)$, and if workers, managers, and financiers anticipate that the central bank will set inflation at $\pi=(1/\omega\beta)$.

Why is “credibility” required? Because, from the central bank’s perspective, there is an even better option than announcing a zero-

inflation policy and following through on it. If the central bank announces a zero-inflation policy, is believed so that $\pi^e=0$, and then does *not* follow through but instead sets inflation $\pi=(1/\omega\beta)$, then:

$$\pi = \frac{1}{\omega\beta}$$

$$u = u^* - \left(\frac{1}{\omega\beta^2} \right)$$

And the value of the social welfare function will be:

$$SWF_{\max} = -u^* + \frac{1}{2\omega\beta^2}$$

The obvious implication is that unless circumstances are special, the central bank's claims that it will follow a zero-inflation policy simply will not be believed. Because once expectations are set, it is to the advantage of the central bank—it is to the benefit of the economy as a whole—it is beneficial for social welfare—for the central bank to break its commitment, its initial claims that it will follow a zero-inflation policy are unlikely to be believed. And so the economy will settle at the worst of the three possibilities, with inflation expectations $\pi^e=(1/\omega\beta)$.

Thus central banks carefully guard their reputations for credibility and consistency. It is to everyone's benefit that expectations of inflation be low. But inflation expectations can be low only if the central bank has a strong reputation as an organization whose policies are consistent, and whose claims and announcements can be trusted.