

Will the Fed Nix Inflation in Time?

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Inflation, potentially rapid inflation, is knocking on the door. Will the Federal Reserve let it in? That is the great looming and unanswered question for United States monetary policy in 2010 and beyond.

Having suffered a deep recession and barely averted a thorough and crushing collapse of the global financial system, the U.S. economy continues to underperform badly: Capacity utilization is down about 10 percent, and the unemployment rate, hovering around 10 percent, is expected to remain elevated for years. Consequently, credible though waning residual concerns about near-term deflation persist.

Against this background of economic weakness, inflation may appear an odd concern, but it is not. Inflation is always and ultimately a monetary phenomenon. At some point, inflation's potential, created by past monetary policy, will be realized regardless of the state of the economy, either through offsetting policies or through a revival of potentially rapid inflation.

The actions of central banks around the world, and most especially the Federal Reserve, successfully stabilized the financial system in part through massive injections of reserves into the credit system. These reserves, which largely sit apparently idle on central bank balance sheets, assure financial institutions they have the liquidity needed in a highly stressed financial environment. These reserves, now totaling over \$1 trillion, present the risk of rapid inflation if they are released too quickly into credit markets.

The inflation threat must be met before inflation becomes a reality through a difficult and judicious unwinding of the monetary stimulus applied since early in 2008—part of the Fed's so-called exit strategy. The policy question ultimately is in two parts. First, does the Fed have the tools for the task? As argued elsewhere and discussed briefly below, the answer is a tentative affirmative.¹ The second part of the policy question is whether the Fed will judge wisely both in using the tools and with respect to the consequences of failure.

Even aside from issues surrounding excess reserves, there is the more traditional question of whether the Fed will remove its ongoing support for the economy appropriately. Raising the Federal funds rate precipitously would undermine the recovery, while untoward delay would trigger a new rash of inflation concerns. History suggests the Fed was tardy in raising the funds rate following the recession at the start of the decade, and remarks from Fed officials as to their current plans are disconcerting.

Fed officials, and most especially Chairman Ben Bernanke, have repeatedly affirmed their determination to respond to building inflation and inflation expectations should they arise. However, the complexity of the task and the uniqueness of the circumstances naturally raise concerns. An even greater concern, and the main subject of

¹ See J. D. Foster, "Is the Inflation Threat Real? Is It Imminent?" Heritage Foundation *Background* No. 2371, February 22, 2010, at <http://www.heritage.org/Research/Economy/bg2371.cfm>.

this paper, is an apparent misconception on the part of monetary policymakers involving an excessive faith in the capacity of the weak economy to restrain inflationary pressures.

This misplaced faith in the persistent effects of high unemployment is explicit in a commonly referenced policy rule—the Taylor Rule—which may guide monetary policy faithfully under normal circumstances. However, present conditions are fundamentally, even radically, different from those in which the Rule typically operates. Under the circumstances, the classic Taylor Rule may misguide monetary policy in ways that can be anticipated in advance.

Whether Fed officials are explicitly relying on the Taylor Rule or not, the Rule nevertheless demonstrates clearly the dangers of forgetting the basic lesson that inflation is a monetary phenomenon ultimately indifferent to the state of the economy. Whatever their prior beliefs or preferred theories, the Fed must move toward a more neutral policy preemptively to head off inflationary pressures, which likely means moving sooner than it would prefer and sooner than current Fed comments imply. The Fed needs to be as swift and decisive in preventing inflationary pressures as it ultimately proved to be in responding to the recent financial crisis.

Inflation as Monetary Phenomenon

Price stability has long been recognized as important to prosperity. In the modern era, price stability has been replaced as a policy goal by a close cousin: low, stable, and predictable inflation. The point in either event is to ensure general price movements of goods and services are not a material factor in economic decision-making. Low inflation means individuals and businesses need spend little time or resources protecting against rapid price movements.²

The stability of the rate of inflation is likewise important. When market participants confidently anticipate the overall rate of inflation, they can more readily interpret relative price movements. A stable inflation rate also means market participants face one less fundamental uncertainty weighing on their various economic decisions. Low inflation is also more likely to be stable, whereas high inflation tends to vary significantly and rapidly over time.³

As is now understood, “inflation is always and everywhere a monetary phenomenon.”⁴ Inflation ultimately results from too much money chasing too few goods, and in this sense, the money in circulation is like any other good or service exchanged in the economy. If supply of a particular good outstrips demand, then the price of the good

² With respect to economic growth, low inflation may even be superior to perfect price stability because nominal prices typically resist downward movements; i.e., they are “sticky” downward over some period of time. If inflation is low, then a nominal price that needs to decline in real terms relative to the prices of other goods and services can do so simply by holding steady or rising more slowly than the general price level.

³ For an interesting discussion of the benefits of low inflation, see B. O’Reilly, “The Benefits of Low Inflation: Taking Stock,” Bank of Canada, April 1998, at <http://www.bankofcanada.ca/en/res/tr/1998/tr83.pdf>.

⁴ See Milton Friedman and Anna Jacobson Schwartz, *A Monetary History of the United States, 1867–1960* (Princeton, N.J.: Princeton University Press, 1963).

falls relative to everything else or, put another way, the price of everything else rises relative to the particular good. The price of everything else rising relative to a dollar is just another definition of inflation.

The relationship between money creation and the price level is clear in the long run but varies greatly in the short run. At certain times, even a hint that the Federal Reserve may waver in preserving low and stable inflation is enough to cause inflation and inflation expectations to rise. In contrast, the Fed has been able to pump enormous quantities of liquidity or “money” into credit markets in recent months without triggering even a modest near-term uptick in inflation.

The Source of the Immediate Inflation Threat

In the course of the recent financial crisis, the Federal Reserve responded through traditional means such as lowering the Fed funds rate (the rate banks charge each other in the United States for overnight lending) and the discount window rate (the rate the Fed charges banks when it lends to banks to help them preserve a prudent level of reserves). The Fed began to lower the funds rate in late June 2006 when it first took the rate from 5.25 percent to 5.00 percent and continued to lower the funds rate until it effectively reached a zero rate in December 2008. Over a similar period, the discount rate dropped from 6 percent to about zero.

The Fed adopted a great many other, novel programs during the crisis to provide liquidity to specific firms and specific credit markets, including the purchases of vast quantities of mostly high-quality debt instruments.⁵ These actions produced a massive expansion of excess reserves held by various financial institutions at the Fed.

