Permazero

James Bullard

The financial crisis of 2007-09 and its aftermath turned monetary economics and policymaking on its head and called into question many of the conventional views held before the crisis. One of the most popular and enduring views in all of monetary economics since the 1970s, and indeed since the 1940s, has been that a nominal interest rate peg is poor monetary policy and that attempts to pursue such a policy would lead to ruin. Yet, post-crisis U.S. monetary policy could be interpreted as exactly that—an interest rate peg—and an extreme one at that, since the policy rate has remained near zero for nearly seven years. The author summarizes some recent academic work on the idea of a stable interest rate peg and what its implications may be for current monetary policy choices. He argues that a stable interest rate peg is a realistic theoretical possibility; that it has some mild empirical support based on a cursory look at the data; and that, should we find ourselves in a persistent state of low nominal interest rates and low inflation, some of our fundamental assumptions about how U.S. monetary policy works may have to be altered. (JEL E31, E52, E58)

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MY CURRENT POLICY RECOMMENDATIONS

Let me begin by describing briefly my current monetary policy recommendations. Those of you who have followed my commentary during 2015 know that I have been an advocate of ending the Federal Open Market Committee's (FOMC's) near-zero nominal interest rate policy. My case has been straightforward. Essentially, I have argued that while the Committee's goals have been met, the Committee's policy settings remain as extreme as they have been at any time since the recession ended in 2009.

With respect to these goals, the current unemployment rate of 5 percent is statistically indistinguishable from the Committee's view of the equilibrium long-run rate of unemployment. In addition, the current year-over-year inflation rate, while low, reflects an outsized oil

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price shock that occurred during 2014. A measure that tries to control for this effect—the Dallas Fed's trimmed mean inflation rate, measured year over year—is currently running at 1.7 percent, just 30 basis points below the FOMC's inflation target of 2 percent. By these measures, the Committee's goals have been met.

On the other hand, the Committee's policy settings remain far from normal. The policy rate remains near zero, and the balance sheet is very large relative to its pre-crisis levels. In the past, the Committee has acted to normalize policy well before goals have been completely met.

A simple and prudent approach to current policy is to move the policy settings closer to normal levels now that the goals of policy have been attained. There is no reason to continue to experiment with extreme policy settings.

Implicit in my argument is a desire to return to the 1984-2007 U.S. macroeconomic equilibrium, which involved relatively good monetary policy, relatively long economic expansions, and a higher nominal interest rate than we have today. Part of the nature of that equilibrium was a monetary policy that was relatively well understood by both financial market participants and monetary policymakers. We gained much experience with the equilibrium over this time period, and we think we know how it works, in part because it has been studied extensively from both a theoretical and empirical perspective.

RETHINKING MONETARY POLICY

Nevertheless, as the topic of this conference is "Rethinking Monetary Policy," I plan to devote the bulk of my remarks not to the return to the standard macroeconomic equilibrium that I recommend, but to the possibility that such a return is not achieved, despite the Committee's best efforts to engineer such an outcome for the U.S. economy.

We have, after all, been at the zero lower bound in the United States for seven years. In addition, the FOMC has repeatedly stressed that any policy rate increase in coming quarters and years will likely be more gradual than either the 1994 cycle or the 2004-06 cycle. In short, the FOMC is already committed to a very low nominal interest rate environment over the forecast horizon of two to three years. Perhaps short-term nominal rates will simply be low during this period, or perhaps the economy will encounter a negative shock that will propel policy back toward the zero lower bound.

Our experience is not unique. In Japan, the policy rate has not been higher than 50 basis points for two decades, and in the euro zone, the policy rate looks set to remain near zero at least through September 2016. The thrust of this talk is to suppose, for the sake of argument, that the zero interest rate policy (ZIRP) or near-ZIRP remains a persistent feature of the U.S. economy. How should we think about monetary stabilization policy in such an environment? What sorts of considerations should be paramount? Should we expect slow growth? Will we continue to have low inflation, or will inflation rise? Would we be at more risk of financial asset price volatility? What types of concrete policy decisions could be made to cope with such an environment? Would it require a rethinking of U.S. monetary policy?

