

NBER WORKING PAPER SERIES

DOES STABILIZING INFLATION CONTRIBUTE TO STABILIZING ECONOMIC
ACTIVITY?

Frederic S. Mishkin

Working Paper 13970

<http://www.nber.org/papers/w13970>

NATIONAL BUREAU OF ECONOMIC RESEARCH

1050 Massachusetts Avenue

Cambridge, MA 02138

April 2008

Based on a speech at East Carolina University, Greenville, North Carolina, February 25, 2008. I would like to thank Michael Kiley and Thomas Laubach for assistance and helpful comments. The views expressed here are my own and are not necessarily those of the Board of Governors of the Federal Reserve, the Federal Reserve System, or the National Bureau of Economic Research.

© 2008 by Frederic S. Mishkin. All rights reserved. Short sections of text, not to exceed two paragraphs, may be quoted without explicit permission provided that full credit, including © notice, is given to the source.

Does Stabilizing Inflation Contribute To Stabilizing Economic Activity?

Frederic S. Mishkin

NBER Working Paper No. 13970

April 2008

JEL No. E31,E32,E52

ABSTRACT

This paper discusses recent economic research that demonstrates that the objectives of price stability and stabilizing economic activity are often likely to be mutually reinforcing. Thus, the answer to the title of this paper--"Does stabilizing inflation contribute to stabilizing economic activity?"--is, for the most part, yes.

Frederic S. Mishkin

Federal Reserve Board

20th Street and Constitution Ave., N.W.

Washington, DC 20551

and NBER

fsm3@columbia.edu

The ultimate purpose of a central bank should be to promote the public good through policies that foster economic prosperity. Research in monetary economics describes this purpose by specifying monetary policy objectives in terms of stabilizing both inflation and economic activity. Indeed, this specification of monetary policy objectives is exactly what is suggested by the dual mandate that the Congress has given to the Federal Reserve to promote both price stability and maximum employment.¹

We might worry that, under some circumstances, the objectives of stabilizing inflation and economic activity could conflict, particularly in the short run. However, economic research over the past three decades suggests that such conflicts may not, in fact, be that serious. Indeed, stabilizing inflation and stabilizing economic activity are mutually reinforcing not only in the long run, but in the short run as well. In this paper, I would like to outline how economic researchers came to that conclusion, and in so doing, explain why it is so important to achieve and maintain price stability.

The Long Run

Both economic theory and empirical evidence indicate that the stabilization of inflation promotes stronger economic activity in the long run.² Two principles underlie that conclusion. The first principle is that low inflation is beneficial for economic welfare. Rates of inflation significantly above the low levels of recent years can have serious adverse effects on economic efficiency and hence on output in the long run. The

¹ The Federal Reserve's congressional mandate is actually couched in terms of the goals of maximum employment, stable prices, and moderate long-term interest rates. However, as I have discussed in Mishkin (2007a), the mandate is more appropriately interpreted in terms of the dual goals of price stability and maximum *sustainable* employment, and this formulation is what is consistent with stabilizing both inflation and economic activity.

² Mishkin (2007c) outlines a set of principles that form the basis of the science of monetary policy that is currently practiced.

distortions from a moderate to high level of long-run inflation are many. High inflation can cause confusion among households and firms, thereby distorting savings and investment decisions (Lucas, 1972; Briault, 1995; Shafir, Diamond, and Tversky, 1997). The interaction of inflation and the tax code, which is often applied to nominal income, can have adverse effects, especially on the incentive of firms to invest in productive capital (Feldstein, 1997). Infrequent nominal price adjustment implies that high inflation results in distorted relative prices, thereby leading to an inefficient allocation of resources (Woodford, 2003). And high inflation distorts the financial sector as firms and households demand greater protection from inflation's erosion of the value of cash holdings (English, 1999).

