

# Shocks, Gaps, and Monetary Policy

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KAEA-Maekyung Forum  
Korea-America Economic Association

Philadelphia, PA

January 4, 2014

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Charles I. Plosser

President and CEO  
Federal Reserve Bank of Philadelphia



FEDERAL RESERVE BANK  
OF PHILADELPHIA

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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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#### **Highlights:**

- President Charles Plosser notes there are several different ways to interpret the economic dynamics during the recent recession and recovery. Some view the shocks hitting the economy as transitory and potential GDP as stable. Others view the shocks as being more permanent, affecting both actual and potential output. Those perspectives would call for different policy responses.
- President Plosser says this is one of the reasons why monetary policymakers should think in terms of policies that are likely to be robust across many models and perspectives.
- He advocates that systematic policymaking seems to be the most promising approach, because it tends to be more transparent and minimizes the degree to which data mismeasurement and model uncertainty affect policy.

I want to thank Bang Jeon, president of the Korea-America Economic Association (KAEA), who is on the faculty here at Drexel University, and Yongsung Chang, vice president of the KAEA, who is on the faculty at the University of Rochester, for inviting me to speak to this forum. The KAEA has hosted a number of prominent speakers in recent years at its annual meetings, and so it is a pleasure and an honor to speak to you this evening.

Much has happened in the field of macroeconomics and monetary policy in the past seven years since I left Rochester to join the Federal Reserve Bank of Philadelphia. Today I want to highlight some key features of the recent recession and the recovery and to discuss how they have influenced my views on monetary policymaking. Before I begin, though, I would like to point out that my views are not necessarily those of the Federal Reserve System or my colleagues on the Federal Open Market Committee (FOMC).

The challenges presented by the recession and recovery have illustrated why policymakers must have a framework that provides a basis for their policy judgments. We say that our policymaking is data dependent, but without a lens through which we view economic data, it is impossible to interpret those data in any sort of useful way, particularly as they pertain to policy. However, policymakers also must approach their task with a great deal of humility. The lens through which we look is often foggy and lacking focus. There is still much we do not understand about recent events, and I am mindful that further research is likely to bring more clarity to the narrative and to our ability to make more informed policy decisions going forward. After all, economists are still debating the events surrounding the Great Depression three-quarters of a century after it ended. Indeed, I would argue that none of us have the economic theory exactly right. That is why I believe it is useful and important that policy discussions include a healthy debate with different perspectives clearly represented. There are many different interpretations of recent events, each with strengths and weakness and it is unlikely that economists will converge to a common or shared understanding of these events anytime soon. Unfortunately, this is not just a characteristic of the current economic environment – it is the typical state of affairs – and it is one of the reasons I believe it is important for monetary policymakers to think in terms of policies that are likely to be robust across many models and perspectives.

### **The Traditional View of Shocks and Gaps**

I want to organize my comments today around “shocks” and “gaps.” I find this to be a simple but useful way to highlight some different perspectives and their implications. For example, economists have different views about the nature of the shocks that sent the economy into recession and about the dynamics of the economy in response to those shocks. Those dynamics are summarized by the economic models or frameworks economists use to interpret incoming data. As a policymaker, I think it is impossible to determine the right course of policy without an assessment of the nature of the shocks and a framework or implicit model for the economy.

One way to characterize some of the key differences in models is to view how the models assess departures from some concept of ideal or desirable outcomes. The concept could be a steady state, some notion of economic potential, or the economic efficient outcome.

Departures of the economy from these ideal outcomes can be viewed as gaps. Of course, to the extent that the ideal outcomes are model dependent, the gaps would also depend on the model one is using.

According to one perspective, which I'll call the traditional view, shocks hitting the economy are largely transitory and dissipate rather quickly over time. Negative shocks can then give rise to something called a negative output gap – a level of output that is lower than the level consistent with the economy operating at its full potential. Such a gap then becomes an object that policy seeks to close or eliminate. In some models, this negative output gap also acts to dampen inflation.

Think about the recent recession. Some economists and policymakers characterize the shock that hit financial markets as a temporary, albeit large, aggregate demand shock. This shock gave rise to a large “output gap,” sometimes referred to as slack, which, in turn, is working to keep inflation low. According to this view, the large output gap and low inflation justify keeping interest rates near zero for a long time. The belief is that low rates will help to close the output gap by increasing the growth of demand and thus output, which will reduce slack and allow inflation to move back to target. In this perspective, there are headwinds that are temporarily restraining economic growth, but these can be offset with aggressive monetary accommodation.

### **An Alternative View of Shocks and Gaps**

But there is an alternative interpretation. Let's look at a rather simple, but I think useful, figure.<sup>1</sup> The figure shows the level of real GDP as well as various vintages of potential GDP estimated by the U.S. Congressional Budget Office (CBO). The CBO defines potential GDP as a

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<sup>1</sup> See figure below.

