

Output Gaps and Robust Policy Rules

2010 European Banking & Financial Forum

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The views expressed today are my own and not necessarily
those of the Federal Reserve System or the FOMC.

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Introduction

Today I would like to discuss how monetary policymakers should approach setting policy in a world in which economic data are measured imprecisely. This is a challenge for policymakers not only in times of crisis but in normal times as well.

I am sure many of you know of the seminal work by John Taylor, in which he showed that monetary policymakers appear to follow a rule in setting interest rates. These rules relate the policy interest rate to the behavior of key macroeconomic variables such as inflation and real activity. As I'll discuss in a moment, I am in favor of a systematic, rule-based approach to monetary policy, primarily because it limits discretion and improves economic stability by reducing policy uncertainty. But I will argue that choosing the particular form of the rule must be done with great care, because many of the economic variables that could be used in setting policy are in fact poorly measured.

For example, many policymakers focus on measures of economic slack, such as the output gap or the unemployment gap, to provide guidance for policy. Broadly speaking, the output gap refers to the deviation of output from some level deemed optimal, often called "potential output." Likewise, the unemployment gap is the deviation of unemployment from an unemployment rate that represents "full employment." But how should we measure "potential output" and "full employment"?

One approach is to estimate potential output using the trend in actual output. Another approach derives an estimate based on a model of the production function for the economy. However, various studies have shown that such statistical measures of potential output or full employment are very imprecise. Moreover, the most common statistical constructs for these variables often have little in common with their relevant theoretical counterparts. What's more, different models of the economy can lead to different theoretical concepts for such output gap or unemployment gap variables. So relying on these constructed gap variables in the formulation of policy forces the central bank to operate under a high degree of uncertainty.

Today, I will discuss an approach to dealing with such uncertainty – namely, relying on systematic, rule-like behavior, in which the policy interest rate responds to the deviation of inflation from a target. If the policy rule includes a measure of real activity, it is the change in the level of activity or growth rate, rather than the output gap or the unemployment gap.

The Benefits of Rules

Why use rules? At least since the work of Henry Simons, economists have understood and debated the benefits of rules versus discretion in policymaking.¹ The modern and more rigorous treatment of this issue is found in the seminal work of Finn Kydland and Ed Prescott.² In their Nobel Prize-winning work, they demonstrated that a credible commitment by policymakers to behave in a systematic, rule-like manner over time leads to better economic outcomes than discretion. In monetary policy, less discretionary behavior and a commitment to more systematic behavior have been shown to lead to more economic stability – lower and less volatile inflation and less volatile output.

Using a well-formulated, simple interest-rate rule as a benchmark is one way to achieve many of the benefits of a commitment to systematic monetary policy. Because such a rule is transparent and easy to monitor, it helps the public form expectations of future policy and determine when a central bank is deviating from normal policy. Sometimes deviations from the simple rule may be required – for example, during an economic crisis like the one we’ve just experienced, or in the aftermath of the 9/11 attacks. In these cases, monetary policymakers must communicate the reasons for the deviations and how they intend to return policy to the norm. Following such a policy framework based on a simple rule as a guideline and communicating any deviations will enhance the policymakers’ credibility for following a systematic monetary policy, which leads to additional benefits.

But what rule should we use? It’s important that our policy rule be robust enough to work in a variety of economic conditions or stages of the business cycle, that it perform well in a variety of economic models, and that it recognize that economic data are measured imprecisely and are subject to revision. These criteria lead me to support a rule based on deviations of inflation from the policymakers’ inflation target and on the growth rate of output, rather than on the output gap commonly used in many variants of the well-known Taylor-rule.

¹ Henry C. Simons, “Rules versus Authorities in Monetary Policy,” *Journal of Political Economy*, 44:1 (January 1936).

² Finn E. Kydland and Edward C. Prescott, “Rules Rather Than Discretion: The Inconsistency of Optimal Plans,” *Journal of Political Economy*, 85 (January 1977), pp. 473-91.

The Problem with Gaps

Three problems arise when trying to rely on output or employment gaps to guide policy choices in real time. First, theory does not always suggest that desirable policy should be based on an output gap measure at all – it depends on the particular model and the type of economic shocks that are hitting the economy.³ Second, even in theoretical models in which optimal policy is based on an output gap measure, such measures are inherently unobservable and therefore must be statistically estimated. And third, the most common statistical measures of the output gap do not correspond particularly well to the theoretical measures that are relevant for policy decisions.

In other words, policy actions that respond to our typical measures of output gaps might not improve economic welfare or economic stability. For example, consider a technological improvement that increases the potential level of output more than the level of actual output, perhaps because firms can't adjust their labor and capital levels in response until their current employment and equipment contracts expire. Such a situation would result in a negative output gap – that is, actual output that is below potential. But suppose our estimate of potential output is based on the trend in actual output. The estimate of potential output based on such a longer-term trend would not increase as much as actual output, leading to a positive measured output gap – actual output that is above the estimated trend. Thus, the policy response suggested by this statistical gap measure would be exactly the opposite of what the true gap would indicate.

Another problem with statistical measures of gaps is that they are based on data that are subject to significant revisions over time and that are significantly affected by the choice of the sample period used to estimate them.⁴ It turns out that the revisions to output gap estimates are often nearly the same size as the output gap measures themselves – which means that an estimated output gap observed in real time could completely disappear or even change sign as the data are revised and updated. Thus, these estimated gaps could easily point monetary policy in the wrong direction at the time decisions have to be made.

