Commentary

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It is very appropriate that a conference on monetary policy transparency begin with a paper by Alex Cukierman. His 1986 paper with Allan Meltzer was the first modern treatment of transparency and the model developed in that paper continues to serve as the basic framework for much of the recent work in this area.

Economists at most major central banks seem to feel the average inflation bias that occupied so much space in academic journals has been conquered. Whether it is because they now know to just do the right thing (McCallum 1995), because they target only the natural rate of output (Blinder, 1998; Svensson, 1999), or because they have gained reputations as inflation fighters through increased transparency and greater accountability is less certain. While many central banks have adopted operating procedures that are designed to provide the public with clearer and more complete information about policy decisions, and this increased transparency is often cited as critical for inflation targeters, Cukierman argues that transparency is still incomplete. This is true even among central banks that are quite transparent along some dimensions, publicly announcing inflation targets, for instance. This incompleteness limits the ability of the public to hold monetary policymakers accountable for their actions. Cukierman highlights two aspects of the policy environment that remain opaque—models and objectives. Emphasizing the role of objectives in the second half of his paper, Cukierman explores the implications for inflation of asymmetric preferences and, specifically, the case in which, at a given inflation rate, output expansions are viewed as beneficial while contractions are viewed as costly.

Cukierman notes that the different notions of the output gap implicit in alternative models is one source of policy opaqueness. First, I want to develop more formally the distinction between alternative measures of the output gap and argue that different economic models and different definitions of the output gap lead to different policy objectives. If central banks are opaque about the models because of uncertainty about the true transmission mechanism of policy, then this will also be reflected in uncertainty (and therefore opaqueness) about the objectives of policy. Thus, uncertainty about the true economic model and opaqueness about policy objectives are intertwined. I then show that a model commonly used in the recent literature to analyze policy transparency arises naturally when the central bank targets the wrong output gap. Turning to asymmetric preferences, I provide a graphical representation of Cukierman's model that helps to illustrate why a positive average inflation rate arises in equilibrium, and I then touch on the nonneutrality of money in the New Keynesian model he uses.

TRANSPARENCY: MODELS AND OBJECTIVES

Cukierman argues that even central banks such as the Bank of England—that is, central banks thought of as being very transparent—are in fact still fairly opaque because they are not transparent about either their exact policy objectives or the models they use in the decisionmaking process. It might seem hard to reconcile this view of central banks with the general perception that monetary policymaking in many countries has become more transparent—after all, if we think of policymakers as solving an optimizing problem, that problem is characterized by the policymakers' objectives and the constraints they face, given by their model of how the economy operates. So if central banks are not transparent about either their objectives or their constraints, what is there for them to be transparent about? Clearly inflation targeters are transparent about at least some of their objectives. As Cukierman notes, however, even inflation targeters appear to care about output objectives, yet none have made these concerns explicit.

The Lucas Supply Curve Versus New Keynesian Inflation Adjustment

Opaqueness about models and opaqueness about objectives are not independent—the choice of a particular model can determine the appropriate objectives of policy. I want to illustrate this point using two of the alternative models Cukierman sets out. Cukierman actually discusses three alternative models of the monetary transmission mechanism to make his point that one reason central banks are

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not transparent about the models they use is that economists have not reached agreement on the "correct model" of the economy. The three models are (i) a monetarist model based on a Lucas-type transmission process in which it is monetary surprises that matter, (ii) a backward-looking model of sticky price adjustment, and (iii) a forward-looking New Keynesian model of sticky prices. I will focus on the first and third of these models. In their most basic form, these models imply different objectives for monetary policy. Thus, a lack of transparency about the central bank's model inevitably also reduces the transparency of its objectives.