“measure of the economy’s maximum sustainable output, in which the intensity of resource use is neither adding to nor subtracting from inflationary pressure.”<sup>2</sup> Such a definition obviously has embedded in it some implicit assumptions about an underlying economic model, but I will return to this point shortly.

I would like to draw your attention to two noteworthy features. First, during the recession, GDP fell sharply, as we all know. But since the end of the recession in June 2009, the economy has continued to grow at roughly the same pace as it grew before the recession. There has been little evidence of the rapid growth required to return the economy to the path of potential GDP as estimated by the CBO in 2007. While that may still happen, there has not been the V-shaped recovery to date anticipated by many. The shock that hit the economy appears to have had very persistent, if not permanent, effects. From a statistical perspective, the economy appears to have taken a permanent hit to the output level.

The second noteworthy feature illustrated in the figure is that the CBO has revised its estimate of the path of potential GDP numerous times since the beginning of the recession. Specifically, almost every year since 2007, it has revised down potential GDP. I am showing only three vintages here as an example. If you look at the “gap,” or the difference between the actual level of GDP – measured as of February 2013 when the latest CBO estimate of potential was released – and estimated potential, it is about half the size that it would have been if the path of potential GDP had not been revised. The gap is closing not because GDP has rebounded toward the earlier estimates of potential – but because potential GDP has fallen. And this has occurred in spite of aggressive policies – especially monetary policy – that were intended to boost economic growth rates.

So, what might one infer from these observations? I want to offer a perspective based on some empirical research that Charles Nelson and I published in the *Journal of Monetary Economics*

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<sup>2</sup> Congressional Budget Office, “A Summary of Alternative Methods for Estimating Potential GDP,” Background Paper, March 2004, p. 1.

over three decades ago.<sup>3</sup> In that paper, we concluded that real output contained important stochastic trends. A stochastic trend is often characterized as a random walk. A particular feature of a random walk is that it doesn't exhibit any mean reversion. It means that the stochastic shocks that drive such a series accumulate. Put another way, each shock is permanently embodied in the level of the series – there is little tendency to return to a previous trend line. Such shocks are the antithesis of transitory, or what some refer to as cyclical, shocks that, by definition, dissipate over time.

In our analysis, Nelson and I assumed that the economy was buffeted by a mixture of permanent and transitory shocks. Such a framework is not unusual and is compatible with the type of permanent and transitory distinction stressed in Milton Friedman's permanent income hypothesis.<sup>4</sup> More generally, in dynamic models, forward-looking agents' responses to permanent shocks can be quite different from their responses to transitory shocks. For example, in the permanent income framework, agents adjust consumption much more in response to changes in permanent income than to temporary changes in income. Our statistical analysis found that a large portion of the fluctuations in real GDP were the result of shocks to the stochastic trend, that is, permanent shocks. Interestingly, the recent recession saw a marked drop in consumption. Some of this decline may have been due to credit constraints that became binding on some consumers. But some of the decline likely reflected the fact that many consumers now perceived that their permanent income had fallen, so they reduced their level of consumption.

Looking at the figure, we see that the behavior of the GDP suggests that in the recent recession, the U.S. economy sustained what appears to be a permanent or at least highly persistent shock to the supply side of the economy that has lowered the level of GDP – although not necessarily its growth rate. One could contemplate numerous hypotheses about the nature of such a shock. In 2009, I put forward the idea that the crisis and recession were caused by a shock that

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<sup>3</sup> Charles R. Nelson and Charles I. Plosser, "Trends and Random Walks in Macroeconomic Time Series: Some Evidence and Implications," *Journal of Monetary Economics*, 10 (1982), pp. 139–162.

<sup>4</sup> Milton Friedman, *A Theory of the Consumption Function*, Princeton: Princeton University Press (1957).

likely had either permanent or very long-lasting consequences for the economy. I suggested that the financial crisis may have precipitated a permanent or highly persistent decline in the output of financial intermediation. I have also considered the possibility that the collapse in house values could be viewed as a permanent loss of wealth affecting household balance sheets. Either of these disturbances would require significant real adjustments in the economy.<sup>5</sup>

If we view the shock we experienced as largely permanent in nature, in contrast to being largely transitory, then it alters the way we should think about gaps and about the policy responses, particularly appropriate monetary policy. If you accept the idea that money is neutral in the long run, then efforts to use monetary policy to offset such permanent shocks and to close what appears to be a gap will likely be ineffective and perhaps even counterproductive. The real economy must ultimately adjust to such permanent shocks. Monetary policy cannot offset the costs or the necessity of such real adjustments, and so it is unlikely to be an effective stabilization tool.

