

## Is the Output Gap a Faulty Gauge for Monetary Policy?

By Thomas Lubik and Stephen Slivinski

Policymakers look to the output gap as a measure of how the economy is performing.

However, different methods of computing the output gap can lead to vastly different results, rendering it a potentially poor guide.

The output gap is a measure of how far away an economy is from a desirable level of output. It can be important in policy discussions because it presents a gauge of when the economy might be overheating or underperforming and can have immediate implications for the stance of monetary policy.

A typical story is that during a recession actual economic output drops below a desirable, or “potential,” level, which creates a negative output gap. In a boom, output rises above its potential level, resulting in a positive gap.

In the latter case, the economy can be described as “overheating.” This would generate upward pressure on inflation and might prompt the central bank to “cool” the economy by raising interest rates. On the other hand, an economy that is performing below its potential may require a more stimulative monetary policy.

Measuring the output gap, however, is not easy. The fundamental problem is that it is not directly observable – an economy’s potential output is a counterfactual that must be constructed either from *a priori* theoretic reasoning or generated from analyzing observable data. Here the choice of empirical and theoretical models matters. The danger for policymakers is that a mismeasured output gap might provide a faulty policy guide.

### THE CONSTRUCTION AND USE OF THE OUTPUT GAP

The output gap has traditionally been constructed using one of two methodologies. One method perceives the gap as the deviation from a long-run trend. This can be modeled to reflect the assumption that there is a normal average growth path for the economy – a linear trend that tends to vary little over time – and business cycles present undesirable deviations that monetary policymakers should strive to avoid. An alternative method of estimating the trend allows for fluctuations in the long-run growth trend and acknowledges that potential output itself is subject to shocks in the course of business cycles and varies substantially over time.

One of the most commonly cited estimates of the output gap comes from the Congressional Budget Office (CBO). The CBO estimates potential output using observations and judgments about factors of

productions. The CBO measures the size and productive capacity of the labor force – such as labor force participation, worker experience, and schooling – and adjusts it for variations in labor demand, thereby arriving at a measure of potential employment. By similar calculations, the CBO then derives measures of other inputs, including capital and overall productivity, and combines these into their potential output measure. The output gap is the difference between their baseline potential output estimate and the actual observed output.

The output gap can also be constructed using more involved statistical and econometric methods. Such a model can be based on the idea that the gap is a useful predictor of inflation. The most common model of this sort estimates inflation using assumptions about the amount of time it takes to observe price changes in the economy (the “lag”) and other predictive variables.<sup>1</sup> The output gap is then extracted from the model as the component that best forecasts potential inflation.

The different methods of computing the output gap present a challenge to a policymaker’s decision process, as there are indeed perils to getting the output gap calculation wrong. A paper by Athanasios Orphanides, formerly an economist at the Federal Reserve Board of Governors and now the Governor of the Central Bank of Cyprus, points out that during the “Great Inflation” of the 1970s, “the Fed believed the output gap to be much more negative than it actually was, which led policymakers to take action that overheated the economy and contributed to an inflationary surge.”<sup>2</sup>

Moreover, modern macroeconomic theory suggests that the potentially attainable level of output is not only a trend that varies over time but one that is buffeted by the same shocks as actual output. Consequently, the difference between actual and potential output may not move around much or at all, leaving the central bank less scope to stabilize real economic activity.

### **DIFFERING MEASUREMENTS OF THE OUTPUT GAP**

There are two types of hypothetical output to consider when conceptualizing the output gap. “Potential” output is the level that would occur if product and factor markets were perfectly competitive – meaning there are no real rigidities, such as the existence of monopolistic producers that can restrict output to artificially low levels.

“Natural” output, on the other hand, describes the level of output that can be achieved under imperfectly competitive markets. Here there are real rigidities, but no nominal distortions such as the costly and time-consuming process needed for prices to adjust.

This natural output concept is more useful in deriving the output gap since it does not assume that the monetary authority is attempting to change the degree of competition in the economy. Instead, it assumes the central bank is merely trying to reduce the distortions from price stickiness – that is, the speed at which prices change – and raise the natural output of the economy as a result. This is the type of counterfactual output that is used in the CBO model described above.

Thus, a more realistic output gap can be defined as the percentage difference between actual and natural output. To derive this sort of output gap, one of us (Lubik) has developed a simple small-scale model based on the work of Boston College professor and former Richmond Fed economist Peter Ireland.<sup>3</sup> This model economy can be subjected to shocks to the productivity trend, to the mark-up that firms can charge above their marginal cost (for instance, due to changes in the degree of competition in markets), and to monetary policy shocks designed to capture the notion that the Federal Reserve cannot perfectly achieve its desired inflation targets in each period.

Figure 1 compares the output gap from the simple model described above to the gap based on the methods of the CBO. The two gaps, constructed using very different methods, overlap substantially. The volatility of the two series is similar and the business cycles turning points – the peaks and troughs of economic activity – coincide closely.

The figure also shows that a sizable negative output gap has rapidly opened since the third quarter of 2008. The gap now stands at almost negative 4 percent. This observation would lend support to the Federal Reserve’s policy of aggressively easing monetary policy in response to the sharp decline in the economy.

The data on which the figure is based reveal that the current negative gap is bigger than that of the comparatively mild recessions of 1991-92 and 2001-02, but not yet as deep as the sequence of recessions in the 1970s and early 1980s. What is notable, however, is the speed of the decline: The dramatic drop-off in the gap is virtually unmatched in the earlier recessions.