The key equation that distinguishes the alternative frameworks links inflation and output. In the Lucas supply curve, one has

$$x_t^L = \alpha(\pi_t - E_{t-1}\pi_t) \tag{1}$$

and

$$x_t^L = y_t - y_{nt},$$

where inflation is denoted by π, the actual (log) level of real output is y_t, y_{nt} is the log natural rate of output (both defined as deviations around the steady-state level of output), and x_t^L is the gap between actual output and the natural rate. In the basic New Keynesian model,

$$\pi_t = \beta E_t \pi_{t+1} + \kappa x_t^{NK} \tag{2}$$

and

$$x_t^{NK} \equiv y_t - y_{ft},$$

where y_{ft} is the log output level that would arise in the absence of nominal rigidities (expressed as a deviation around the steady-state level) and x_t^{NK} is the gap between actual output and the flexible-price equilibrium output level.[1]

As Cukierman notes, the two models do not necessarily imply the same definition of the output gaps x_t^L and x_t^{NK}, nor do either of these theoretical constructs correspond closely to standard empirical methods of measuring output gaps. The first issue to address is the relationship between these alternative definitions of the output gap. The appropriate objective of monetary policy implied by these two models differs; so, if central banks, perhaps because of uncertainty about the structure of the economy, are opaque about their model, it will be difficult to be transparent about their objectives.

Output Gaps. The output gap is the difference between actual output and some reference output level. Cukierman draws a distinction between the appropriate definition of this reference level in the Lucas neo-monetarist approach and in the New Keynesian approach. While measurement issues arise in trying to make operational any concept of the output gap, I think economic theory provides some guidance as to which one should be the focus of policy.

To contrast alternative interpretations of the output gap, it will be useful to add some more structure to the model. Suppose the aggregate production function takes the form

$$Y_t = e^{z_t} N_t^a, \tag{3}$$

where z is an aggregate productivity disturbance and N_t is aggregate employment. The utility of the representative agent is

$$U = \sum_{i=0} \beta^i \left[\left(\frac{C_{t+i}^{1-\sigma}}{1-\sigma} \right) - \chi \left(\frac{N_{t+i}^{1+\eta}}{1+\eta} \right) \right]. \tag{4}$$

In the absence of any nominal rigidities, labor market equilibrium would be determined by the two conditions

$$a e^{z_t} N_t^{a-1} = \theta \left(\frac{W_t}{P_t} \right) \tag{5}$$

and

$$\mu \left(\frac{\chi N_t^{\eta}}{C_t^{-\sigma}} \right) = \left(\frac{W_t}{P_t} \right), \tag{6}$$

where $1 \leq \theta < \infty$ and $1 \leq \mu < \infty$ are mark-ups in the goods and labor markets arising from the presence of monopolistic competition. If both the goods and labor markets are characterized by perfect competition, $\theta = \mu = 1$ and (5) and (6) reduce to the familiar condition that the marginal product of labor equals the marginal rate of substitution between leisure and consumption.

Letting a subscript f denote the equilibrium in the absence of nominal rigidities, and noting that in the absence of investment and government purchases $C_t = Y_t = e^{z_t} N_t^a$, the flexible-wage and flexible-price equilibrium level of output is

[1] The inflation adjustment equations in recent New Keynesian models imply that inflation is related to expected future inflation and real marginal cost. Real marginal cost is then related to the output gap to yield an equation such as (2) (see Galí and Gertler, 1999). Cukierman identifies the gap in the New Keynesian model as output minus potential. However, the standard definition of the gap in recent New Keynesian models is the difference between (log) output and the log of the flexible-price equilibrium level of output. This does not correspond to "potential output" in the sense that Cukierman uses it as reflecting long-run supply factors.

$$Y_{ft} = e^{z_t} N_{ft}^{a} = \left[\frac{a}{\theta\mu\chi}\right]^{\frac{a}{1+\eta-a(1-\sigma)}} e^{\left(\frac{1+\eta}{1+\eta-a(1-\sigma)}\right)z_t}.$$

Expressed in log terms as a deviation around the steady-state,[2]

$$y_{ft} = \left(\frac{1+\eta}{1+\eta-a(1-\sigma)}\right) z_t \equiv \gamma z_t. \tag{7}$$

Recall that in New Keynesian models, the output gap is identified with the deviation of actual output around this flexible-price output level, or

$$x_t^{NK} = y_t - y_{ft} = y_t - \gamma z_t.$$

How does this gap variable compare with the gap between output and the natural rate in models based on a Lucas supply curve? According to Friedman (1968),

> The "natural rate of unemployment," in other words, is the level that would be ground out by the Walrasian system of general equilibrium equations, provided there is imbedded in them the actual structural characteristics of the labor and commodity markets, including market imperfections, stochastic variability in demands and supplies, the costs of gathering information about job vacancies and labor availability, the costs of mobility, and so on.