Looking at the figure again, we see the repeated downward revision in the estimate of potential GDP suggests that the CBO is gradually recognizing that the fall in output was most likely a permanent or at least highly persistent shock to the supply side of the economy. In other words, the CBO's measures of potential output now recognize that the shock that hit the economy damaged the productive potential of the economy in a persistent way, as potential GDP is now lower as far out as 2020. Therefore, the output gap is no longer what we thought it was – it has been revised down over time. One can wonder whether five years from now the CBO's potential GDP estimates will gradually converge with the existing growth path of real GDP. At that point, the output gap will have been gradually revised away.

The constant revision of estimates of potential output and thus of the output gap also underscore one of the difficulties policymakers have in trying to use gaps as a guide to

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<sup>5</sup> Charles Plosser, "A Perspective on the Outlook, Output Gaps, and Price Stability," speech presented to Money Marketeers, New York, May 21, 2009.

policymaking in real time. Indeed, Athanasios Orphanides and Simon van Norden have argued that a major problem that gave rise to the great inflation of the 1970s was the mismeasurement of the perceived output gap.<sup>6</sup> They explained how the Fed consistently relied on estimated output gaps that were subsequently revised and ended up being much smaller than initially thought. They argue that policymakers' reliance on estimated gaps led to overly expansionary monetary policy and the resulting high rates of inflation.

There is a separate and perhaps more challenging issue. While a permanent shock to the level of GDP is disturbing enough, it would be even worse if the underlying growth rate of the economy were to slow. Economists normally think that the longer-run growth rate of the economy is roughly the sum of the growth rate of the labor force and the growth rate of productivity. Here again, monetary policy would not be an effective tool to address such real economic challenges as slower labor force or productivity growth. Appropriate policies would require focusing on increasing productivity and the quality of the labor force, not on traditional countercyclical monetary policy.

### **Alternative Concepts for the Gap**

To this point, I've talked about the traditional view and an alternative view of the nature of the shock the economy experienced and how these views change the nature of the gap and the appropriate monetary policy response. But as I mentioned at the outset, there are different ways to approach the standard to which economic performance is measured. In particular, we need to remember that economic theory does not give us a unique way to define gaps. Different models can offer different conceptual approaches to the gap.

For example, as I mentioned earlier, implicit in the CBO's approach to constructing potential GDP is a model of the economy and the concept of a noninflationary maximum level of output. One feature of the CBO's construct of potential, and many others', is that potential output moves very slowly and very smoothly. This means that potential GDP does not – indeed,

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<sup>6</sup> Athanasios Orphanides and Simon van Norden, "The Reliability of Inflation Based on Output Gap Estimates in Real Time," *Journal of Money, Credit and Banking*, 37 (2005), pp. 583–601.



cannot – respond much to current shocks to the economy regardless of their magnitude or source, especially in real time.

This is in contrast to research Nelson and I conducted that revealed that a significant proportion of the variability in GDP was due to permanent or very long-lasting shocks. While our statistical approach was not based on an economic model, there is good reason to believe that shocks that give rise to permanent changes in GDP should be viewed differently from those that give rise to purely transitory movements, especially in terms of their policy prescriptions. Measures that arbitrarily, or by assumption, assign the bulk of fluctuation in GDP to purely temporary factors may provide poor policy guidance when shocks are more permanent in nature.

A different conceptual approach to defining a gap is implied by a class of economic models in wide use today – the new Keynesian dynamic stochastic general equilibrium, or DSGE, models. DSGE models explicitly posit that firms have some pricing power; that is, there is imperfect competition so that a firm can choose to sell more of its output by lowering its price or to sell less of its output by raising its price, and the firm will set its price at a markup over marginal cost to maximize its profits. DSGE models also assume that firms are able to only adjust prices infrequently. This form of sticky prices, together with imperfect competition, allow monetary policy to have real effects in the short run, while remaining neutral for the real side of the economy in the long run. The sticky prices generate distortions that mean allocations and output can be inefficient in the face of shocks. In these models, the efficient level of output is the level of output that would prevail in the absence of the sticky prices and other market imperfections that allow deviations from perfect competition.

In this framework, the relevant output gap to be addressed is the difference between the efficient level and that level generated by the distortion introduced by the sticky prices and market imperfections. The behavior of the efficient level of output is unlikely to be a smooth or a slowly evolving series like the CBO concept. In fact, it could be quite volatile and may bear little or no resemblance to the traditional concept of potential used by the CBO and others. Efficient output would be altered by changes in technology that affect productivity or changes in agents' preferences. The role of monetary policy in these models is to react to economic

conditions in a way that minimizes the potential for distortions arising from the price stickiness or other market imperfections. The general policy prescription is to minimize the gap between output and the efficient level of output. In the absence of unexpected events that lead firms to change their desired markups over marginal cost, or other real rigidities like real wage rigidities, this would be equivalent to stabilizing inflation.<sup>7</sup>

A great deal of work is being done on this class of models. For example, many researchers are attempting to build richer models that have a more elaborate financial sector in light of the recent financial crisis, and they are incorporating frictions of various kinds. Regardless of how these models are enhanced, their concept of the gap will continue to be a deviation of output from the efficient level that would prevail in the absence of nominal rigidities and market imperfections. Therefore, the gap in these models will remain conceptually different from a gap based on potential output. And there is no reason to believe that the policy prescriptions based on these gaps will be the same. Indeed, the nature of the shock will be an important determinant in whether the efficient output level changes and whether monetary policy should react or not.