Banks are required to keep a certain amount of reserves at the Fed based on the amount of their deposits. In 2007, for example, banks’ required reserves averaged about \$41 billion. Traditionally, banks would keep a modest amount of excess reserves on deposit at the Fed to avoid penalties that arise if their total deposits fall below the level of their required reserves. In 2007, banks’ excess reserves averaged about \$1.8 billion. By January 2010, excess reserves held at the Fed exceeded \$1 trillion.⁶

As long as banks are content to leave excess reserves at the Fed, the inflation threat is checked. However, once a bank withdraws reserves from the Fed, it enters the credit-creation process, leading to a multiple expansion of the money supply through the fractional banking system.⁷ In practice, this means a small amount of reserves eventually

⁵ For a discussion of the actions taken by the Fed, see Foster, “Is the Inflation Threat Real? Is It Imminent?” as well as Andrew Ross Sorking, *Too Big To Fail* (New York: Viking, 2009).

⁶ See Federal Reserve Statistical Release, Aggregate Reserves of Depository Institutions and the Monetary Base, H.3, November 12, 2009, at <http://www.federalreserve.gov/releases/H3/Current/>.

⁷ A bank will hold a fraction of its deposits as reserves and lend out the balance. When the borrower then spends the money, it becomes deposits in other financial institutions which, in turn, retain a portion as reserves and lend out the balance. This process continues on, at each stage creating a further expansion of the money supply from an initial expansion of the money base. The process does not continue indefinitely, creating an unlimited amount of money, because of the portion of each deposit held as a reserve.

becomes a large amount of money in the financial system.⁸ For example, the narrowest measure of the money supply, the money base comprising currency plus commercial bank reserves held at the Fed, averaged about \$1 trillion in 2008. Add in checkable deposits, savings accounts, money market funds, and the like and a common broad measure of the money supply reached almost \$8.7 trillion on average in 2008.

The simple expression of inflation is “too much money chasing too few goods.” If \$1 trillion of excess reserves were released quickly into the financial system, soon to become a multiple of that amount of money in circulation, then there would be far too much money chasing goods, and inflation would soar. As financial markets heal, banks will increasingly seek to draw down their balances of excess reserves held at the Fed in pursuit of greater profits by making private-sector loans.

The Fed’s task is to control the release of these reserves to prevent an excessive outflow that could trigger a bout of inflation. As discussed briefly below, and at greater length elsewhere,⁹ the Fed appears to have the tools for the task. The greater outstanding question discussed in the latter sections of this paper is whether it has the judgment to use those tools wisely.

Controlling Excess Reserves

Helping to control the outflow of excess reserves and, thus, the inflation threat is a tool recently granted to the Fed by the Congress. In the Financial Services Regulatory Relief Act of 2006, the Fed was given the authority to pay interest on excess reserves. The Fed currently pays a minimal one-quarter of a percent. Suppose, however, a bank with a deposit of excess reserves at the Fed wanted to withdraw those reserves to pursue more lucrative lending opportunities. If the Fed wants to resist the withdrawal and the monetary expansion that would follow, all the Fed need do in theory is to raise the interest rate it pays on reserves sufficiently, and the bank would be content to forego the lending and earn safe interest at the Fed.

The ability to pay interest on excess reserves is as powerful as it is simple. In theory, the Fed should be able to control the rate at which excess reserves are withdrawn and applied to credit markets. This should be sufficient to allow the Fed’s more traditional tool of raising and lowering the Fed funds rate (in conjunction with changes in the discount rate) to influence the pace of credit creation and inflation.

Having the tools and the intention to use them is no guarantee of success. There remains the question of execution: Will the Fed successfully execute its exit strategy to allow economic recovery while effectively restraining inflation? Despite public assurances from Chairman Bernanke and his colleagues at the Fed, embedded in these

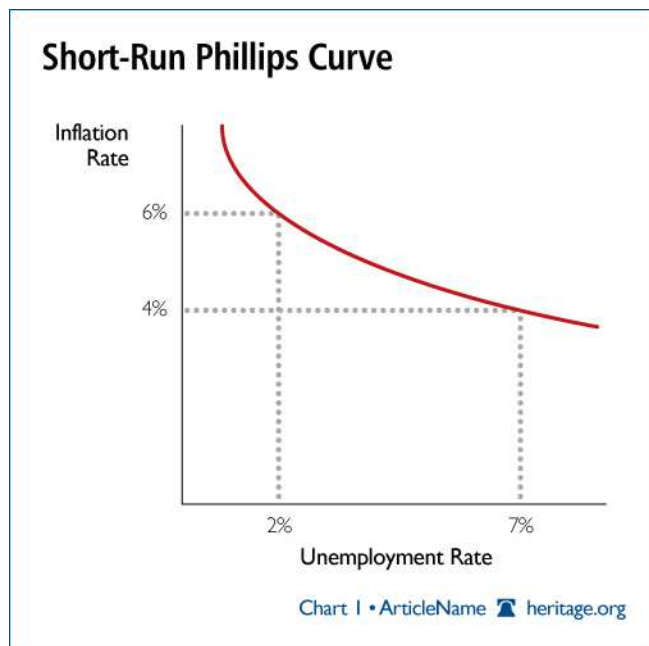
⁸ The term “money” is somewhat flexible because different kinds of financial instruments have different degrees of money-ness; i.e., the ability to be used in exchange for goods and services. For example, cash and coin and debit cards and checking accounts all have a very high degree of money-ness. Savings accounts are easily tapped for spending, but one must typically first transfer funds out of the account. Certificates of deposit have much less money-ness because there are penalties for early withdrawal, but they can still be readily tapped for cash if the need arises. .

⁹ See Foster, “Is the Inflation Threat Real? Is It Imminent?”

assurances is a clear suggestion the Fed may be significantly late in responding to building inflation pressures. A lesson from history illuminates the issue—perhaps too well.

An Inflation Lesson from a Dark Era

Many years ago, a proposition called the “Phillips Curve” was widely accepted by economists.¹⁰ The Phillips Curve suggested a stable relationship between inflation rates and unemployment rates, specifically that relatively high unemployment rates or excess capacity dampen inflationary pressures. Seeking to take advantage of this relationship, some economists counseled allowing inflation to increase a bit to obtain the benefits of lower unemployment. In the neighboring chart, for example, policymakers might well choose to accept a monetary policy that increases inflation from 4 percent to a relatively high 6 percent rate if the unemployment rate could be reduced from 7 percent to 2 percent in response.