At one level, this definition could be taken to mean the level of employment in a New Keynesian model is always at the natural rate. After all, the costs of adjusting prices and wages are part of the "structural characteristics" of the economy. Fluctuations in demand induced by monetary policy alter the level of employment ground out by the general equilibrium model. Yet this is clearly not what economists have interpreted the natural rate to mean. Earlier in the same paragraph from which the quotation above is drawn, Friedman speaks of the unemployment rate "consistent with equilibrium in the structure of *real* wage rates" (emphasis in original). This definition seems more consistent with the notion of the flexible-price equilibrium level of employment. Under that interpretation, the output gap in the New Keynesian models is, in fact, equal to the gap between output and the natural level of output, and the Lucas supply curve and New Keynesian gaps are the same.

A more common interpretation of the natural level of output, however, corresponds to the equilibrium output in the absence of inflation surprises, i.e., when $x_t^L = 0$. How does output in the absence of inflation surprises compare with the flexible-price equilibrium level, and what is the relationship between the gap measure x_t^L and the measure x_t^{NK}? To answer this question, one needs to know where the Lucas supply function comes from.

The standard motivation for the Lucas supply function is not the information-based story originally developed by Lucas (1972). Instead, it is based on Fischer (1977), who shows that equation (1) can arise when prices are flexible and goods markets are perfectly competitive but nominal wages are set at the start of the period, prior to observing the current shocks (including innovations to monetary policy).

With competitive goods markets and flexible prices, firms adjust employment to ensure the real wage is equal to the marginal product of labor. If $\overline{W}_t$ is the period t nominal wage set at the end of period $t-1$, employment satisfies

$$a e^{z_t} N_t^{a-1} = \theta\left(\frac{\overline{W}_t}{P_t}\right).$$

In log deviations around the steady-state,

$$n_t = \left(\frac{1}{1-a}\right)\left(p_t - \overline{w}_t + z_t\right).$$

Assume the nominal wage is set to ensure that the expected marginal rate of substitution between leisure and consumption is equal to the expected marginal product of labor:

$$\mu E_{t-1}\left(\frac{\chi N_t^{\eta}}{C_t^{-\sigma}}\right) = E_{t-1}\left(\frac{W_t}{P_t}\right) = \left(\frac{a}{\theta}\right) E_{t-1}\left(e^{z_t} N_t^{a-1}\right).$$

This implies, in terms of a log-linear approximation around the steady-state, that the nominal wage is set equal to

$$\overline{w}_t = E_{t-1} p_t + \left[\frac{\eta+\sigma}{1+\eta-a(1-\sigma)}\right]\rho\, z_{t-1}.$$

Note that I have assumed the productivity disturbance z_t follows an AR(1) process $z_t = \rho z_{t-1} + e_t$, where e_t is a white noise process. Equilibrium employment is given by

$$n_t = \left(\frac{1}{1-a}\right)\left[e_t + \left(p_t - E_{t-1} p_t\right)\right] + \left[\frac{1-\sigma}{1+\eta-a(1-\sigma)}\right]\rho\, z_{t-1},$$

[2] The log steady-state level of output is $\{a/[1+\eta-a(1-\sigma)]\}\ln[a/\theta\mu\chi]$.

and output is

$$y_t = z_t + an_t$$
$$= \left(\frac{a}{1-a}\right)(p_t - E_{t-1}p_t) + \left(\frac{1}{1-a}\right)e_t + \gamma\rho z_{t-1}.$$

Therefore, the natural rate of output defined as output in the absence of price surprises is

$$y_{nt} = \left(\frac{1}{1-a}\right)e_t + \gamma\rho z_{t-1}.$$

With nominal wages fixed, a policy that stabilizes the price level (eliminates price surprises) keeps the real wage unchanged in the face of productivity innovations. Employment rises with a positive productivity shock ($e_t > 0$) as firms hire more workers until the marginal product of labor is again equal to the (fixed) real wage. The impact of e_t on y_{nt} is $e_t/(1-a)$. In contrast, the efficient, flexible-price response is equal to γe_t (see equation (7)). Since

$$\gamma \equiv \left(\frac{\eta+\sigma}{1+\eta-a(1-\sigma)}\right) \leq \left(\frac{1}{1-a}\right),$$

the natural rate fluctuates more in responses to productivity innovations than does the flexible-price equilibrium output level. A policy of price stability, when nominal wages are sticky, leads to too much output variability. Stabilizing the output gap defined by x_t^L is not the optimal policy when nominal wages are sticky.