I will provide tentative answers to all of these questions. But first, I want to argue that it may indeed be possible to converge to an equilibrium at the zero lower bound, and that this

situation has some surprising consequences. Chief among these consequences is that the policy itself may put downward pressure on inflation in the medium and long term, rather than upward pressure as conventionally thought. This is a simple consequence of the Fisher equation having to hold in concert with monetary neutrality. I will now turn to developing this point.

PERMAZERO

Most analyses of U.S. monetary policy since the crisis of 2007-09 have suggested that the ZIRP in the United States is a temporary affair, one that was part of an important set of policy actions designed to mitigate a particularly large shock to the U.S. economy. But how temporary is it?

We have been at the zero lower bound for nearly seven years. This is well beyond an ordinary business cycle time. Normally, we would think of a shock hitting the economy, with the effects of that shock largely wearing off well within a seven-year time span. What are the consequences of spending such a long time with the policy rate at one value? Arguably, it is an interest rate peg.

In the 1970s and 1980s, the typical reply to this question was that an interest rate peg was poor policy. Trying to keep the nominal policy rate unnaturally low for too long a period would ultimately be inflationary, and indeed, this was widely viewed as a large part of the problem leading to global inflation during this era.[1] Indeed, during the past six years I have warned, along with many others, that the Committee's ZIRP has put the U.S. economy at considerable risk of future inflation. In fact, my monetarist background urges me to continue to make this warning right now!

In any case, after seven years, one might want to consider other models. One important possibility is that the 1970s were an era when U.S. monetary policy was not very credible with respect to fighting inflation, whereas the 2000s were an era when U.S. monetary policy had already earned a lot of credibility for keeping inflation low and stable. One way to interpret this is to say that market expectations of future inflation today move to stay in line with the FOMC's desired policy rate instead of becoming "unanchored" as they did in the 1970s. In particular, this would mean that a low nominal interest rate peg, far from being a harbinger of runaway inflation, would instead dictate medium- and longer-run low inflation outcomes.

This theme is sometimes labeled "neo-Fisherian" because it emphasizes that the Fisher equation holds in virtually all modern macroeconomic models. The Fisher equation states that the nominal interest rate can be decomposed into a real interest rate component and an expected inflation component. If we view the real interest rate as determined by supply and demand conditions in the private sector, then a permanent nominal interest rate peg would also pin down the long-run rate of inflation. The Fisher equation implies, among other things, that the monetary authority cannot choose the long-run value of the nominal policy interest rate separately from the long-run value of inflation.

This Fisher effect is well known and is not likely to be disputed in macroeconomic circles. However, how long before this Fisher effect sets in? Over what time period can the monetary

authority maintain an interest rate peg before the peg itself begins to pull inflation expectations in a direction consistent with the peg? Is seven years a sufficient length of time? How about 20 years, as in Japan?

COCHRANE (2016)

A recent paper by Cochrane (2016) provides an interesting analysis of this issue in the context of the most canonical of modern macroeconomic models, the linearized three-equation New Keynesian model.[2] I will not provide any details of the model here, but for those who are unfamiliar with it, I will briefly describe its essential ingredients. The key friction in the model is that prices are sticky, meaning that they do not adjust immediately in response to supply and demand conditions. Households and firms solve optimization problems taking the friction as given. The policymaker controls a one-period nominal interest rate and through this channel can have temporary effects on real output and inflation. The Fisher equation holds at all times. The model can be described by three simple equations that depend on expectations of future real output, future inflation, and future monetary policy. The spirit of Cochrane's analysis is to suggest that neo-Fisherian effects are part of even the most ordinary of macroeconomic models used to inform current monetary policy.

Cochrane (2016) uses a solution technique for the model due to Werning (2012). We can think of the economy as continuing from the distant past to the distant future. The policymaker chooses the short-term nominal interest rate sequence, and, given this sequence, the model traces out what would happen to the real output gap (x) and inflation (π).