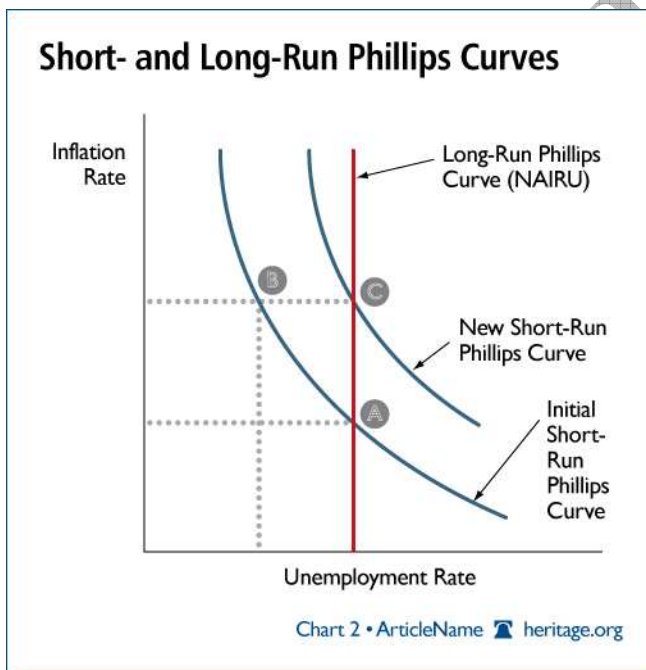


What ultimately transpired in the late 1960s and 1970s when policymakers accepted higher inflation rates in exchange for lower unemployment rates is both higher inflation and higher unemployment rates: stagflation. From the first quarter of 1970 to the first quarter of 1981, the unemployment rate rose from 4.2 percent to 7.4 percent, yet

¹⁰ See, for example, A. W. Phillips, “The Relationship Between Unemployment and the Rate of Change of Money Wages in the United Kingdom 1861–1957,” *Economica*, Vol. 25, No. 100 (1958), pp. 283–299; Richard Clarida, Jordi Galí, and Mark Gertler, “The Science of Monetary Policy: a New-Keynesian Perspective,” *Journal of Economic Literature*, Vol. 37, No. 4 (1999), pp. 1661–1707, at <http://www.nyu.edu/econ/user/gertler/science.pdf>, and Paul Samuelson, “Thoughts About the Phillips Curve,” FRBB Conference Series 53, June 3, 2008, at <http://www.bos.frb.org/economic/conf/conf53/papers/Samuelson.pdf>.

inflation nearly doubled from 5.5 percent to 10.3 percent. Higher inflation worked to reduce unemployment by surprising individuals and businesses, most especially by artificially lowering labor compensation costs after inflation. Real wages fell, and more labor was hired. Markets adapt quickly, however, and individuals and businesses soon came to expect higher inflation and thus neutralized any downward pressures on unemployment rates.

This experience gave rise to an understanding of a distinction between a possible concave short-term Phillips Curve relationship and a vertical long-run Phillips Curve at the long-run rate of unemployment. Policymakers might believe they can achieve lower unemployment with higher inflation, thus moving from point A to point B in the neighboring graph. But markets are not fooled indefinitely, so as they protect themselves from the distortions of higher inflation, the economy moves from point B to point C of higher inflation. Unemployment at the long-run rate of unemployment, which is determined by conditions specific to the labor market, is sometimes called the natural rate of unemployment or the Non-Accelerating Inflationary Rate of Unemployment (NAIRU).¹¹ Worse, relatively high inflation is itself inherently distorting and costly, so the long-run result is that the vertical Philips Curve shifts rightward so society reaps both higher unemployment and higher inflation.



Past episodes of relying on a Philips Curve–like process stressed the false promise of lower unemployment at the cost of slightly higher inflation. Today, many Fed officials

¹¹ Ironically, the expression for the NAIRU is misdefined. The issue is not whether inflation is accelerating, but whether the rate of inflation is increasing or, equivalently, the rate of increase in the price level is accelerating. In mathematical terms, we are interested in the second derivative of the price function, not the third, so the name should either be the Non-Increasing Inflation Rate of Unemployment (NIIRU) or the Non-Accelerating Price Level Unemployment Rate (NAPLUR).

appear to be focusing on the converse effect: the promise of lower inflation due to high unemployment. For example:

- “So we must begin to withdraw accommodation *well before aggregate spending threatens to press against potential supply* [italics added].” — Donald L. Kohn, Fed Vice-Chairman, September 2009¹²
- “In light of increasing economic slack here and abroad, the Committee expects that inflation will remain subdued.” — Federal Open Market Committee Statement, March 2009¹³
- “With substantial resource slack likely to continue to dampen cost pressures and with longer-term inflation expectations stable, the Committee expects that inflation will remain subdued.” — Federal Open Market Committee Statement, September 2009¹⁴

These comments parallel views expressed outside the Fed as well:

- “Despite upward pressure from recovering commodity prices, global inflation is expected to remain subdued through 2010, *held back by significant excess capacity*” [italics added]. — Dominique Strauss-Kahn, Managing Director, International Monetary Fund, July 2009¹⁵
- “With a subdued recovery and substantial excess capacity (across the OECD), inflation is expected to continue to fall well into 2010.” — OECD Economic Outlook, November 2009¹⁶

It may well be that excess capacity in the economy can dampen cost and price pressures for a period. However, it will not do so indefinitely, as the 1970s period of stagflation demonstrated painfully. If, and to the extent, the Fed is relying on excess capacity and stable longer-term inflation expectations to restrain the current inflation rate, then legitimate doubts arise as to the Fed’s judgment. Excess capacity is a fleeting source of restraint, while longer-term inflation expectations can shift overnight.

Policy Judgment and the Taylor Rule

Two common arguments trace to this focus on counter-inflationary effects of persistent excess capacity and high unemployment. The first is the belief that businesses and workers typically have a difficult time increasing prices and wages broadly when the

¹² See Donald L. Kohn, “Central Bank Exit Strategies,” September 30, 2009, at <http://www.federalreserve.gov/newsevents/speech/kohn20090930a.htm>.

¹³ See “Statement of the Federal Open Market Committee,” March, 18, 2009, at <http://www.federalreserve.gov/newsevents/press/monetary/20090318a.htm>.

¹⁴ See “Statement of the Federal Open Market Committee,” September 23, 2009, at <http://www.federalreserve.gov/newsevents/press/monetary/20090923a.htm>.