The flexible-price equilibrium will be replicated if

$$\pi_t - E_{t-1}\pi_t = -\left(\frac{\eta+\sigma}{1+\eta-a(1-\sigma)}\right)e_t. \tag{8}$$

This fall in prices in the face of a productivity shock raises the real wage, reducing the demand for labor. This ensures that the marginal rate of substitution between leisure and consumption remains equal to the real wage. As one would expect from the analysis of Erceg, Henderson, and Levin (2000), the policy given by (8) would, in a sticky-wage environment, ensure that the nominal wage remains constant, thereby undoing the distortion generated by sticky nominal wages.

Of course, the converse results arise if prices are sticky and policymakers attempt to avoid wage surprises.

How does the gap between output and the natural level of output compare with the gap between output and the flexible-price equilibrium level of output? It is straightforward to show

$$x_t^{NK} = x_t^L + \left(\frac{a}{1-a}\right)\left(\frac{\eta+\sigma}{1+\eta-a(1-\sigma)}\right)e_t.$$

Consider the impact of a positive productivity disturbance, $e_t > 0$. A policy that tries to stabilize x_t^L needs to let x_t^{NK} rise. That is, output will expand above the flexible-price equilibrium level. In contrast, if the central bank focuses on stabilizing x_t^{NK}, it will allow output to fall below the natural rate in the face of a positive productivity shock.

Which output gap measure should the central bank focus on? The policy recommendation from the Lucas model would seem to be "avoid inflation surprises." Yet such a policy is inefficient because it generates economic fluctuations that are too large in response to productivity shocks. The natural rate is not the appropriate output benchmark for stabilization policies when nominal wages are sticky. On the other hand, if wages are flexible and prices are sticky, eliminating inflation surprises by maintaining zero inflation would be optimal. If the central bank is uncertain whether the economy is characterized by sticky wages or sticky prices, it will also be uncertain about the optimal policy is should follow. If this uncertainty means the central bank is opaque about its views of the monetary transmission mechanism, then it is also likely to be opaque with respect to its objectives.

The general lesson is that policy objectives are not independent of the structure of the economy. In a Lucas supply curve model based on nominal wage rigidity, price stability is not the optimal policy, although it is in a New Keynesian model of sticky prices. Both these models are based on a key simplifying assumption—only one nominal variable is sticky. With a single monetary distortion, optimal policy calls for undoing that distortion. If both wages and prices are sticky, then neither price stability nor nominal wage stability will be optimal.

Targeting the Wrong Gap and Models of Transparency. Cukierman lists another gap measure—the difference between output and potential. Since potential is a constant in my simple example, this gap measure is just

$$y_t = x_t^{NK} + \gamma z_t.$$

Suppose the central bank does focus on output relative to potential and the economy is actually characterized, as in New Keynesian models, by flexible nominal wages and sticky prices. In this case, inflation is given by

$$\pi_t = \beta E_t \pi_{t+1} + \kappa x_t^{NK}, \tag{9}$$

while the central bank's loss function is

$$\begin{aligned} L_t &= (1-\beta) E_t \sum_{i=0}^{\infty} \beta^i \left[\pi_{t+i}^2 + A y_{t+i}^2 \right] \\ &= (1-\beta) E_t \sum_{i=0}^{\infty} \beta^i \left[\pi_{t+i}^2 + A\left(x_{t+i}^{NK} + \gamma z_{t+i} \right)^2 \right]. \end{aligned} \tag{10}$$

Notice that, by focusing on y_t rather than x_t^{NK}, we have a situation in equation (10) that is equivalent to the presence of a stochastic output target equal to γz_t. Alternatively, the central bank's decision problem can be written in terms of y_t. In this case, the loss function is

$$L_t = (1-\beta) E_t \sum_{i=0}^{\infty} \beta^i \left(\pi_{t+i}^2 + A y_{t+i}^2 \right),$$

and this is minimized subject to

$$\pi_t = \beta E_t \pi_{t+1} + \kappa y_t + \kappa \gamma e_t.$$

This reveals how the productivity shock e_t appears as a cost shock (and therefore leads to a policy trade-off—see Clarida, Galí, and Gertler, 1999) because the central bank employs the wrong measure of the output gap. In the present model, the socially optimal policy would set $\pi_t = 0$ and $x_t^{NK} = 0$; but, when the central bank targets output relative to potential, it is straightforward to show that inflation fluctuates too much.