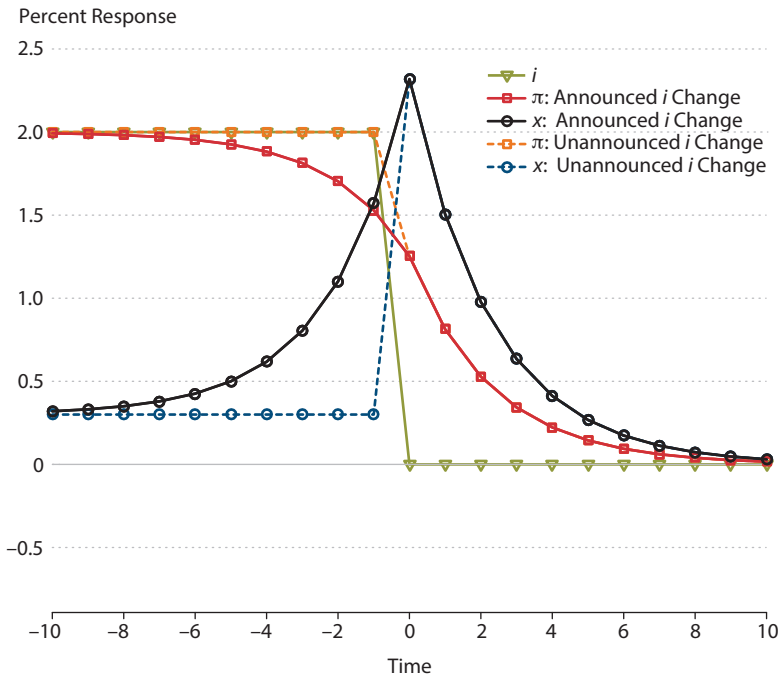
I use Cochrane's model to trace out the effects on the economy of the following thought experiment. Suppose the economy begins with the nominal interest rate equal to 2 percent, a real interest rate equal to 0 percent (for convenience), and an inflation rate equal to 2 percent. The Fisher equation holds, as it must, so that in the long run the policy rate will equal the inflation rate in this example. The policymaker then lowers the policy rate by 200 basis points to zero and leaves it there for a considerable time.

Figure 1 illustrates the effect of such a policy experiment in Cochrane's (2016) model. The green triangles show the policy rate, which begins at 200 basis points, but is lowered to zero at date 0. If the policy move is anticipated, as many actual policy moves are, then the effects on inflation are described by the red squares, and the effects on the real output gap are given by the black circles. If the policy change is completely unanticipated, then the effects on inflation are given by the orange squares, and the effects on the real output gap are given by the blue circles. In the case of a "surprise" policy move, nothing happens until the date of the move, whereupon the inflation and real output gap variables jump to the path they would have been on had the policy change been known in advance. For our purposes here, it does not matter that much if we focus on an anticipated or an unanticipated policy change.

Instead, I want to focus on the right-hand side of this picture, after the policy move has occurred. The policymaker has lowered the policy rate to zero, and in response, the real output gap has increased.[3] This is one way to gauge the real effects of monetary policy according to the model: A pure change in the policy rate, with no other shocks occurring, would temporar-

Figure 1

The Policy Rate Falls 200 Basis Points



NOTE: i = policy rate; π = inflation, x = output gap.

SOURCE: Adapted from Cochrane (2016).

ily increase output. This is what the model is designed to do, and if we added more shocks to the model, the policymaker could use this power appropriately to smooth real output over time. Smoother output would be preferred to more volatile output by the households in the model, and thus the model provides a theory of monetary stabilization policy.