¹⁵ See Dominique Strauss-Kahn, “Contractionary Forces Receding But Weak Recovery Ahead,” World Economic Outlook Update, July 8, 2009, at <http://www.imf.org/external/pubs/ft/weo/2009/update/02/index.htm>.

¹⁶ See OECD Economic Outlook No. 86, November 2009, at http://www.oecd.org/document/18/0,3343,en_2649_33733_20347538_1_1_1_1,00.html.

economy is experiencing significant excess capacity and unemployment. This intuitively appealing notion may well be valid over certain periods of time. In effect, it suggests monetary policy *can be* relatively more stimulative during periods of excess capacity. However, as the period of stagflation in the United States during the 1970s painfully demonstrated, economic weakness cannot ward off inflationary pressures indefinitely.

The second argument is that when the economy is experiencing excess capacity and inflation remains at or below a target level, monetary policy *should be* relatively more stimulative through a lower Fed funds rate. This view is well-captured by the popular Taylor Rule for monetary policy. The Taylor Rule, which explicitly or implicitly guides central bank practice in much of the world, relies on excess inflation and excess capacity to prescribe the Fed funds rate. The Taylor Rule, or at least some of the principles it reflects, also appears to influence Fed policy to an extent based on public comments such as those described above referencing excess capacity.

The Taylor Rule can be written out as

$$R = i + r + a[y] + b[i - i^*]$$

where

R = the Federal funds rate

i = the current rate of inflation

i* = the target rate of inflation

r = the natural rate of interest

y = the output gap, or the difference between actual and potential output.¹⁷

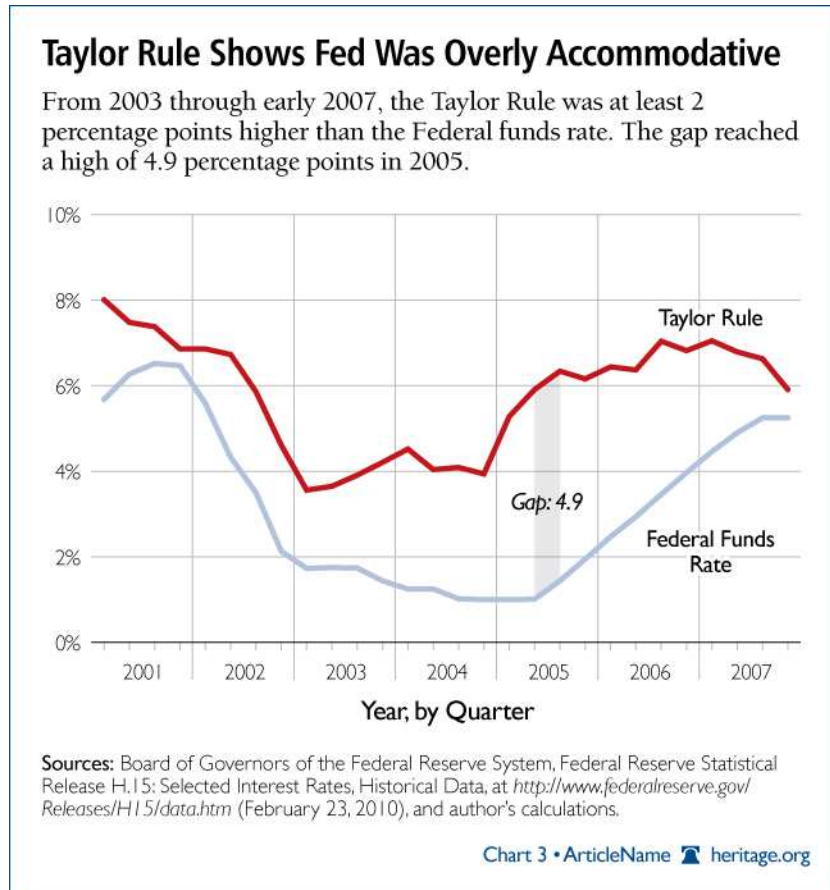
The intuition behind the Taylor Rule is straightforward. In equilibrium, with output at its potential (full employment) and inflation at its target rate, the Fed funds rate should be neutrally accommodative and set at the rate of inflation plus the natural rate of interest. Inflation above the target rate indicates a need for monetary tightening, so the Fed funds rate should be higher than its neutral rate, whereas if the economy is operating below its potential, the Fed funds rate should be lower.

The Taylor Rule has been used to argue that an overly accommodative monetary policy from 2003 to 2006 played a major role in contributing to the housing bubble and excessive reliance on debt generally that led to the financial collapse later in the decade.¹⁸ A brief review of this discussion is useful here as a precursor to the discussion to follow.

¹⁷ Following Orphanides and Williams, the natural rate of interest is defined here to be the real (inflation-adjusted) interest rate consistent with full employment and stable inflation. See Athanasios Orphanides and John C. Williams, "Robust Monetary Policy Rules with Unknown Natural Rates," December 2002, at <http://www.federalreserve.gov/Pubs/feds/2003/200311/200311pap.pdf>. Analogously, potential output is the level of output consistent with full employment and stable inflation. Following Taylor, for purposes of these calculations, the natural rate of interest is assumed to be 2 percent as is the target rate of inflation. See John B. Taylor and John C. Williams, "Simple and Robust Rules for Monetary Policy," Preliminary Draft for *Handbook of Monetary Economics*, October 2009, At <http://www.federalreserve.gov/Events/conferences/kdme2009/pdfs/Taylor%20Williams%20Policy%20Rule%2010-5-09.pdf>.

¹⁸ See John B. Taylor, *Getting Off Track: How Government Actions and Interventions Caused, Prolonged, and Worsened the Financial Crisis* (Stanford, Cal.: Hoover Institution Press, 2009).

Using the Taylor Rule, Taylor has argued that by lowering the Fed funds rate to 1 percent, the Fed overreacted to the recession at the start of the decade and then was much too slow in raising the funds rate as the economy recovered.¹⁹ In contrast, Bernanke has argued that the Taylor Rule is operationally subject to significant limitations, some of which are developed further below, and that the extent to which monetary policy was overly accommodative is at least very much open to question.²⁰



The debate over the stance of monetary policy early in the decade is fundamentally a debate over degree. As the accompanying chart shows, the Fed funds rate was significantly and persistently below the rate prescribed by a common application of the Taylor Rule throughout the period.²¹ On the other hand, Bernanke suggests that if

¹⁹ See J. D. Foster, "Understanding the Great Global Contagion and Recession," Heritage Foundation Backgrounder No. 2331, October 22, 2009, at <http://www.heritage.org/research/economy/bg2331.cfm>.