Transparency and a Stochastic Output Target. When the central bank incorrectly targets output relative to potential, we have a situation that is equivalent to the presence of a stochastic output target. What is interesting about this case is that recent work on central bank transparency has often been based on the assumption that the central bank has a stochastic output target. Models with stochastic output targets have been used by Faust and Svensson (2001), Jensen (2000), and Walsh (2002) to study the role of transparency. As just shown, this situation can arise when the central bank targets the wrong measure of the output gap, perhaps because of the sort of model uncertainty that Cukierman emphasizes.[3]

Faust and Svensson (2000) conclude that transparency is desirable. In their model, transparency takes the form of better information about the central bank's control error— transparency is increased if the central bank provides more information about its forecasts. Thus, greater transparency improves the ability of the public to monitor the central bank by distinguishing between control errors and stochastic shifts in the central bank's output objective. Improved transparency means that any deliberate attempt by the central bank to expand output would quickly be discovered and lead to a rise in expected inflation. This rise in expected inflation increases the marginal cost of an expansion, inducing the central bank to refrain from trying to overly expand real economic activity. Transparency acts as a disciplinary device (see also Walsh 2000).

Cukierman (2000) and Jensen (2000) point out that transparency may come at a cost. By making expected inflation more sensitive to central bank actions, the cost of engaging in policies aimed at stabilizing output rises. This can distort stabilization policy and lead to excessive fluctuations in real economic activity.

This type of distortion is common in many systems based on an imperfect measure of performance. Announcing a target for inflation, for example, establishes a measure by which the central bank's performance can be measured. If too much stress is placed on achieving the target (essentially making inflation targeting a high-powered incentive scheme), the central bank may downplay other potentially desirable objectives. However, greater transparency by publishing the central bank's forecasts would allow the public to more easily verify whether the central bank's short-run target for inflation is appropriate, given the central bank's forecast of economic conditions. In other words, greater transparency allows the public to more closely monitor the central bank.[4] Better monitoring improves the public's ability to hold the central bank accountable for achieving its inflation target. Thus, greater transparency is consistent with a stricter inflation targeting regime (i.e., a high-powered incentive scheme with more weight placed on achieving the target) because the public is able to determine the appropriate state-contingent target inflation rate.

THE ROLE OF ASYMMETRIC PREFERENCES

The second part of Cukierman's paper develops the implications for inflation of asymmetric central bank preferences. Cukierman questions the assumption of symmetric preferences that is implied by the standard quadratic specification for the central

[3] For a survey of the recent literature on central bank transparency, see Geraats (2002).

[4] Walsh (2002) relates transparency to the ability to monitor the central bank.

Figure 1

Asymmetric Preferences and Cost Shocks When Expected Future Inflation Is Zero

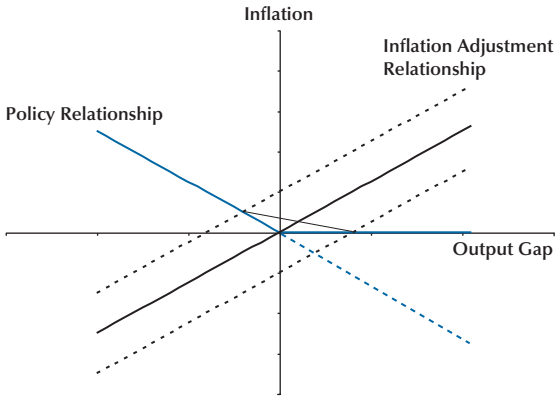
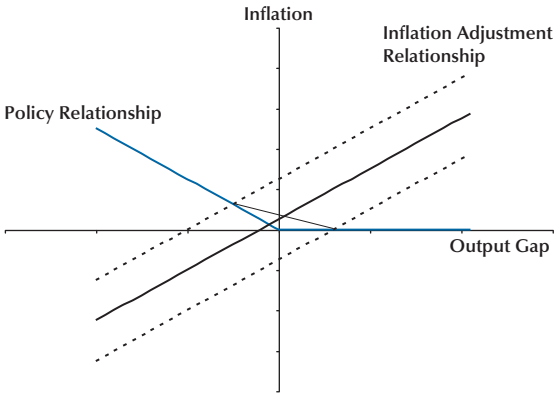