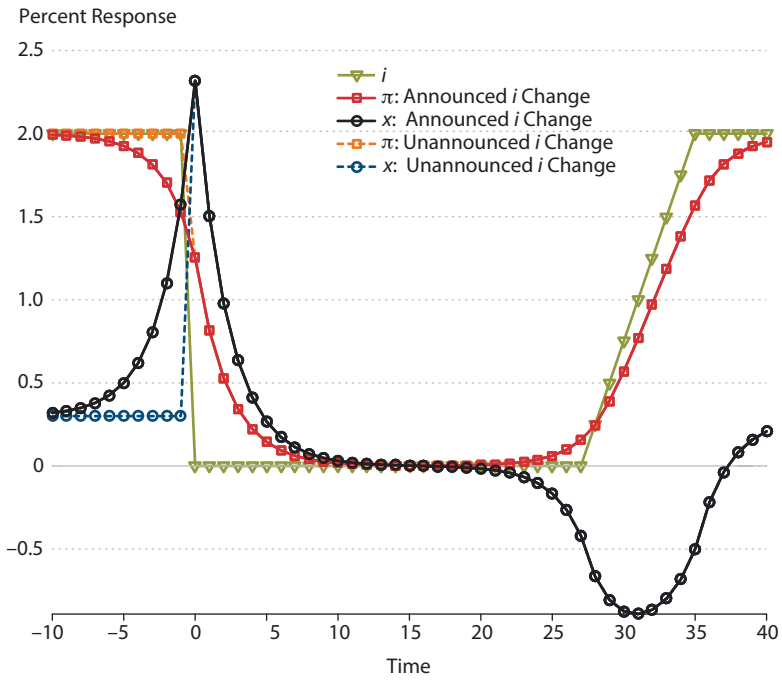
But now let us look at inflation in response to the policy change. It falls in response to the policy change, very little at first, but more substantially as the ZIRP continues. After about 2.5 years (10 quarters), at the far right of Figure 1, the transitory effects of the policy change have nearly completely died out. The real output gap is zero, the policy rate remains at zero, and the inflation rate has fallen to zero. This can be interpreted as a neo-Fisherian result: The policy rate is lowered, and after some transitory dynamics, the inflation rate falls to be consistent with the new interest rate peg.

It is clear from Figure 1 that, should the policymaker simply elect to keep the nominal interest rate at zero for a much longer time, nothing further would happen in this economy. The black, red, and green lines would simply remain at zero.

Cochrane's (2016) analysis, as I have translated it into Figure 1, yields a very different interpretation of current events compared with conventional wisdom. Conventional descrip-

Figure 2

A Gradual Policy Rate Increase



NOTE: i = policy rate; π = inflation, x = output gap.

SOURCE: Adapted from Cochrane (2016).

tions of current monetary policy, including my own description earlier in this very speech, suggest that the Committee's ZIRP is putting upward pressure on inflation, perhaps dangerously so. Figure 1 suggests otherwise.

What's going on? The model does have a Phillips curve in that today's inflation rate does depend in part on today's real output gap. When the policy rate is lowered, the output gap is higher than it otherwise would have been, and this does put upward pressure on inflation in the model.[4] However, the model also has a Fisher relation, which means that as the real output gap returns to normal (that is, monetary neutrality asserts itself), the inflation rate will have to fall to be consistent with the new level of the nominal interest rate. Another aspect is that the policymaker is viewed as choosing the interest rate sequence, and inflation follows as dictated by the Fisher equation. The policymaker cannot set the nominal interest rate and the inflation target in an inconsistent way.

A few of you may be aware of a closely related analysis by Benhabib, Schmitt-Grohé, and Uribe (2001) that I have championed in discussing dimensions of monetary policy since 2007-09.[5] In that analysis the Fisher relation also plays a prominent role, but the analysis is nonlinear and global. Benhabib, Schmitt-Grohé, and Uribe (2001) find two steady states, one

of which is associated with a low nominal interest rate and inflation below target. Arguments in this context then center around which of the two steady states is the stable one in a reasonable expectation dynamic ("learning"). Often the argument is that the traditional steady state is the stable one and therefore the one worthy of the most attention from policymakers.[6] The Cochrane (2016) analysis is of a linear system, and, consequently, ideas about "getting stuck at the wrong steady state" are not nearly as clear. Rational expectations prevail at all times.[7]

To illustrate that policymakers can reverse their actions in the Cochrane (2016) model, Figure 2 illustrates an alternative policy experiment. This experiment is almost the same as the one described in Figure 1, except that the policymaker chooses the nominal policy rate sequence to remain at zero for seven years before gradually raising the policy rate back to 2 percent.