²⁰ See Ben S. Bernanke, "Monetary Policy and the Housing Bubble," speech at Annual Meeting of the American Economic Association, Atlanta, Georgia, January 3, 2010, At <http://www.federalreserve.gov/newsevents/speech/bernanke20100103a.htm>.

²¹ One weakness of the Taylor Rule operationally that becomes immediately apparent is that, if taken literally, it suggests frequent changes in the funds rate, often reversing course quickly. This, of course, would be highly disruptive to markets. Therefore, some means of (inherently artificial) smoothing of the funds rate prescription is necessary. For the charts presented here, the funds rate shown is the average of

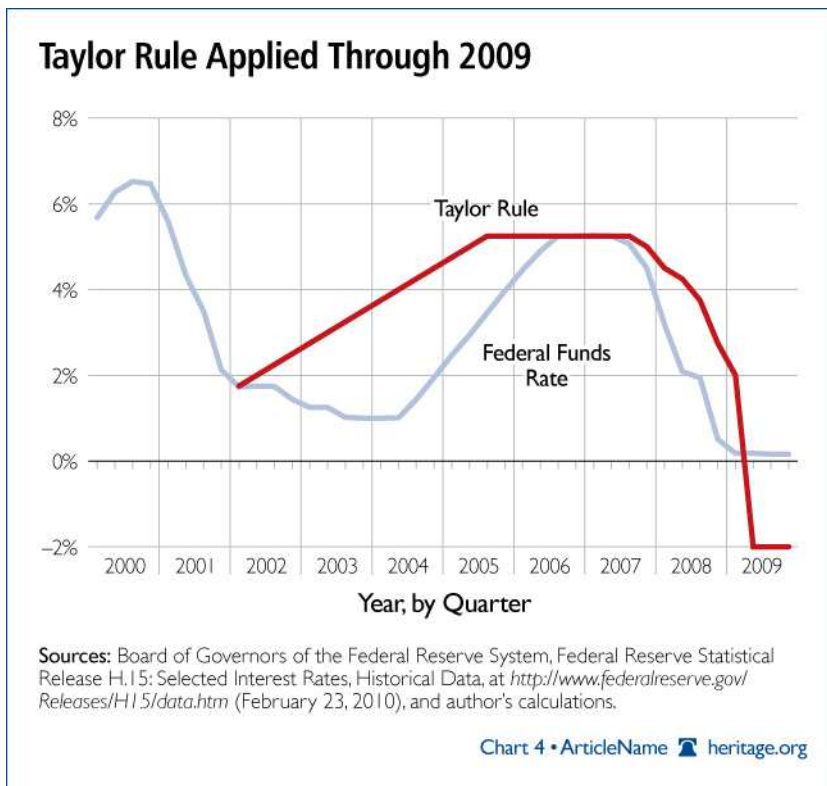
one replaces the measure of current inflation in the Taylor Rule with an inflation forecast, then the resulting trajectory for the Fed funds rate much more closely approximates the Fed's policy over this period. While numerous causes have been cited for the speculative bubbles that led to the Great Contagion and the debate over the Fed's role is likely to continue for years, at this point it seems clear the Fed's overly accommodative stance over an extended period was, at the very least, a substantial contributor.

Some of the strengths and weaknesses of the Taylor Rule are on further display in the period from the end of 2006 to the end of 2009. The strengths are shown in that the Taylor Rule prescribes rapid reductions in the funds rate beginning around the start of 2007 and continuing until the funds rate is theoretically negative beginning in the second quarter of 2008, roughly coinciding with the collapse of the investment firm Bear Stearns. A negative Fed funds rate is, of course, impossible, but the Fed was able to continue to pursue an ever more accommodative policy through quantitative easing.²²

A weakness of the Taylor Rule is that the prescription for the funds rate can be distorted by non-monetary external events such as a rise in the price of oil that temporarily raises the reported inflation rate without increasing trend inflation. This occurred in 2008, leading the Taylor Rule to prescribe a sustained high rate for the funds rate even as the financial crisis accelerated. In contrast to the Taylor Rule prescription, the Fed was cutting the funds rate rapidly yet still too slowly.

that prescribed for the current and previous two quarters. This method gives the Taylor Rule prescription an unfortunate, backward-looking bias. However, the alternative is to allow the prescription to reflect some degree of inflation expectations, for which Bernanke argues in his January 2010 address but which is typically eschewed by Taylor Rule proponents.

²² Under quantitative easing, a central bank injects reserves directly into credit markets by buying securities (typically government securities) on the open market.



The Taylor Rule in Light of Persistent Excess Capacity

The Taylor Rule is a relatively recent major development in the ongoing debate over rules versus discretion in setting monetary policy. Whether one advocates a gold standard, a fixed exchange rate, a fixed rate of growth of a monetary aggregate such as the money base, or a pre-determined policy rule for the Fed funds rate, one is advocating a monetary rule. Rules are appealing because they denude government of a fundamental power: the power, intentionally or not, to inflate prices and devalue a currency. They are also appealing because rules provide a welcome degree of certainty to markets with respect to what the central bank is doing or likely to do.

The abiding difficulty with monetary rules of any kind is they cannot anticipate all the types of shocks an economy is likely to face. Moreover, markets are constantly evolving so that a rule that may work perfectly at one time may well fail terribly later. An alternative to rules dictating a central bank's actions is to establish a credible outcome the central bank seeks to achieve, such as a target rate of inflation.

Defining outcomes and defining rules need not be in conflict, of course. The Taylor Rule establishes a rule in part by incorporating a desired outcome: the target rate of inflation. Yet credible defined outcomes such as a target rate of inflation allow monetary authorities greater freedom to respond to unexpected situations like the recent crisis, or surprising evolutions in money and banking that would render a fixed rule harmful. Further, credible defined outcomes still achieve the dual benefits of depriving the central bank of the power to devalue the currency while providing markets with a degree of certainty.

Rules are useful whether applied mechanically, used as guides, or used merely as additional information for the monetary authority to consider. In the present study, the Taylor Rule is also useful in demonstrating an apparent developing error in monetary policy.