Although the simple model computations falls broadly in line with the popular CBO gap measure, that is not the case for alternative models. Figure 2 compares the extracted output gap from the simple model above with the natural output gap from the Federal Reserve Board of Governors’ model, which is estimated over a smaller sample period starting in the first quarter of 1985. The latter is a more elaborate

model, but it shares the same structure and assumptions.<sup>4</sup>

The two series also line up reasonably well in terms of the business cycle turning points. However, the Board model estimates that potential output has fallen below actual output. Thus, the output gap in the Board’s model, while currently shrinking, is still strongly positive. This would signal caution to policymakers as there are signs that the economy is operating above capacity and could possibly begin to overheat, implying that the preferred monetary policy should be tighter.

On the other hand, the simple model suggests that the economy is still operating below capacity. That’s because the shocks in the model have driven down both actual and potential output, although potential output remains higher than actual output. This results in a large negative output gap and suggests that the economy is far from overheating and a stimulative monetary policy is still necessary.

## CONCLUSION

The output gap is meant to be a useful indicator for monetary policymakers because it signals to what extent the over- or under-employment of productive resources during the business cycle might feed inflation. The main challenge, however, is to compute the output gap “correctly.” The computations can be based on purely statistical measures derived from historical data or be based on an approach suggested by modern theory. Different models produce different gaps, however. This suggests that the uncertainty surrounding the various measures renders the output gap a potentially faulty gauge for assessing the economic situation and guiding monetary policy.

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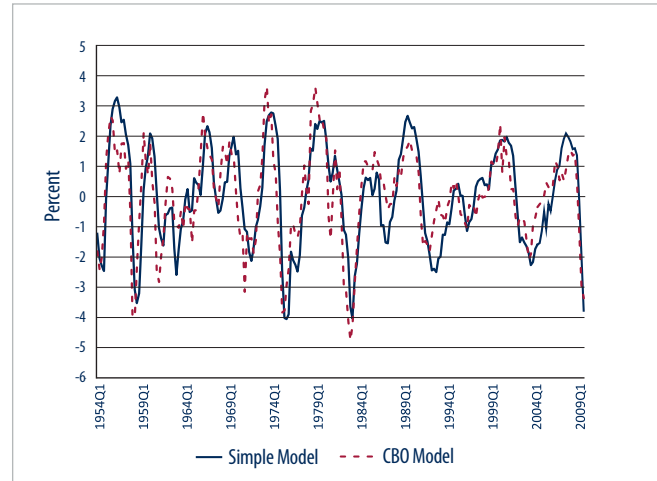
## ENDNOTES

<sup>1</sup> Macroeconomists know this as the “accelerationist Phillips Curve model.”

<sup>2</sup> Orphanides, Athanasios. “Monetary-Policy Rules and the Great Inflation.” *American Economic Review*, May 2002, vol. 92, no 2, pp. 115-120.

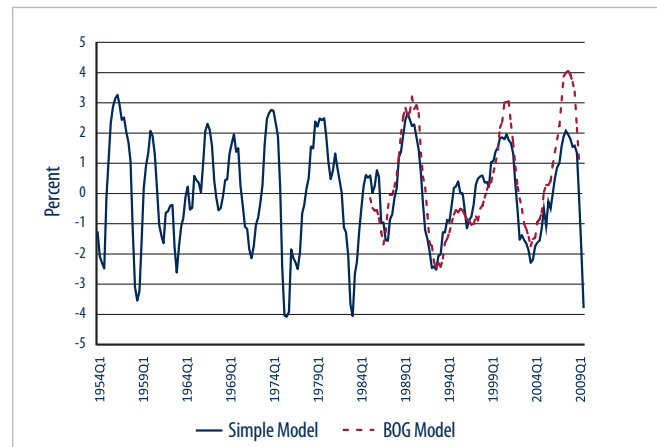
<sup>3</sup> See Ireland, Peter. “Changes in the Federal Reserve’s Inflation Target: Causes and Consequences.” *Journal of Money, Credit, and Banking*, December 2007, vol. 39, no. 8, pp. 1851-1882. The model developed by Lubik is a dynamic stochastic general equilibrium model. It consists of forward-looking and utility-maximizing households that purchase consumption goods and supply labor to the firms, and profit-maximizing firms that produce these consumption goods but enjoy the power to set their own price. They are subject, however, to a nominal rigidity in the form of price adjustment cost, which distorts the allocation of goods. Finally, the model

**FIGURE 1: OUTPUT GAPS (SIMPLE MODEL VS. CONGRESSIONAL BUDGET OFFICE)**



SOURCE: Author’s calculations and Congressional Budget Office

**FIGURE 2: OUTPUT GAPS (SIMPLE MODEL VS. BOARD OF GOVERNORS)**



SOURCE: Author’s calculations and Board of Governors of the Federal Reserve System

assumes a monetary authority that sets the nominal interest rate in response to deviations of inflation and output from their respective target levels. The model is estimated using structural Bayesian methods.

<sup>4</sup> That is, the model assumes households and firms optimize and it includes various nominal rigidities.

*The views expressed in this article are those of the authors and not necessarily those of the Federal Reserve Bank of Richmond or the Federal Reserve System.*



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