The second principle is the lack of a long-run tradeoff between unemployment and the inflation rate. Rather, the long-run Phillips curve is vertical, implying that the economy gravitates to some natural rate of unemployment in the long run no matter what the rate of inflation is (Friedman, 1968; Phelps, 1968).³ The natural rate, in turn, is determined by the structure of labor and product markets, including elements such as the ease with which people who lose their jobs can find new employment and the pace at which technological progress creates new industries and occupations while shrinking or eliminating others. Importantly, those structural features of the economy are outside the control of monetary policy. As a result, any attempt by a central bank to keep unemployment below the natural rate would prove fruitless. Such a strategy would only

³ The deleterious effects of inflation on economic efficiency imply that the level of sustainable employment may even be higher at lower rates of inflation. Thus, the goals of price stability and high employment are likely to be complementary, rather than competing, and so there is no policy tradeoff between the goals of price stability and maximum sustainable employment. A further possibility is that low inflation may even help increase the rate of economic growth. Although time-series studies of individual countries and cross-national comparisons of growth rates are not in total agreement (Anderson and Gruen, 1995), the consensus has developed that inflation is detrimental to economic growth, particularly when inflation rates are high.

lead to higher inflation that, as the first principle suggests, would lower economic activity and household welfare in the long run.

Empirical evidence has starkly demonstrated the adverse effects of high inflation (e.g., see the surveys in Fischer, 1993, and Anderson and Gruen, 1995). In most industrialized countries, the late 1960s to early 1980s was a period during which inflation rose to high levels while economic activity stagnated. While many factors contributed to the improved economic performance of recent decades, policymakers' focus on low and stable inflation was likely an important factor.⁴

The Short Run

Although there is no long-run tradeoff between unemployment and inflation, in the short run, expansionary monetary policy that raises inflation *can* lower unemployment and raise employment. That is, the short-run Phillips curve is *not* vertical. That fact would seem to suggest that achieving the dual goals of price stability and maximum sustainable employment might at times conflict. However, several lines of research provide support for the view that stabilization of inflation and economic activity can be complementary rather than in conflict.

Economists have long recognized that some sources of economic fluctuations imply that output stability and inflation stability are mutually reinforcing. Consider a negative shock to aggregate demand (such as a decline in consumer confidence) that causes households to cut spending. The drop in demand leads, in turn, to a decline in

⁴ Cogley and Sargent (2001, 2005), Boivin and Giannoni (2006), and Kiley (2007a) provide evidence that monetary policy that stabilized inflation played an important role in stabilizing real activity. However, Primiceri (2005) and Sims and Zha (2006) argue that “good luck” from a reduction in the volatility of shocks was more important in stabilizing output.

actual output relative to its potential—that is, the level of output that the economy can produce at the maximum sustainable level of employment. As a result of increased slack in the economy, future inflation will fall below levels consistent with price stability, and the central bank will pursue an expansionary policy to keep inflation from falling. The expansionary policy will then result in an increase in demand that boosts output toward its potential to return inflation to a level consistent with price stability. Stabilizing output thus stabilizes inflation and vice versa under these conditions.

For example, the Federal Reserve reduced its target for the federal funds rate a total of 5-1/2 percentage points during the 2001 recession; that stimulus not only contributed to economic recovery but also helped to avoid an unwelcome decline in inflation below its already low level. At other times, a tightening of the stance of monetary policy has prevented the economy from overheating and generating a boom-bust cycle in the level of employment as well as an undesirable upward spurt of inflation.

One critical precondition for effective central-bank easing in response to adverse demand shocks is anchored long-run inflation expectations. Otherwise, lowering short-term interest rates could raise inflation expectations, which might lead to higher, rather than lower, long-term interest rates, thereby depriving monetary policy of one of its key transmission channels for stimulating the economy. The role of expectations illustrates two additional basic principles of monetary policy that help explain why stabilizing inflation helps stabilize economic activity: First, expectations of future policy actions and accompanying economic conditions play a crucial role in determining the effects of current policy actions on the economy. Second, monetary policy is most effective when the central bank is firmly committed, through its actions and statements, to a “nominal

anchor”—such as to keeping inflation low and stable. A strong commitment to stabilizing inflation helps anchor inflation expectations so that a central bank will not have to worry that expansionary policy to counter a negative demand shock will lead to a sharp rise in expected inflation—a so-called inflation scare (Goodfriend, 1993, 2005). Such a scare would not only blunt the effects of lower short-term interest rates on real activity but would also push up actual inflation in the future. Thus, a strong commitment to a nominal anchor enables a central bank to react more aggressively to negative demand shocks and, therefore, to prevent rapid declines in employment or output.