Much of the research and commentary regarding the Taylor Rule involves the possibility of altering the basic formula and the choice of values for the coefficients. In many respects, the debate over the specification of the Taylor Rule is a debate over the best rule to use over time, and more or less in equilibrium. Under present conditions, and in light of historical experience, an important modification to the Rule appears to be in order.

As noted, most of the debate over the Taylor Rule involves specification issues of fixed parameters. However, there is nothing about the Rule suggesting the parameters themselves must be constant through all stages of every conceivable circumstance. This is a matter not of abandoning the principle of having a pre-specified rule guiding monetary policy, but rather of having a dynamic rule reflecting dynamic circumstances.

Taylor argues the form of the Rule derives from experiments in optimal control theory.²³ Even so, including excess capacity in the Rule in some fashion lends itself to ready intuitive explanation. First, excess capacity may, for a period, put downward pressure on inflationary tendencies. Second, monetary policy is one tool to which policymakers may turn to support the real economy during periods of weakness or to restrain the economy if it appears to be overheating. Importantly, these are not long-term considerations, though how short-term their relevance may be is open to question.

Monetary policy affects the trajectory of the real economy in modern neo-Keynesian-style models because they incorporate sticky prices in some fashion. In general, business cycles result because some quantities or prices in some market or markets are unable to adjust downward rapidly in response to changing circumstances. Wages and salaries are common examples of prices that resist downward movements. Imbalances then quickly build, leading to layoffs and further imbalances as the dislocations spread. However, even in these models, price stickiness is time-limited. Eventually, prices and quantities adjust, and imbalances correct, and so, eventually, the ability of monetary policy to influence the real economy is likewise limited.

In terms of the Taylor Rule, this means that the two justifications for including excess capacity as a determinant of the Fed funds rate apply for a limited period. Thereafter, in some fashion, *the coefficient on excess capacity in the Taylor Rule should decline, likely to zero.*

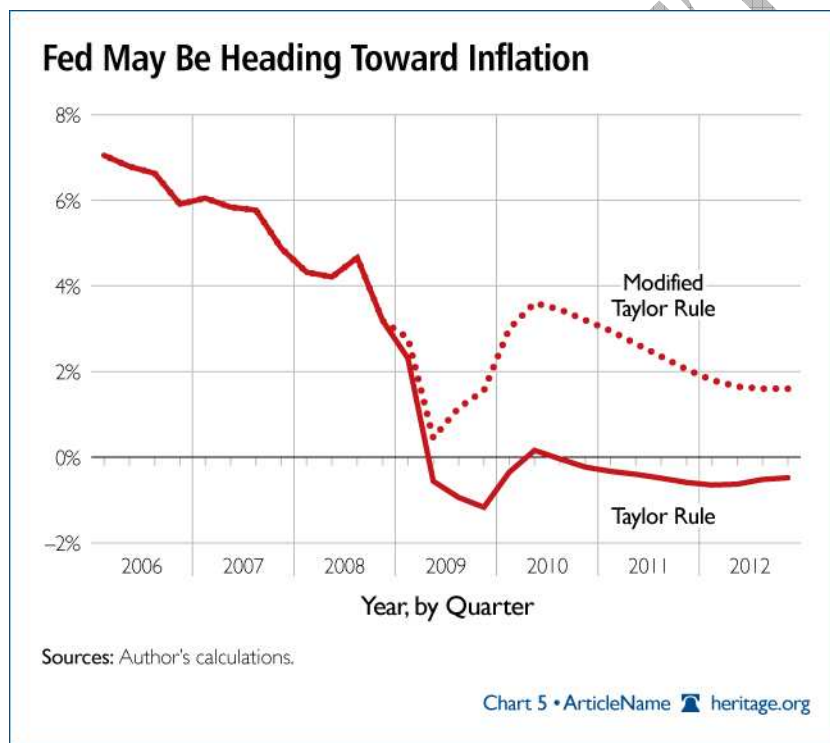
To see the implications of this alternative treatment of excess capacity in the Taylor Rule, consider the following experiment. In constructing the experiment, forecasts of actual and potential output are taken from the Congressional Budget Office's (CBO) August 2009 Report. The CBO forecast for GDP price index inflation in 2010, 2011, and from 2012 to 2013 is 0.8 percent, 0.3 percent, and 0.7 percent, respectively. These

²³ See Taylor and Williams, "Simple and Robust Rules for Monetary Policy."

forecasts seem unrealistically low. Therefore, the experiment uses the forecast provided by the Mid-Session Review of the Office of Management and Budget (OMB).²⁴

Using these forecasts, one can construct a projected trajectory for the Fed funds rate using the classic Taylor Rule with an excess capacity term and a modified Taylor Rule without an excess capacity term. These projections are shown in the graph below. They indicate the Fed funds rate would be at or near zero through 2011 if the Fed followed the traditional Taylor Rule and would only then begin to rise toward normal levels. In contrast, if the Fed adopted the modified Taylor Rule as of the start of 2010, then the funds rate would increase to 0.25 percent by the third quarter of 2010 and would rise steadily through 2012, reaching a rate of 3.25 by the end of 2012.

The consequences for monetary policy are quite substantial if the effects of excess capacity on inflation pressures wear off as posited. The modified Taylor Rule prescribes a Fed funds rate that is higher from 2010 through 2012 by an average of over 2.75 percentage points. To put this figure in perspective, the classic Taylor Rule prescribes a Fed funds rate that was higher than actual policy from 2004 through 2007, averaging just over 2.5 percentage points.



Whether the Taylor Rule is used mechanically or as a guide, or only loosely reflects policymakers' thinking about setting monetary policy, the results suggest the Fed

²⁴ The OMB projections for 2010 through 2012 Q4/Q4 are 1.2 percent, 1.4 percent, 1.7 percent, and 1.7 percent, respectively. See "Mid-Session Review," Fiscal Year 2010, Office of Management and Budget, August 25, 2009, at http://www.whitehouse.gov/omb/assets/fy2010_msr/10msr.pdf.

will be overly accommodative significantly and persistently for an extended period if—and this is the important issue—the effects of ongoing high unemployment on inflation dissipate over time. The history of the 1970s and the theoretical justification for including excess capacity in the Taylor Rule based on sticky prices suggest that the excess capacity effect should indeed fade away.