Figure 2

Equilibrium Inflation with Asymmetric Preferences



bank's loss function. Instead, he argues that, given the rate of inflation, central banks prefer a 1 percent output gap to a –1 percent gap. This assumption strikes me as quite reasonable, and there are a number of ways of modeling it. Perhaps the simplest is to subtract a linear term in the output gap from the standard quadratic loss function. This makes the marginal benefit of an expansion positive when evaluated at a zero output gap. Ruge-Murcia (2001) uses a linex function to allow for asymmetric preferences, although he assumes this applies to inflation, not output.

Cukierman employs a specification that is very simple but that captures the basic idea—he assumes that as long as the output gap is positive, the central bank cares only about inflation stabilization. When the gap is negative, then the familiar quadratic preferences kick in. In his neo-monetarist model, the central bank must act prior to observing the current shocks. To ensure against a bad output realization, the policymaker sets the nominal money supply above the zero inflation level. As a consequence, an average inflation bias appears.

A Graphical Analysis in the New Keynesian Model

As Cukierman notes, a similar effect arises in his New Keynesian model, even if the central bank can observe the shocks. It is easy to illustrate this graphically. In Figure 1, the line labeled "Policy Relationship" illustrates the inflation and output gap combinations that are consistent with the central bank's first order condition.[5] Also shown in the figure is the inflation adjustment curve, drawn as a solid line for the case of zero expected inflation and a zero cost shock. Inflation occurs where the policy relationship and the inflation adjustment curve intersect. Assume the cost shock takes on the values $\varepsilon > 0$ and $-\varepsilon < 0$ with equal probability, as indicated by the dashed lines. Since inflation is zero when the cost shock is $-\varepsilon$ and positive when the shock is ε, on average, inflation will be positive. Since private agents will anticipate this inflation bias, expected inflation rises, shifting the inflation adjustment curves upward until equilibrium is established at $(\bar{x}, \bar{\pi})$, as shown in Figure 2 where the inflation adjustment equation for zero shock intersects the vertical axis at $\beta\bar{\pi}$. As Cukierman also notes, the equilibrium involves positive average inflation *and* a positive average output gap.

Figure 3 illustrates the effects of an increase in the weight the central bank places on its output objectives (an increase in the parameter A). With a larger A, the central bank is willing to accept higher inflation to limit declines in the output gap. As a consequence, average inflation rises. In addition to depending positively on A, the average inflation rate is increasing in the variance of the cost shock. This can be seen by increasing the distance between the inflation adjustment curves for $\varepsilon > 0$ and $-\varepsilon < 0$.

[5] For $x > 0$, the central bank sets $\pi = 0$. For $x < 0$, the central bank equates the marginal rate of substitution between the output gap and inflation, $-Ax/\pi$, to the marginal rate of transformation, κ, or $\kappa\pi + Ax = 0$, where A is the weight on output fluctuations in the objective function and κ is the marginal effect of output on inflation.

Are Preferences Asymmetric?

Asymmetric preferences over output is one possibility, but there are other ways in which the central bank's preferences may be asymmetric. Ruge-Murcia (2001) models the asymmetry as applying to inflation. He assumes that inflation-targeting central banks are more concerned about overshooting their inflation target than they are about undershooting the target. As a consequence, he finds there is a deflationary bias. That is, average inflation will be systematically below the announced target. This is the opposite of Cukierman's conclusion that inflation will be systematically above target.[6]

The presence and form of asymmetric preferences seems to me an empirical issue. Cukierman cites some evidence that supports his specification. For instance, Gerlach (2000) finds some support for a positive association between variability and the level of inflation. For the inflation targeting countries he studies, Ruge-Murcia (2001) finds that average inflation is negatively related to the variance of inflation, evidence that he interprets as supportive of his specification. Clearly, there cannot be both an inflation bias and a deflation bias, so this is an area that will need to be resolved by further empirical testing.