Unlike demand shocks, which drive inflation and economic activity in the same direction and thus present policymakers with a clear signal for how to adjust policy, supply shocks, such as the increases in the price of energy that we have been experiencing lately, drive inflation and output in opposite directions. In this case, because tightening monetary policy to reduce inflation can lead to lower output, the goal of stabilizing inflation might conflict with the goal of stabilizing economic activity.

Here again, a strong, previously established commitment to stabilizing inflation can help stabilize economic activity, because supply shocks, such as a rise in relative energy prices, are likely to have only a temporary effect on inflation in such circumstances. When inflation expectations are well anchored, the central bank does not necessarily need to raise interest rates aggressively to keep inflation under control following an aggregate supply shock. Hence, the commitment to price stability can help avoid imposing unnecessary hardship on workers and the economy more broadly.

The experience of recent decades supports the view that a substantial conflict between stabilizing inflation and stabilizing output in response to supply shocks does not

arise if inflation expectations are well anchored. The oil shocks in the 1970s caused large increases in inflation not only through their direct effects on household energy prices but also through their “second round” effects on the prices of other goods that reflected, in part, expectations of higher future inflation. Sharp economic downturns followed, driven partly by restrictive monetary policy actions taken in response to the inflation outbreaks. In contrast, the run-up in energy prices since 2003 has had only modest effects on inflation for other goods; as a result, monetary policy has been able to avoid responding precipitously to higher oil prices. More generally, the period from the mid-1960s to the early 1980s was one of relatively high and volatile inflation; at the same time, real activity was very volatile. Since the early 1980s, central banks have put greater weight on achieving low and stable inflation, while during the same period, real activity stabilized appreciably. Many factors were likely at work, but this experience suggests that inflation stabilization does not have to come at the cost of greater volatility of real activity; in fact, it suggests that, by anchoring inflation expectations, low and stable inflation is an important precondition for macroeconomic stability.

Research over the past decade using so-called New Keynesian models has added further support to the proposition that inflation stabilization may contribute to stabilizing employment and output at their maximum sustainable levels. This research has also led to a deeper understanding of the benefits of price stability and the setting of monetary policy in response to changes in economic activity and inflation.

In particular, research has emphasized the interaction between stabilizing inflation and economic activity and has found that price stability can contribute to overall economic stability in a range of circumstances. The intuition that leads to the conclusion

that stabilizing inflation promotes maximum sustainable output and employment is simple, and it holds in a range of economic models whose policy prescriptions have been dubbed the New Neoclassical Synthesis. To begin, the prices of many goods and services adjust infrequently. Accordingly, under general price inflation, the prices of some goods and services are changing while other prices do not, thus distorting *relative* prices between different goods and services. As a consequence, the profitability of producing the various goods and services no longer reflects the relative social costs of producing them, which in turn yields an inefficient allocation of resources. A policy of price stability minimizes those inefficiencies (Goodfriend and King, 1997; Rotemberg and Woodford, 1997; Woodford, 2003).

There are several subtleties here. First, in some circumstance, relative prices *should* change. For example, the rapid technological advances in the production of information-technology goods witnessed over the past decades mean that the prices of these goods relative to other goods and services should decline, because fewer economic resources are required for their production. Conversely, shifts in the balance between global demand for, and supply of, oil require that relative prices change to achieve an appropriate reallocation of resources—in this case, the reduced use of expensive energy. Thus, the policy prescription from the New Neoclassical synthesis refers to stability of the price level as a whole, not to the stability of each individual price.

Second, the New Neoclassical Synthesis suggests that only those prices that move sluggishly, referred to as sticky prices, should be stabilized. Indeed, these models indicate that monetary policy should try to get the economy to operate at the same level that would prevail if all prices were flexible—that is, at the so-called natural rate of

output or employment. Stabilizing sticky prices helps the economy get close to the theoretical flexible-price equilibrium because it keeps sticky prices from moving away from their appropriate relative level while flexible prices are adjusting to their own appropriate relative level. The New Neoclassical Synthesis, therefore, does not suggest that headline inflation, in which the weight on flexible prices is larger, should be stabilized. For example, to the extent that households directly consume energy goods with flexible prices, such as gasoline, headline inflation should be allowed to increase in response to an oil price shock. At the same time, insofar as energy enters as an input in the production of goods whose prices are sticky, stabilizing the level of sticky prices would require that the increase in energy-intensive goods prices be offset by declines in the prices of other goods.