The simple implication is that the Fed is likely to be much too late in raising the Fed funds rate. As discussed above, the Fed appears to have the tools to prevent a resurgence of inflation, but comments by Fed officials, consistent with admonitions from other sources, suggest that it will be late in using these tools and that inflation will therefore and before long rise well above any implicit target or expected rate. If surprisingly higher inflation appears, there is every reason to believe the Fed will act as necessary using traditional policy tools, especially by raising the Fed funds rate rapidly to bring inflation back under control. However, there is also every reason to believe that in so doing the Fed will trigger another bout of economic weakness if not recession.

Three Degrees of Uncertainty

The foregoing discussion regarding the implications of excess capacity was distilled down to whether the coefficient on excess capacity in the Taylor Rule should decline over time, perhaps to zero. A consideration of a different sort involving the classic Taylor Rule is that it depends on two variables whose values are highly uncertain and a third that is subject to significant subsequent revision. If one knows these values with certainty, the Taylor Rule produces a certain result. However, in real time, policymakers must estimate the values of these parameters subject to great uncertainty, and the interpretation of the Taylor Rule prescription therefore carries at least that same degree of uncertainty.²⁵

For example, the Taylor Rule is partly a function of potential output. Potential output, however, is a theoretical construct depending on projections of past productivity, future productivity growth, and various labor supply dynamics. One can make reasonable guesses as to current potential output and reasonable forecasts for future potential output, a widely used measure of which is provided by the Congressional Budget Office.²⁶ However, significant uncertainty surrounds both the estimate of current and projections of future potential output.

Similarly, the natural rate of interest is a well-defined term but an unobserved quantity. Despite efforts to estimate the natural rate of interest,²⁷ the current value remains uncertain, as is its trajectory. A common estimate for the natural rate of interest is 2.0 percent, but it could easily range from as low as 1.5 percent to as high as 2.5 percent.

²⁵ This discussion was motivated in part by another work, Athanasios Orphanides and John C. Williams, “Robust Monetary Policy Rules with Unknown Natural Rates,” *Brookings Papers on Economic Activity*, Vol. 2002, December 2002, at <http://www.jstor.org/stable/1209203?cookieSet=1>.

²⁶ Congressional Budget Office, “The Budget and Economic Outlook: An Update,” August 2009, at <http://158.219.33.254/doc.cfm?index=10521>.

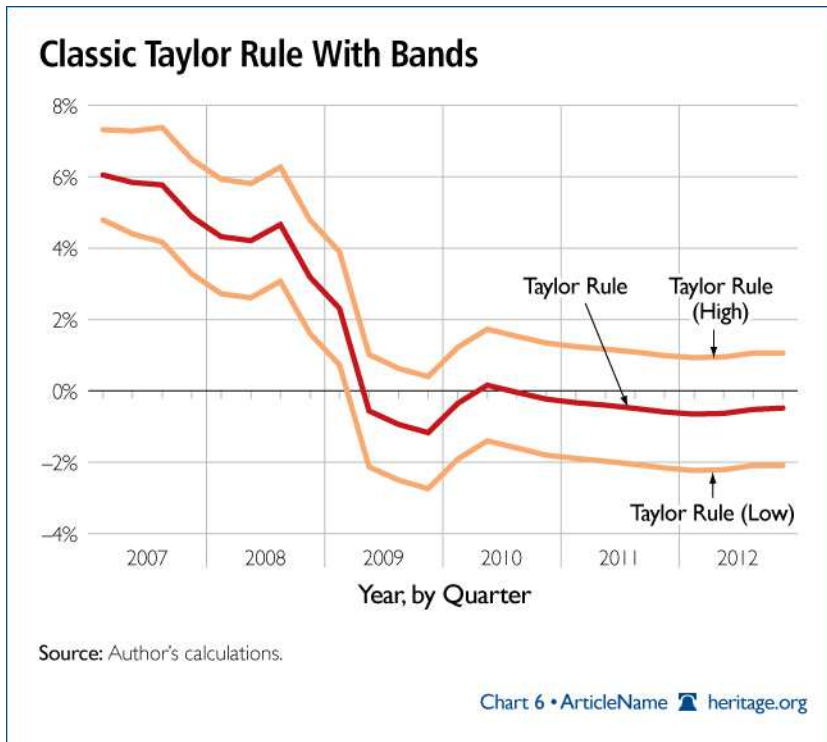
²⁷ See, for example, Thomas Laubach and John C. Williams, “Measuring the Natural Rate of Interest,” November 2001, at <http://www.federalreserve.gov/pubs/feds/2001/200156/200156pap.pdf>.

The classic Taylor Rule also depends on the measure of inflation. Reported inflation measures are subject to sizable revisions with the passage of time. In calculating the value for the Fed funds rate suggested by the Taylor Rule, policymakers need to allow for the possibility that real-time estimates either understate or overstate current inflation.

These three uncertain factors of the Taylor Rule—potential output, the natural rate of interest, and the current estimate of inflation—suggest that policymakers should be aware in applying the Taylor Rule there is both a point estimate and an implicit confidence band surrounding the estimate.²⁸ It is entirely possible that at any point in time, the three factors combined could largely offset one another or lead to a modestly higher or lower target fed funds rate. However, purely as a matter of probability, it is certain two or all three factors will episodically produce a significantly higher or significantly lower correct prescription for the funds rate than would be indicated by the usual point estimate.

Considering these three degrees of uncertainty together produces a band for the prescribed Fed funds rate above and below the usual point estimate. For the following experiment, we assume that potential output may be 1 percent higher or lower than the CBO estimate; actual inflation differs from the current estimate by ± 0.4 percentage point; and that the real rate of interest may be as low as 1.5 percent and as high as 2.5 percent. These different sets of assumptions produce the three possible trajectories for the Fed funds rate shown in the graph below. They suggest a 3 percentage point band around the classic Taylor Rule prescription, a fairly large dispersion. Such a large band suggests that while a policy rule such as the Taylor Rule may provide greater certainty to markets about the Fed's policy, that certainty may come at the price of a problematic real-time prescription for the funds rate.