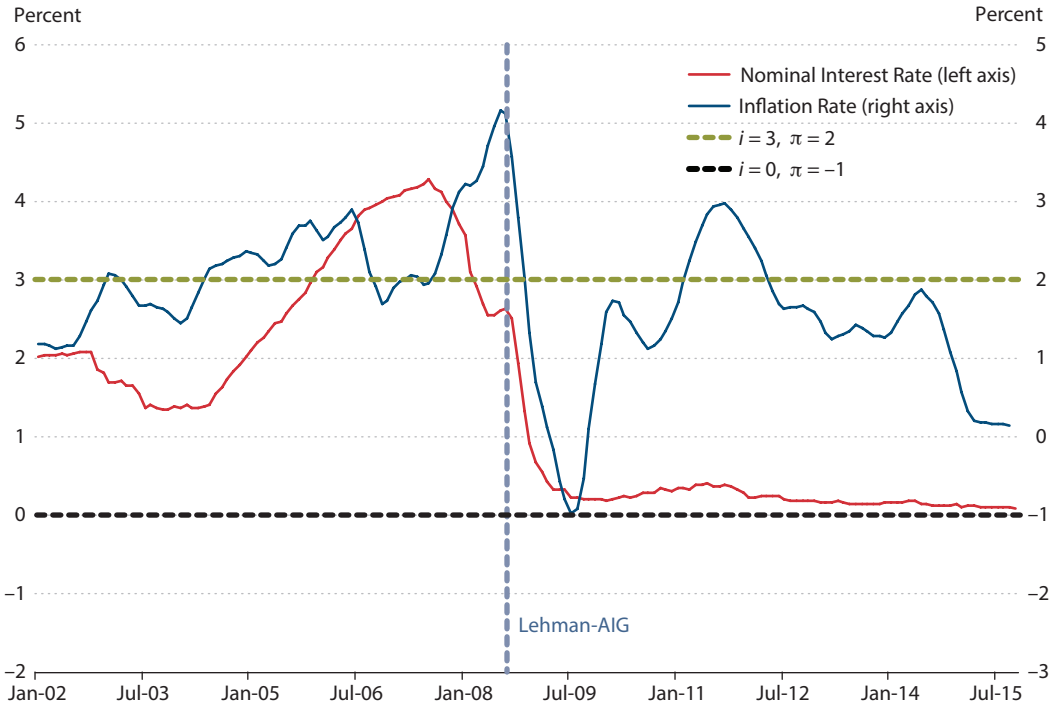
The left-hand side of Figure 2 simply repeats what is in Figure 1. The middle portion of Figure 2 shows how the case where the policy rate remains near zero simply keeps the inflation rate low and the output gap steady as the effects of the first policy move wear off. The gradual policy rate increase is shown in the right-hand portion of Figure 2 by the green triangles. This policy move is portrayed as being anticipated here, so inflation and the output gap begin to react before the actual date of liftoff. The rising rate environment puts downward pressure on the output gap, reversing the effects of the previous policy rate move. As before, inflation moves in tandem with the policy rate as the Fisher equation asserts itself.

Is this what will actually happen in the U.S. economy? Definitely not, since we are looking here at pure policy effects with no other shocks added to the model. At best, Figures 1 and 2 can illustrate the directions that monetary policy can be expected to push in this particular model; but a more realistic analysis would include additional shocks, and monetary policy would have to react appropriately to those changes in macroeconomic conditions. Still, the key point is that this canonical model has a clear interpretation in neo-Fisherian terms, and that this interpretation is hardly surprising, since the Fisher equation is built into the model.