That reasoning suggests that better outcomes in terms of stabilizing output and employment would come from monetary policy which focuses on stabilizing a measure of “core” inflation, which is made up mostly of sticky prices. Simulations with FRB/US, the model of the U.S. economy created and maintained by the staff of the Federal Reserve Board (Mishkin, 2007b), illustrate this point. To keep the simulations as simple as possible, I have assumed that the economy begins at full employment with both headline and core inflation at desired levels. The economy is then assumed to experience a shock that raises the world price of oil about \$30 per barrel over two years; the shock is assumed to slowly dissipate thereafter. In each of two scenarios, a Taylor rule is assumed to govern the response of the federal funds rate; the only difference between the two scenarios is that in one, the federal funds rate responds to core personal consumption

expenditures (PCE) inflation, whereas in the other, it responds to headline PCE inflation.⁵ Figure 1 illustrates the results of those two scenarios. The federal funds rate jumps higher and faster when the central bank responds to headline inflation rather than to core inflation, as would be expected (top-left panel). Likewise, responding to headline inflation pushes the unemployment rate markedly higher than otherwise in the early going (top-right panel), and produces an inflation rate that is slightly lower than otherwise, whether measured by core or headline indexes (bottom panels). More important, even for a shock as persistent as this one, the policy response under headline inflation has to be unwound in the sense that the federal funds rate must drop substantially below baseline once the first-round effects of the shock drop out of the inflation data.⁶

The basic point from these simulations is that monetary policy that responds to headline inflation rather than to core inflation in response to an oil price shock pushes unemployment markedly higher than monetary policy that responds to core inflation. In addition, because this policy has larger swings in the federal funds rate that must be reversed, it leads to more pronounced swings in unemployment. On the other hand, monetary policy that responds to core inflation does not lead to appreciably worse performance on stabilizing inflation than does monetary policy that responds to headline

⁵ The Taylor rule is written as follows: $R = r^* + \tilde{\pi} + (\tilde{\pi} - \pi^*) + y$, where R is the nominal policy rate; r^* is the equilibrium real short-term rate; $\tilde{\pi}$ is the four-quarter inflation rate, either core or headline; π^* is the inflation target, taken to be the baseline inflation rate; and y is the output gap. Under that specification, the response coefficient on each gap variable is 1.

⁶ The scenarios were constructed with a rule that assumes no knowledge of how long the oil price shock will last. Research done by the staff of the Federal Reserve Board using other types of models also suggests that when the persistence of shocks is uncertain, the use of core inflation rather than headline inflation in central-bank reaction functions can improve policy outcomes (Bodenstein, Erceg, and Guerrieri, 2007).

inflation. Stabilizing core inflation, therefore, leads to better economic outcomes than stabilizing headline inflation.

Although the simplest sticky-price models imply that stabilizing sticky-price inflation and economic activity are two sides of the same coin, the presence of other frictions besides sticky prices can lead to instances in which completely stabilizing sticky-price inflation would not imply stabilizing employment (or output) around their natural rates. For example, in response to an increase in productivity (a positive technology shock), the real wage has to rise to reflect the higher marginal product of labor inputs, which requires either prices to fall or nominal wages to rise for employment to reach its natural rate. If both nominal wages and prices are sticky, a policy of completely stabilizing prices will force the necessary real wage adjustment to occur entirely through nominal wage adjustment, thereby impeding the adjustment of employment to its efficient level (Blanchard, 1997; Erceg, Henderson, and Levin, 2000). Indeed, if wages are much stickier than prices, the best strategy to promote stable output and employment is to stabilize nominal wage inflation rather than price inflation, thereby allowing price inflation to decline to achieve the required increase in real wages.