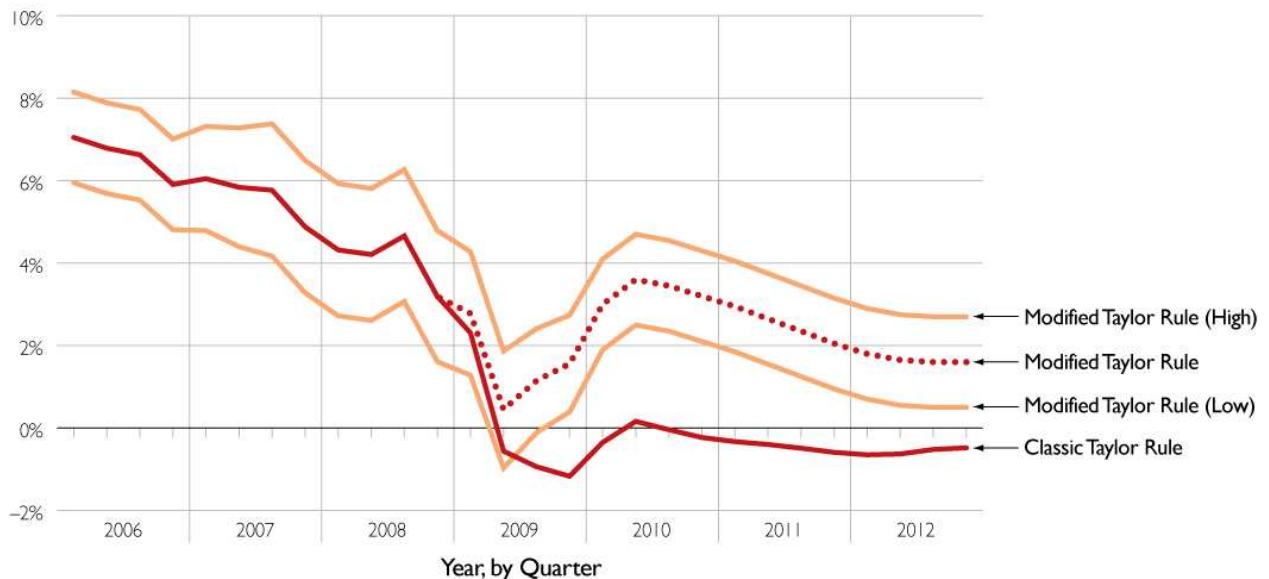
²⁸ Bernanke also makes the important observation that the Taylor Rule is based in part on current measures of inflation. Yet monetary policy affects the economy and prices with a substantial lag, suggesting that any monetary policy rule should reflect instead expectations of future inflation as the best available proxy for actual future inflation. See Bernanke, "Monetary Policy and the Housing Bubble."



Finally, it is interesting to see how these three uncertainties affect the projected trajectory of the funds rate when considered in the context of the modified Taylor Rule described above, in which the effect of excess capacity is assumed to fade out in 2010. As shown in the graph below, this again produces trajectories above and below the baseline trajectory. Similar to the band surrounding the classic Taylor Rule, the band around the modified Taylor Rule starts out one and a half percentage points above and below the baseline trajectory. However, the bands narrow to just over a percentage point over time because in dropping excess capacity from the rule one is also dropping the error associated with potential output.

Of particular note is that even the lower trajectory under the modified Taylor Rule is a full percentage point above the baseline Taylor Rule prescription by the end of 2012. In effect, this suggests the error in setting the Fed funds rate, if there is one, from following the classic Taylor rule is greater even than the combined effects of the three sources of uncertainty suggested here. In short, this highlights once again that whether the Fed follows the classic Taylor Rule or its views are merely sympathetic to the Rule's treatment of excess capacity is a very big deal and that getting it wrong would have very serious consequences, both for inflation and for the real economy.

Modified Taylor Rule With Bands



Source: Author's calculations.

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Implications for Monetary Policy

Concerns about resurgent inflation may have many roots. One very distant possibility is that the Fed has become ambivalent or lax in its watch over inflation. Another, more plausible concern is that the Fed's extraordinary actions in recent months imply it has explicitly or implicitly chosen financial stabilization over price stability. A more reasonable concern addressed elsewhere is whether the Fed has the tools to eliminate or at least contain the inflation pressures from the mountain of banks' excess reserves.

The consensus view seems to be that the inflation threat will grow as the economy recovers. Rapid recovery or not, however, the inflation threat remains as long as extraordinary levels of bank excess reserves remain. Perhaps the greatest risk is that, as in a previous episode, inflation may roar back irrespective of the state of the economy, surprising the Federal Reserve and market participants alike.

Fed Chairman Bernanke and his colleagues have expressed a clear determination to act aggressively to restrain inflation and inflation expectations. These signals are especially welcome given the potential for a severe bout of inflation. Bernanke and others have similarly expressed confidence in the Fed's ability to execute a successful exit strategy. In theory, at least, this confidence appears well founded.

Granting that the Fed has the tools and the intent, an entirely separate issue is whether the Fed will use those tools wisely. On this, the nation has reason for concern. Fed officials and others have made numerous comments referencing persistent excess capacity and high unemployment in the economy, suggesting that this excess capacity gives the Fed greater freedom to delay raising the Fed funds rate to more neutral levels.

However, both history and theory suggest that whatever effects such excess capacity have on inflationary pressures disappear after a period. Assuming persistent effects from excess capacity on inflation would lead the Fed to delay raising the Fed funds rate and therefore create the basis for a surprising, possibly rapid unfolding of much higher inflation.

The Taylor Rule, even if modified to reflect the declining effects of excess capacity, remains at once a vital tool for monetary policy but an uncertain guide. The uncertainty arises because the Rule itself is a function of quantities that are unknown in real time and must be estimated with sizable room for error. Erroneous estimates run through the Taylor Rule then quickly translate to errant prescriptions for the Fed funds rate. The general message of this discussion is that even the classic Taylor Rule must be understood to produce more of a band of target Fed funds rate rather than a point estimate.

There is a more immediate message arising from the uncertainties surrounding parameter values. Recall the modified Taylor Rule in which the coefficient on excess capacity is set to zero. A simple experiment performed in the present context suggests the lower bound of Fed funds rates in the modified Taylor Rule reflecting these uncertainties exceeds the prescription for the funds rate from the classic Taylor Rule. This result underscores that following the classic Taylor Rule under present circumstances could result in a long and costly delay by the Fed in normalizing interest rates.

Whether or not Bernanke and the Fed are using the Taylor Rule to some extent to guide policy, the prescriptions of the Taylor Rule with and without an excess capacity term suggest the extent of the possible monetary policy error, and it is quite large. This conclusion gains greater weight when one considers the uncertainties surrounding critical parameters in the Rule itself.

In recent remarks, Bernanke has referenced the importance of forward-looking indicators of inflation. If and when these indicators signal trouble, the Fed should quickly heed their warning and not rely on excess capacity in the economy to restrain inflation. The Fed should be prepared to raise the funds rate sooner than it is currently signaling and more aggressively than markets anticipate.

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