I have spent a lot of my time with these particular figures because I think they are interesting and can communicate to a wide audience in the monetary policymaking community. But I do want to stress that the New Keynesian model is just one model in a sea of possibilities. In addition, it is a model that was designed to describe the relatively good monetary policy in the United States from 1984-2007, without features that turned out to be quite important during the 2007-09 crisis and its aftermath. While I do not have time to emphasize other more novel work here, let me just say that there is important recent work in monetary theory and policy that has tried to explain very low real rates of return on safe assets along with the implications for monetary policy. Andolfatto and Williamson (2015), for instance, think of all consolidated government debt as having value in conducting transactions. Their model has a liquidity premium on government debt under some circumstances and offers novel interpretations of current policy dilemmas. Caballero and Farhi (2015) similarly study safe asset shortages and suggest important ways that our understanding of the effectiveness of various policies at the zero lower bound would be affected. These are just some examples of interesting work going on outside the relatively narrow New Keynesian framework to try to come to terms with the reality of the post-crisis macroeconomy.

Figure 3

G-7 Countries' Aggregated Inflation and Policy Rates



SOURCE: Organization for Economic Co-operation and Development's *Main Economic Indicators* and author's calculations. Last observation: September 2015.

EMPIRICAL EVIDENCE

Figures 1 and 2 suggest that low nominal interest rates and low inflation may go hand in hand, at least over relatively long horizons in which the policy rate is kept at a constant level. Over shorter horizons with more policy moves and more shocks, the correlation may not be very high. Policy rates have generally been very low, near zero, continuously in the G-7 economies since the 2007-09 period. Consequently, we may be able to look at the data since 2009 to see to what extent neo-Fisherian effects are exerting themselves in the G-7.[8]

To get at this issue in just one picture, Figure 3 shows the centered five-quarter moving average of the G-7 headline inflation rate and the average, GDP-weighted, G-7 nominal policy rate since 2002. In Figure 3, the inflation rate is the blue line on the right-hand scale, and the GDP-weighted nominal policy rate is the red line on the left-hand scale. The horizontal green line is an inflation rate of 2 percent, and the horizontal black line is an inflation rate of –1 percent. The vertical line in the middle of Figure 3 marks the Lehman-AIG event. On the left side of Figure 3, interest rates and inflation arguably behaved according to traditional interpretations of New Keynesian theory. On the right half of Figure 3, the nominal policy

rate falls to near zero and remains there. Inflation initially falls across the G-7, but then impressively returns close to target. In fact, inflation was above target as of the beginning of 2012, about 2.5 years after the end of the recession in the United States. Since then, however, policy rates have remained near zero and inflation has drifted down, to the point where G-7 inflation is around zero today.

Conventional wisdom would have suggested that the zero policy rates in the G-7 were putting upward pressure on inflation during the nearly four years since January 2012, but instead, inflation fell. This could be viewed as consistent with neo-Fisherian effects asserting themselves. Of course, we have to be cautious about carrying such an explanation too far. There have been many other shocks during the past four years, notably a very large oil price shock beginning in the summer of 2014.

CONSEQUENCES

Let us suppose for the sake of argument that the G-7 economies will spend still more time at or near the zero lower bound. This would occur because either liftoff does not materialize in most or all countries or because additional negative shocks drive those countries that do raise their policy rates back to the zero lower bound. Prudent policymaking suggests that we should at least entertain this as a realistic possibility for the path of G-7 monetary policy in the coming years. What are the consequences of remaining in such a state for a long period of time?[9]

I can think of six consequences, based on the discussion in the earlier part of this speech:

First, consider the near-zero policy rate path illustrated on the right-hand side of Figure 1. In this situation, promising to keep the nominal interest rate sequence at the zero lower bound simply reinforces the equilibrium and does not provide accommodation as in the traditional New Keynesian equilibrium. Nothing happens in response to such promises. Policymakers would have to come to grips with such a situation.

Second, in such a situation, inflation remains persistently below the stated inflation target. The near-zero policy rate is not putting upward pressure on inflation, but is instead through the Fisher equation dictating a rate of inflation lower than the original target. It could be that policymakers do not intend to return to the original equilibrium—that is, they may intend to remain with the near-zero policy rate. In that case, policymakers may wish to lower the inflation target to remain more consistent with the actual inflation outcomes.