Fluctuations in inflation and economic activity induced by variation over time in sources of economic inefficiency, such as changes in the markups in goods and labor markets or inefficiencies in labor market search, could also drive a wedge between the goals of stabilizing inflation and economic activity (Blanchard and Galí, 2006; Galí, Gertler, and López-Salido, 2007). For example, in sectors of the economy subject to little competitive pressure, prices that firms set tend to be higher and output lower than would prevail under greater competition. Monetary policy is, of course, unable to offset

permanently high markups because of the principle, mentioned earlier, that the long-run Phillips curve is vertical. However, a temporary increase in monopoly power that raises markups would exert upward pressure on prices without, at the same time, reducing the productive potential of the economy. That would, indeed, be a case of a tradeoff between stabilizing inflation and stabilizing output.

These examples narrow the degree to which the recent findings apply in all cases of congruence between stabilizing inflation and economic activity (sometimes referred to as the “divine coincidence”, Blanchard, 2005), but they do not necessarily overturn the findings. The example of sticky wages would not invalidate the view that stabilizing inflation stabilizes economic activity if wages are sticky, for example, because they are held constant in order to operate as an “insurance” contract between employers and workers (Goodfriend and King, 2001). And for many of the inefficient shocks that drive a wedge between the sustainable level of output and the level of output associated with price stability, monetary policy may be the wrong tool to offset their effects (Blanchard, 2005).

Of course, central banks at times will still face difficult decisions regarding the short-run tradeoff between stabilizing inflation and output. For example, judging from the fit of New Keynesian Phillips curves, a substantial fraction of overall inflation variability seems related to supply-type shocks that create a tradeoff between inflation and output-gap stabilization (Kiley, 2007b). But the key insight from recent research—that the interaction between inflation fluctuations and relative price distortions should lead to a focus on the stability of nominal prices that adjust sluggishly—will likely prove

to have important practical implications that can help contribute to inflation and employment stabilization.

Stabilizing Inflation as a Robust Policy in the Presence of Uncertainty

The discussion so far has been based on the premise that the central bank knows the efficient, or natural, rate of output or employment. However, the natural rates of employment and output *cannot* be directly observed and are subject to considerable uncertainty—particularly in real time. Indeed, economists do not even agree on the economic theory or econometric methods that should be used to measure those rates. These concerns are perhaps even more severe in the most recent models, where fluctuations in natural rates of output or employment can be very substantial (for example, Rotemberg and Woodford, 1997; Edge, Kiley, and Laforde, forthcoming). Furthermore, because the natural rates in the most recent models are defined as the counterfactual levels of output and employment that would be obtained if prices and wages were completely flexible, the estimated fluctuations in natural rates generated by the research are very sensitive to model specification.

If a central bank errs in measuring the natural rates of output and employment, its attempts to stabilize economic activity at those mismeasured natural rates can lead to very poor outcomes. For example, most economists now agree that the natural unemployment rate shifted up for many years starting in the late 1960s and that the growth of potential output shifted down for a considerable time after 1970. However, perhaps because those shifts were not generally recognized until much later (Orphanides and van Norden, 2002; Orphanides, 2003), monetary policy in the 1970s seems to have

been aimed at achieving *unsustainable* levels of output and employment. Hence, policymakers may have unwittingly contributed to accelerating inflation that reached double digits by the end of the decade as well as undesirable swings in unemployment. And although subsequent monetary policy tightening was successful in regaining control of inflation, the toll was a severe recession in 1981-82, which pushed up the unemployment rate to around 10 percent.

Uncertainty about the natural rates of economic activity implies that less weight may need to be put on stabilizing output or employment around what is likely to be a mismeasured natural rate (Orphanides and Williams, 2002). Furthermore, research with New Keynesian models has found that overall economic performance may be most efficiently achieved by policies with a heavy focus on stabilizing inflation (for example, Schmitt-Grohé and Uribe, 2007).

Conclusion

Because monetary policy has not one but two objectives, stabilizing inflation and stabilizing economic activity, it might seem obvious that those objectives would usually, if not always, conflict. As so often occurs with the “obvious,” however, the impression turns out to be incorrect. The economic research that I have discussed today demonstrates, rather, that the objectives of price stability and stabilizing economic activity are often likely to be mutually reinforcing. Thus, the answer to the title of this paper—“Does stabilizing inflation contribute to stabilizing economic activity?”—is, for the most part, yes.