## **Conclusion**

Policymakers need a framework with which to evaluate incoming data in order to set appropriate monetary policy. But the recession and recovery have underscored that we must remain humble about our degree of understanding of the economy and that we must entertain various perspectives in setting policy. As I've discussed, there are several different ways to interpret the economic dynamics we have seen in recent years, and those perspectives would call for different policy responses. Some view the shocks hitting the economy as transitory and potential GDP as stable. Others view the shocks as being more permanent, affecting both actual and potential output.

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<sup>7</sup> See Jordi Gali and Olivier Blanchard, "Real Wage Rigidities and the New Keynesian Model," *Journal of Money, Credit and Banking*, 39 (2007), pp. 35–65 and Aubhik Khan, Robert G. King, and Alexander L. Wolman, "Optimal Monetary Policy," *Review of Economic Studies*, 70 (2003), pp. 825–860.

In addition, there are alternative concepts of the output gap itself, some of which focus on the efficient level of output instead of potential output. Each of these perspectives has some merit as well as drawbacks, and it will be some time (if ever) when we will know which perspective is the correct one in explaining our recent economic experience.

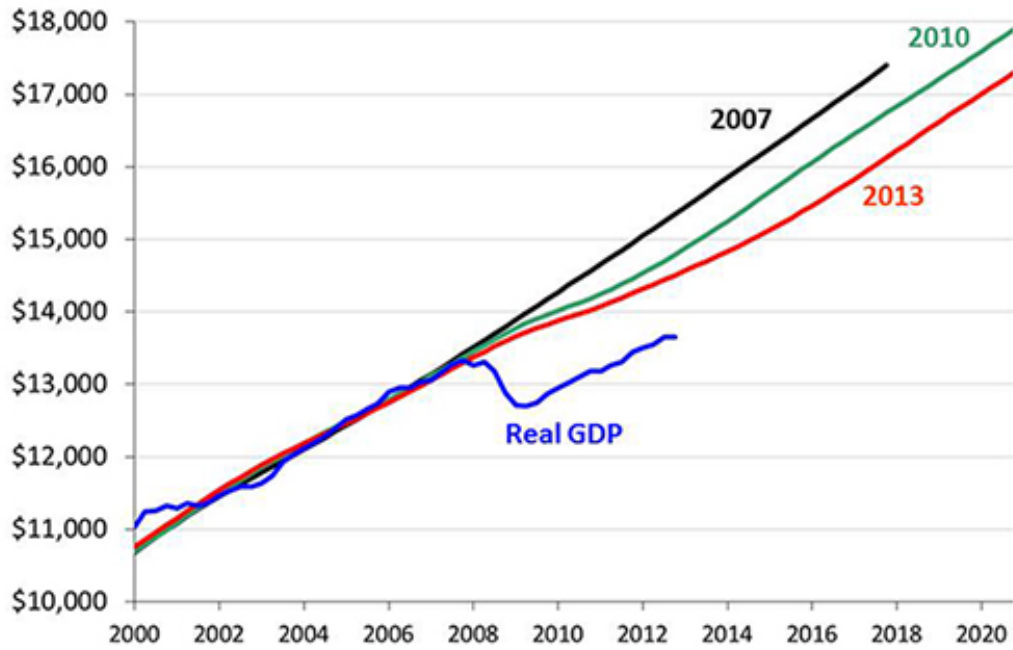
This state of affairs has led me to be skeptical of relying on gaps in general as well as optimal control exercises that are derived from specific models. Instead, I have long advocated that we should think in terms of robust policies that yield good economic outcomes across a variety of models and frameworks.<sup>8</sup> In my view, a robust, systematic approach to policy, which is transparent and minimizes the degree to which data mismeasurement and model uncertainty affect policy is the most promising approach to the uncertainties facing policymakers in real time.

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<sup>8</sup> Charles Plosser, "Output Gaps and Robust Policy Rules," speech presented to the 2010 European Banking and Financial Forum, Czech National Bank, Prague, the Czech Republic, March 23, 2010.

## Real GDP and Revisions of CBO Potential GDP

Billions of Chained 2005 Dollars



Notes: Real GDP and revisions of CBO potential GDP – 2007, 2010, and 2013 vintages. Real GDP was the vintage available in February 2013.