Third, longer-run economic growth would still be driven by human capital accumulation and technological progress, as always, but without the accompanying stabilization policy as conventionally practiced from 1984-2007. In principle, the economy would still be expected to grow at a pace dictated by fundamentals.[10]

Fourth, the celebrated Friedman rule would arguably be achieved so that household and business cash needs are satiated. In many monetary models this is a desirable state of affairs.

Fifth, the risk of asset price fluctuations may be high. In the New Keynesian model, the near-ZIRP with little or no response to incoming shocks is associated with equilibrium indeterminacy. This means there are many possible equilibria, all of which are consistent with

rational expectations and market clearing. In a nutshell, a lot of things can happen. Many of the possible equilibria are exceptionally volatile. One could interpret this theoretical situation as consistent with the idea that excessive asset price volatility is a risk.

Sixth, and finally, the limits on operating monetary policy through ordinary short-term nominal interest rate adjustment in this situation would surely continue to fire a search for alternative ways to conduct monetary stabilization policy. The favored approach during the past five years within the G-7 economies has been quantitative easing, and there would surely be pressure to use this or related tools.[11]

CONCLUSION

During 2015, I was an advocate of beginning to normalize the policy rate in the United States. My arguments have focused on the idea that the U.S. economy is quite close to normal today based on an unemployment rate of 5 percent, which is essentially at the Committee's estimate of the long-run rate, and inflation net of the 2014 oil price shock only slightly below the Committee's target. The Committee's policy settings, in contrast, remain as extreme as they have ever been since the 2007-09 crisis. The policy rate remains near zero, and the Fed's balance sheet is more than $3.5 trillion larger than it was before the crisis. Prudence alone suggests that, since the goals of policy have been met, we should be edging the policy rate and the balance sheet back toward more normal settings.

Implicit in my argument has been a yearning to return to the monetary equilibrium of 1984-2007, which is one around which a great deal of theory and empirical work has been done. We would be returning to a world in which monetary policy is better understood, the effects of policies are more closely calibrated, and private sector expectations can move and adapt to ordinary adjustments of the policy rate.

My current policy views have not changed. But in the spirit of the conference, I have tried to contribute to the topic of "Rethinking Monetary Policy" by focusing on a situation where the nominal policy rate and the inflation rate remain low, either because liftoff does not materialize or because future negative shocks to the economy force a return to the zero interest rate policy. I have illustrated by reference to relatively new research how such a situation could become permanent. In addition, I have suggested several consequences of remaining at such an equilibrium over the long term. It is my hope that my characterizations here will spur further thinking and research on these important topics. ■

NOTES

[1] See, for instance, Sargent and Wallace (1975) for an argument that an interest rate peg is associated with price level indeterminacy.

[2] See Woodford (2003) and Galí (2015).

[3] The long-run real output gap in this model is not zero unless the long-run inflation rate is zero, so the initial real output gap on the left-hand side of this picture is somewhat positive. This is not material to the argument here, but has been discussed extensively in the New Keynesian literature.

[4] The inflation decline is mitigated by the increase in real activity.

[5] See Bullard (2010) and Bullard (2015).

[6] See Eusepi (2007), Evans (2013), and Benhabib, Evans, and Honkapohja (2014).

[7] García-Schmidt and Woodford (2015) delve into this question and, in particular, consider departures from rational expectations.

[8] For state-of-the-art empirical analysis of the issues discussed here, see Aruoba and Schorfheide (2015) and Aruoba, Cuba-Borda, and Schorfheide (2014).

[9] Cochrane (2014) addresses how U.S. monetary policy might operate in a zero policy rate and large balance sheet environment.

[10] Endogenous growth theories that mix long-run growth prospects with monetary policy practice are rare and of dubious empirical validity.

[11] For some recent arguments concerning the future of monetary policy in a low interest rate environment, see Haldane (2015). For a theoretical analysis of quantitative easing at the zero lower bound, see Boel and Waller (2015).

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