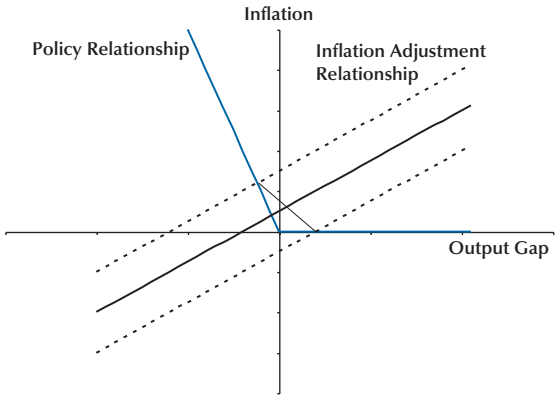
IS THERE LONG-RUN NONNEUTRALITY IN THE NEW KEYNESIAN MODEL?

Finally, I want to comment on the presence of a long-run trade-off between average inflation and the output gap in the New Keynesian model Cukierman employs. Cukierman notes that the existence of this trade-off leads to what he labels an "inflation tendency." A positive average rate of inflation produces an output gap that is also positive on average. If the average rate of inflation is $\bar{\pi} > 0$, then equation (2) implies the average output gap is $\bar{x} = (1-\beta)\bar{\pi}/\kappa > 0$. This situation was illustrated in Figures 2 and 3 by the positive output gap that accompanies the positive equilibrium inflation rate.

This apparent trade-off arises in some, but not all, derivations of the inflation equation given by (2). For example, suppose prices are set according to a Calvo mechanism in which a randomly drawn fraction $1-\theta$ of all firms adjust their prices each period. Adjusting firms set prices to maximize the present discounted value of profits, subject to a constant elasticity demand for their goods. Following Erceg, Henderson, and Levin (2000) and Christiano, Eichenbaum, and Evans (2001), assume that the other θ fraction of firms simply update their prices based on the average rate of inflation.[7] One could think of the costs of adjusting as reflecting decision-making costs so that each period not all firms decide to fully optimize in setting their price.

Figure 3

Equilibrium Inflation with a Larger Weight on Output



Let $\hat{\psi}_t$ be the firm's real marginal cost, with $\hat{}$ denoting percentage deviation from the steady-state, and β the discount factor. Then one obtains

$$\hat{\pi}_t = \beta E_t \hat{\pi}_{t+1} + \left[\frac{(1-\beta\theta)(1-\theta)}{\theta}\right]\hat{\psi}_t .$$

By using the production function and the household's marginal rate of substitution between leisure and consumption, real marginal cost can be eliminated to yield a standard New Keynesian inflation-adjustment equation[8]:

$$\hat{\pi}_t = \beta E_t \hat{\pi}_{t+1} + \kappa x_t^{NK}. \tag{11}$$

[6] In Figure 1, make the policy relationship concave, rather than convex, to illustrate the resulting deflationary bias.

[7] Christiano, Eichenbaum, and Evans (2001) characterize this as static pricing. They also analyze "dynamic" pricing in which firms update price based on the lagged inflation rate.

[8] The marginal cost variable can be related to the output gap by noting that from (3) and (4),

$$\hat{\psi}_t = \hat{w}_t - \hat{p}_t - (a-1)\hat{n}_t = \eta\hat{n}_t + \sigma x_t^{NK} - (a-1)\hat{n}_t$$
$$= [\eta a + \sigma + a(1-a)]x_t^{NK}.$$

So in (11),

$$\kappa \equiv \left[\frac{(1-\beta\theta)(1-\theta)}{\theta}\right][\eta a + \sigma + a(1-a)].$$

The critical point to note is that equation (11) does not involve the *level* of the inflation rate. It is expressed in terms of the deviation of inflation from the steady-state. By definition, $\hat{\pi}$ equals zero in the steady-state, and (11) then implies that the output gap will also be zero, regardless of the average steady-state rate of inflation. Thus, in this version of the New Keynesian model there is no long-run trade-off between the average rate of inflation and the output gap.