References

- Anderson, Palle, and David Gruen (1995). "Macroeconomic Policies and Growth," in Palle Anderson, Jacqueline Dwyer, and David Gruen, eds., *Productivity and Growth: Proceedings of a Conference held at the H.C. Coombs Centre for Financial Studies, Kirribilli, Australia, July 10-11*. Sydney: Reserve Bank of Australia, pp. 279-319.
- Blanchard, Olivier (1997). "Comment on 'The New Neoclassical Synthesis and the Role of Monetary Policy,'" in Ben S. Bernanke and Julio J. Rotemberg, eds., *NBER Macroeconomics Annual*, vol. 12. Cambridge, Mass.: MIT Press, pp. 289-93.
- Blanchard, Olivier (2005). "Comment on 'Inflation Targeting in Transition Economies: Experience and Prospects,'" in Ben S. Bernanke and Michael Woodford, eds., *The Inflation-Targeting Debate*. Chicago: University of Chicago Press, pp. 413-21.
- Blanchard, Olivier, and Jordi Galí (2006). "A New Keynesian Model with Unemployment," unpublished paper, Universitat Pompeu Fabra.
- Bodenstein, Martin, Christopher Erceg, and Luca Guerrieri (2007). "Optimal Monetary Policy in a Model with Distinct Core and Headline Inflation Rates," unpublished paper, Board of Governors of the Federal Reserve System.
- Boivin, Jean, and Marc P. Giannoni (2006). "Has Monetary Policy Become More Effective?" *Review of Economics and Statistics*, vol. 88 (August), pp. 445-62.
- Briault, Clive (1995). "The Costs of Inflation," *Bank of England Quarterly Bulletin*, vol. 35 (February), pp. 33-45.
- Cogley, Timothy, and Thomas J. Sargent (2001). "Evolving Post-World War II U.S. Inflation Dynamics," in Ben S. Bernanke and Kenneth Rogoff, eds., *NBER Macroeconomics Annual*, vol. 16. Cambridge, Mass.: MIT Press, pp. 331-73.
- Cogley, Timothy, and Thomas J. Sargent (2005). "Drifts and Volatilities: Monetary Policies and Outcomes in the Post WWII US," *Review of Economic Dynamics*, vol. 8 (April, Monetary Policy and Learning), pp. 262-302.
- Edge, Rochelle M., Michael T. Kiley, and Jean-Philippe Laforte (forthcoming). "Natural Rate Measures in an Estimated DSGE Model of the U.S. Economy," *Journal of Economic Dynamics and Control*.
- Erceg, Christopher J., Dale W. Henderson, and Andrew T. Levin (2000). "Optimal Monetary Policy with Staggered Wage and Price Contracts," *Journal of Monetary Economics*, vol. 46 (October), pp. 281-313.
- English, William B. (1999). "Inflation and Financial Sector Size," *Journal of Monetary Economics*, vol. 44 (December), pp. 379-400.

Feldstein, Martin (1997). "The Costs and Benefits of Going from Low Inflation to Price Stability," in Christina D. Romer and David H. Romer, eds., *Reducing Inflation: Motivation and Strategy*. Chicago: University of Chicago Press, pp. 123-66.

Fischer, Stanley (1993). "The Role of Macroeconomic Factors in Growth," *Journal of Monetary Economics*, vol. 32 (December), pp. 485-512.

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

Galí, Jordi, Mark Gertler, and J. David López-Salido (2007). "Markups, Gaps, and the Welfare Costs of Business Fluctuations," *Review of Economics and Statistics*, vol. 89 (February), pp. 44-59.

Goodfriend, Marvin (1993). "Interest Rate Policy and the Inflation Scare Problem: 1979-1992," Federal Reserve Bank of Richmond, *Economic Quarterly*, vol. 79 (Winter), pp. 1-23.

Goodfriend, Marvin (2005). "Inflation Targeting in the United States?" in Ben S. Bernanke and Michael Woodford, eds., *The Inflation-Targeting Debate*. Chicago: University of Chicago Press, pp. 311-37.