Research has shown that data uncertainties are not just theoretical curiosities. They have caused actual problems when policy has been based on mismeasured gaps, resulting in unnecessary economic instability. A particularly poignant example is the

³ For example, in Michael Woodford's model, the change in the theoretical gap, not the level of the gap, is the relevant variable for welfare calculations and hence the relevant variable to which the interest rate should respond. See Michael Woodford, "Optimal Monetary Policy Inertia," NBER Working Paper 7261 (August 1999).

⁴ Both of these components of mismeasurement are explored in Athanasios Orphanides and Simon van Norden, "The Unreliability of Output Gap Estimates in Real Time," *Review of Economics and Statistics*, 84:4 (November 2002), pp. 569-83.

Great Inflation of the 1970s in the U.S.⁵ While I do not believe that mismeasurement is the sole reason for the stagflation of that era, I do believe it was a contributing factor. Part of the problem appears to have been caused by basing monetary policy on unemployment gaps. Over much of the 1970s, real-time estimates of the natural rate of unemployment indicated that the economy was operating below its full-employment potential. In fact, the opposite was true. This misperception led to an inflationary bias to policy, as policymakers reacted to the mismeasured unemployment gap.⁶

In contrast, a good case can be made that the Fed seemed to follow more robust rules during the mid to late 1990s, responding aggressively to deviations of inflation from a target and to economic growth — not gaps. By doing so, the Fed averted a large deflation that would have occurred if it had used real-time unemployment or output gaps.⁷ Chairman Greenspan's choice not to base monetary policy on gaps had its precursor under the leadership of William McChesney Martin. During most of Martin's chairmanship, the Fed raised interest rates early in recoveries, responding to economic growth rather than gaps.⁸

The Implications of Data Uncertainty for Monetary Policy Design

Policymakers should not base policy on poorly estimated data, and they should try to minimize the degree to which the data uncertainty affects policy.⁹ If policymakers responded aggressively to mismeasured gaps, they would essentially build a policy error into their rule. This would be counterproductive, increasing the variance of the true output gap and inflation.¹⁰

So, if we have problems in measuring output gaps, what type of rule should we use? I believe it makes more sense to use an interest rate rule that responds aggressively to movements in inflation relative to a target and, if it responds to real economic activity, responds to a measure of the change in economic activity itself rather than some deviation from unobserved potential.¹¹ While measures of the growth rate of output

⁵ See Athanasios Orphanides, "Monetary Policy Rules and the Great Inflation," *American Economic Review Papers and Proceedings*, 92:2 (May 2002), pp. 115-20.

⁶ See Orphanides (2002).

⁷ See Athanasios Orphanides and John C. Williams, "Robust Monetary Policy Rules with Unknown Natural Rates," *Brookings Papers on Economic Activity* (2002), pp. 63-118.

⁸ See Robert L. Hetzel, *The Monetary Policy of the Federal Reserve: A History* (Cambridge University Press, 2008).

⁹ Useful papers are Orphanides and Williams (2002) and Athanasios Orphanides, "Monetary Policy Evaluation with Noisy Information," *Journal of Monetary Economics*, 50:3 (April 2003), pp. 605-31.

¹⁰ See Orphanides (2003).

¹¹ See Bennett T. McCallum and Edward Nelson, "Performance of Operational Policy Rules in an Estimate Semi-Classical Structural Model," in John B Taylor, ed., *Monetary Policy Rules* (University of Chicago Press, 1999); Bennett T. McCallum, "Should Monetary Policy Respond Strongly to Output Gaps," *American Economic Review Papers and Proceedings*, 91 (May 2001), pp. 258-62; and Carl E. Walsh, "Implications of a Changing Economic Structure for the Strategy of Monetary Policy," in *Monetary Policy and Uncertainty:*

are also subject to data revisions, they are not dependent on an unobservable construct associated with the level of output. Moreover, the measurement errors in growth rates don't tend to cumulate, which can often happen with mismeasured levels.

My preferred approach also is consistent with the idea that, as economic growth accelerates, the economy's underlying real rate of interest also rises, signaling the need for tighter monetary policy. This is likely to keep policy ahead of the curve rather than behind it — lowering rates sooner in a cyclical downturn and raising them earlier in a recovery.

Summary

In summary, I believe that simple rules serve as a useful benchmark for setting monetary policy. They allow policymakers to be more systematic and less discretionary in their approach to policy. A commitment to systematic behavior has been shown to result in more economic stability and lower inflation. Rules allow both policymakers and the public to more easily discern when actual policy is deviating markedly from the norm. When such deviations occur, policymakers would need to communicate the reason. Thus, rules can lend more transparency to monetary policymaking.

In constructing a simple rule, though, we must choose our variables carefully. My remarks have outlined three problems that arise when trying to base policy rules on an output gap or an unemployment gap. Basing policy on such an ill-measured variable has led to policy errors in the past and could do so in the future as well. In my view, policy should respond aggressively to movements in inflation from a target, and if it responds to economic activity, it should respond to measures of economic growth rather than an output gap.

This approach has important implications in the current environment as various economies around the world begin to recover from the global financial crisis and the Great Recession. Although there is a good deal of uncertainty about the pace of those recoveries, as the expansions continue, central banks will eventually need to tighten monetary conditions. My remarks today are intended to highlight that statistical measures of output gaps or unemployment gaps could very well appear to remain quite wide, even when increases in economic growth and the outlook for inflation call for such tightening. Explaining such decisions about the appropriate stance of monetary policy will be challenging, and central bankers will need to communicate with the public about these issues well in advance of their decisions to ensure that their policy actions are not misunderstood.