CONCLUSIONS

Central banks are not transparent about their models, for the reasons Cukierman highlighted. If policymakers are uncertain about the true model of the economy, then opaqueness about objectives is not surprising, since a choice of model serves to define the appropriate objectives. In the models Cukierman uses to illustrate differences in the transmission process, different policies are optimal. Under the standard Lucas supply curve a la Fischer, monetary policy should stabilize nominal wages; in the basic New Keynesian model, prices should be stabilized. Greater transparency about objectives is likely to arise, therefore, only when there is greater agreement on models.

Transparency is important if policymakers are to be held accountable. It is difficult to monitor the central bank's performance if little information is available about the economic outlook that forms the basis for the central bank's policy decisions. Greater transparency, by improving the ability to monitor the central bank, contributes to making policymakers more accountable for achieving the central bank's inflation target.

As for asymmetric preferences, I find it plausible that central bankers are not indifferent between expansions and recessions or between inflation target overshoots and undershoots. How important this is empirically, however, is an open question.

REFERENCES

Blinder, Alan S. *Central Banking in Theory and Practice*. Cambridge, MA: MIT Press, 1998.

Christiano, Lawrence J.; Eichenbaum, Martin and Evans, Charles. "Nominal Rigidities and the Dynamic Effects of a Shock to Monetary Policy." Working Paper 8403, National Bureau of Economic Research, July 2001.

Clarida, Richard; Galí, Jordi and Gertler, Mark. "The Science of Monetary Policy: A New Keynesian Perspective." *Journal of Economic Literature*, December 1999, *37*(4), pp. 1661-707.

Cukierman, Alex. "Accountability, Credibility, Transparency and Stabilization Policy in the Eurosystem." Unpublished manuscript, The Eitan Berglas School of Economics, Tel Aviv University, 2000.

_____ and Meltzer, Allan H. "A Theory of Ambiguity, Credibility and Inflation under Discretion and Asymmetric Information." *Econometrica*, September 1986, *54*(5), pp. 1099-128.

Dixit, Avinash. "A Repeated Game Model of Monetary Union." *Economic Journal*, October 2000, *110*(466), pp. 759-80.

Erceg, Christopher J.; Henderson, Dale and Levin, Andrew T. "Optimal Monetary Policy with Staggered Wage and Price Contracts." *Journal of Monetary Economics*, October 2000, *46*(2), pp. 281-313.

Faust, Jon and Svensson, Lars E.O. "Transparency and Credibility: Monetary Policy with Unobservable Goals." *International Economic Review*, May 2001, *42*(2), pp. 369-97.

Fischer, Stanley. "Long-Term Contracts, Rational Expectations, and the Optimal Money Supply Rule." *Journal of Political Economy*, February 1977, *85*(1), pp. 191-206.

Friedman, Milton. "The Role of Monetary Policy." *American Economic Review*, March 1968, *58*(1), pp. 1-17.

Geraats, Petra. "Central Bank Transparency." *Economic Journal*, 2002 (forthcoming).

Galí, Jordi and Gertler, Mark. "Inflation Dynamics: A Structural Econometric Investigation." *Journal of Monetary Economics*, October 1999, *44*(2), pp. 195-222.

Gerlach, Stefan. "Asymmetric Policy Reactions and Inflation." BIS, April 2000.

Jensen, Henrik. "Optimal Degrees of Transparency in Monetary Policymaking." University of Copenhagen, December 2000.

Lucas, Robert E. Jr. "Expectations and the Neutrality of Money." *Journal of Economic Theory*, April 1972, *4*(2), pp. 103-24.

McCallum, Bennett T. "Two Fallacies Concerning Central Bank Independence." *American Economic Review*, May 1995, *85*(2), pp. 207-11.

Ruge-Murcia, Francisco J. "Inflation Targeting under Asymmetric Preferences." Université de Montréal, June 2001.

Svensson, Lars E.O. "How Should Monetary Policy Be Conducted in an Era of Price Stability," in *New Challenges for Monetary Policy*. Federal Reserve Bank of Kansas City, 1999, pp. 195-259.

Walsh, Carl E. "Market Discipline and Monetary Policy." *Oxford Economic Papers*, April 2000, *52*(2), pp. 249-71.

_____. "Accountability, Transparency, and Inflation Targeting." *Journal of Money, Credit, and Banking*, 2002 (forthcoming).