Goodfriend, Marvin, and Robert G. King (1997). "The New Neoclassical Synthesis and the Role of Monetary Policy," in Ben S. Bernanke and Julio J. Rotemberg, eds., *NBER Macroeconomics Annual*, vol. 12. Cambridge, Mass.: MIT Press, pp. 231-83.

Goodfriend, Marvin, and Robert G. King (2001). "The Case for Price Stability," in A. Garcia-Herrero, V. Gaspar, L. Hoogduin, J. Morgan, and B. Winkler, eds., *Why Price Stability? Proceedings of the First ECB Central Banking Conference*. Frankfurt: European Central Bank, pp. 53-94.

Kiley, Michael T. (2007a). "Is Moderate-to-High Inflation Inherently Unstable?" *International Journal of Central Banking*, vol. 3 (June), pp. 173-201.

Kiley, Michael T. (2007b). "A Quantitative Comparison of Sticky-Price and Sticky-Information Models of Price Setting," *Journal of Money, Credit and Banking*, vol. 39 (February, S1), pp. 101-25.

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

Mishkin, Frederic S. (2007a). "Monetary Policy and the Dual Mandate," speech delivered at Bridgewater College, Bridgewater, Va., April 10, www.federalreserve.gov/newsevents/speech/mishkin20070410a.htm.

Mishkin, Frederic S. (2007b). “Headline versus Core Inflation in the Conduct of Monetary Policy,” speech delivered at the Business Cycles, International Transmission and Macroeconomic Policies Conference, HEC Montreal, Montreal, October 20, www.federalreserve.gov/newsevents/speech/mishkin20071020a.htm.

Mishkin, Frederic S. (2007c). “Will Monetary Policy Become More of a Science?” Finance and Economics Discussion Series 2007-44. Washington: Board of Governors of the Federal Reserve System, September, www.federalreserve.gov/pubs/feds/2007/index.html.

Orphanides, Athanasios (2003). “Monetary Policy Evaluation with Noisy Information,” *Journal of Monetary Economics*, vol. 50 (April, Swiss National Bank/Study Center Gerzensee Conference on Monetary Policy under Incomplete Information), pp. 605-31.

Orphanides, Athanasios, and Simon van Norden (2002). “The Unreliability of Output-Gap Estimates in Real Time,” *Review of Economics and Statistics*, vol. 84 (November), pp. 569-83.

Orphanides, Athanasios, and John C. Williams (2002). “Robust Monetary Policy Rules with Unknown Natural Rates,” *Brookings Papers on Economic Activity*, vol. 2002 (December), pp. 63-145.

Phelps, Edmund S. (1968). “Money-Wage Dynamics and Labor-Market Equilibrium,” *Journal of Political Economy*, vol. 76 (July/August, Part 2), pp. 678-711.

Primiceri, Giorgio (2005). “Time Varying Structural Vector Autoregressions and Monetary Policy,” *Review of Economic Studies*, vol. 72 (July), pp. 821-52.

Rotemberg, Julio J., and Michael Woodford (1997). “An Optimization-Based Econometric Framework for the Evaluation of Monetary Policy,” in Ben S. Bernanke and Julio J. Rotemberg, eds., *NBER Macroeconomics Annual*, vol. 12. Cambridge, Mass.: MIT Press, pp. 297-346.

Schmitt-Grohé, Stephanie, and Martín Uribe (2007). “Optimal Simple and Implementable Monetary and Fiscal Rules,” *Journal of Monetary Economics*, vol. 54 (September), pp. 1702-25.

Shafir, Eldar, Peter Diamond, and Amos Tversky (1997). “Money Illusion,” *Quarterly Journal of Economics*, vol. 112 (May), pp. 341-74.

Sims, Christopher A., and Tao Zha (2006). “Were There Regime Switches in U.S. Monetary Policy?” *American Economic Review*, vol. 96 (March), pp. 54-81.

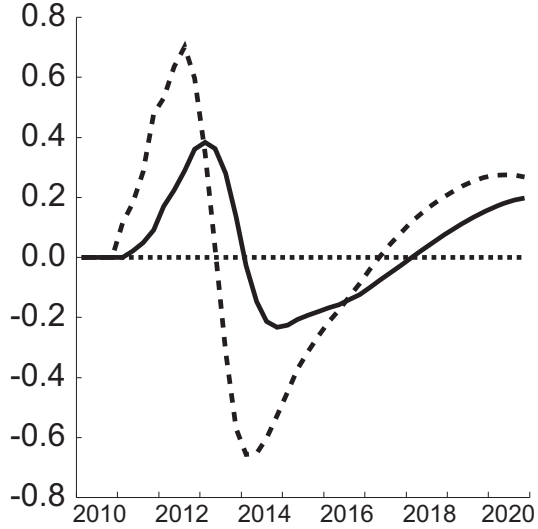
Woodford, Michael (2003). *Interest and Prices: Foundations of a Theory of Monetary Policy*. Princeton: Princeton University Press.

Figure 1

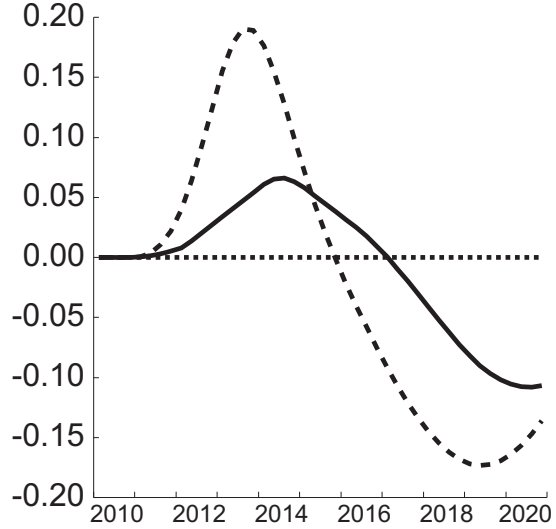
Implications of Responding to Core versus Headline PCE Inflation
 (Persistent oil price shock with the FRB/US Model, levels relative to baseline)

— Taylor rule with core inflation - - - Taylor rule with headline inflation

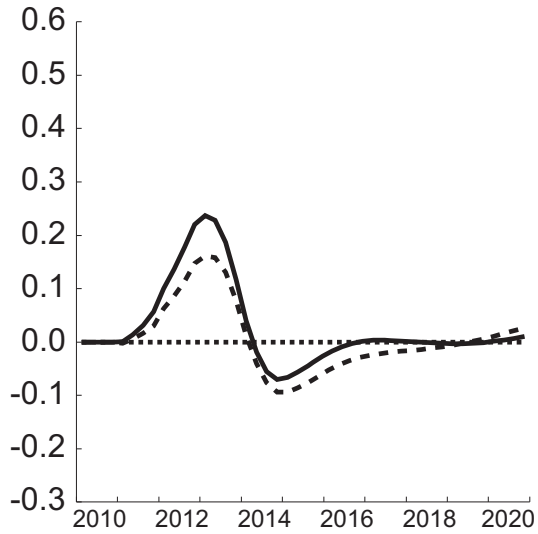
Federal funds rate (quarterly average)



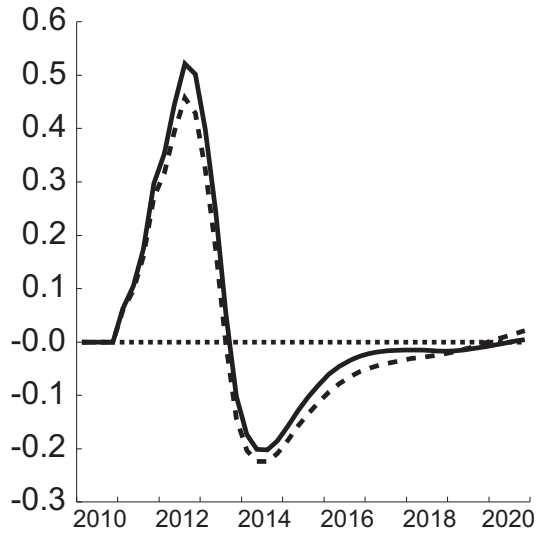
Civilian unemployment rate



Core PCE inflation (4-quarter rate)



Headline PCE inflation (4-quarter rate)



Note: Headline PCE inflation is the change in the price index for personal consumption expenditures (PCE).
 Core PCE inflation is the change in the price index for PCE excluding food and energy.