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CRS Report for Congress

Evaluating the Current Stance of Monetary Policy Using a Taylor Rule

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Summary

Oversight of the Federal Reserve's (Fed's) monetary policy decisions rests with Congress. But oversight is encumbered by the absence of a straightforward relationship between interest rates and economic performance. The Fed's policy decisions are discretionary, meaning there is no objective, transparent "yardstick" for evaluating their decisions; this also hampers oversight. A simple rule of thumb guide to monetary policy decisions called a "Taylor rule" is an intuitive way to judge actual policy against some objective, albeit simplistic, ideal. Taylor rules are flexible enough to be adjusted to reflect a wide variety of policy goals. This report compares current policy to a number of Taylor rules, and finds that interest rates are currently lower than most rules would prescribe. This report will be updated as events warrant.

The government has two main tools for influencing overall economic conditions, fiscal policy and monetary policy. Monetary policy can boost economic activity and inflation by lowering short-term interest rates (the federal funds rate), or depress economic activity and inflation by raising interest rates. Changes in output and employment caused by monetary policy are of a temporary nature: in the long run, changes in the money supply affect only inflation and have no effect on the economy's sustainable growth rate. In essence, monetary policy has two attainable goals: to promote economic stability (minimize fluctuations in the business cycle) and price stability (low and stable inflation). Because the Fed has only one tool at its disposal, influence over interest rates, it faces a tradeoff in the pursuit of these two goals — when the two goals conflict, they cannot both be pursued at once.[1]

Congress has delegated responsibility for monetary policy decisions to the Federal Reserve, but maintains oversight responsibilities. Oversight is made difficult, however, by the absence of a straightforward relationship between interest rates and economic performance. Because of changes in investment demand, any given interest rate may be

[1] For more information, see CRS Report RL30354, *Monetary Policy: Current Status and Conditions*, by Marc Labonte and Gail Makinen.

expansionary when the economy is booming, but contractionary when the economy is in recession. Furthermore, the Fed's policy decisions are discretionary: it justifies policy decisions qualitatively rather than quantitatively. Its decisions to change interest rates need only be consistent with the broad mandate that it maintain full employment, stable prices, and moderate interest rates. When these goals are mutually exclusive, as they frequently are, the mandate can be used to justify virtually any policy decision. In this context, Congress frequently finds itself in a position where it must "take the Fed's word for it" that the policy change will have the effect it is said to have because there is no objective outside "yardstick" to evaluate it. This report attempts to offer such a yardstick.

One way to evaluate Fed policy for oversight purposes would be to use complex econometric models to generate predicted results of a monetary policy change, and see if these results conform with the policy change's stated or mandated goals. But this requires sophisticated knowledge of econometric modeling that may not be practical for oversight, particularly since different models yield significantly different results. This report uses a simpler, popular alternative called a "Taylor rule" to quantitatively evaluate the current stance of monetary policy.[2] Economist John Taylor, recently a Treasury Undersecretary, proposed the following rule to set interest rates that balances the goals of maintaining economic stability and price stability:[3]

$$FFR = (R + I) + 0.5 \times (\text{output gap}) + 0.5 \times (I - IT)$$

where:

FFR = federal funds rate
R = equilibrium interest rate (assumed here to equal 2)
output gap = percent difference between actual GDP and potential GDP
I = inflation rate
IT = inflation target (assumed here to equal 2)

The goal of maintaining economic stability is represented by the factor *0.5 x (output gap)*, which raises interest rates when actual GDP is greater than potential GDP and lowers rates when it is below potential. The output gap is the difference between actual and potential GDP. Potential GDP is the level of output that would be produced if all of the economy's labor and capital resources were being utilized; in economic downturns, actual GDP falls below potential because some resources are idle. Likewise, because prices adjust slowly, the economy can temporarily be pushed above a level of output that is sustainable. Once prices adjust, output will return to potential. There is no direct way to measure potential GDP, so it must be inferred; different estimating methods yield different results.[4] This Taylor rule states that when actual GDP is, say, 1% above potential GDP, the federal funds rate should be increased by 0.5 percentage points. If

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[2] For background and analysis of Taylor rules, see CRS Report RL31050, *Formulation of Monetary Policy by the Federal Reserve: Rules vs. Discretion*, by Marc Labonte.

[3] John Taylor, "Discretion vs. Policy Rules in Practice," *Carnegie-Rochester Series on Public Policy*, vol. 39, 1993, p. 195; Robert Solow and John Taylor, *Inflation, Unemployment, and Monetary Policy* (Cambridge, MA: MIT Press, 1998), p. 45. The specific mathematical form of this rule does not appear to be formally derived from theory or empirical evidence.

[4] This report uses CBO's estimate of potential GDP. See Congressional Budget Office, *CBO's Method for Estimating Potential Output*, August 2001.

policymakers wanted a more (less) aggressive reaction to changes in growth, they would place a larger (smaller) weight on the coefficient than 0.5.

The goal of maintaining price stability is represented by the factor *0.5 x (I-IT)*, which states that interest rates are to be raised when inflation (I) is above its target (IT) and lowered when inflation is below its target. Unlike the output gap, the inflation target can be any rate that policymakers desire. This rule assumes a 2% inflation target, which is close to the 1994-2003 average of 1.8%, as measured by the GDP deflator. (As measured by the consumer price index (CPI), the 10-year average inflation rate is 2.5%.) This rule weights the response to deviations from the inflation target equally to deviations from potential GDP: a one percentage point increase in inflation above its target would lead to a 0.5 percentage point increase in the federal funds rate. If actual GDP is equal to potential GDP and inflation is equal to its target, the rule calls for an inflation-adjusted federal funds rate of 2%, or an actual federal funds rate equal to 2% plus the current inflation rate. This is often called the "neutral" interest rate, at which monetary policy is neither stimulative nor contractionary.

Current Policy Prescriptions According to Different Taylor Rules

In the second quarter of 2007, actual GDP was 0.2% below potential GDP and inflation (using the GDP deflator) equaled 2.7% over the previous four quarters. Entering these data into the Taylor rule above (and rounding to the nearest quarter point) yields a federal funds rate of (2% + 2.7%) + 0.5 x (-0.2%) + 0.5 x (2.7% - 2%) = 5%, higher than the current rate of 4.75%. With inflation at 2.7%, the current neutral rate is 4.75%, according to the rule. The Taylor rule calls for an interest rate a little above the neutral rate because the above-target inflation rate slightly outweighs the output gap currently. Since this rule considers only inflation and the output gap, it cannot consider other factors that counsel against tightening policy, such as the potential for financial turmoil in August 2007 to slow future growth.[5]

Figure 1 plots actual federal funds rates against rates determined by the Taylor rule from 1998 to 2003. This figure should not be used to directly evaluate actual policy for two reasons. First, because economic data are released with a lag and subject to subsequent revisions, Figure 1 is based on data unavailable to the Fed when actual policy decisions were made.[6] Second, since subsequent events would have differed had a different monetary path been followed at any given point, the chart cannot be interpreted as a consistent alternative policy option over time.

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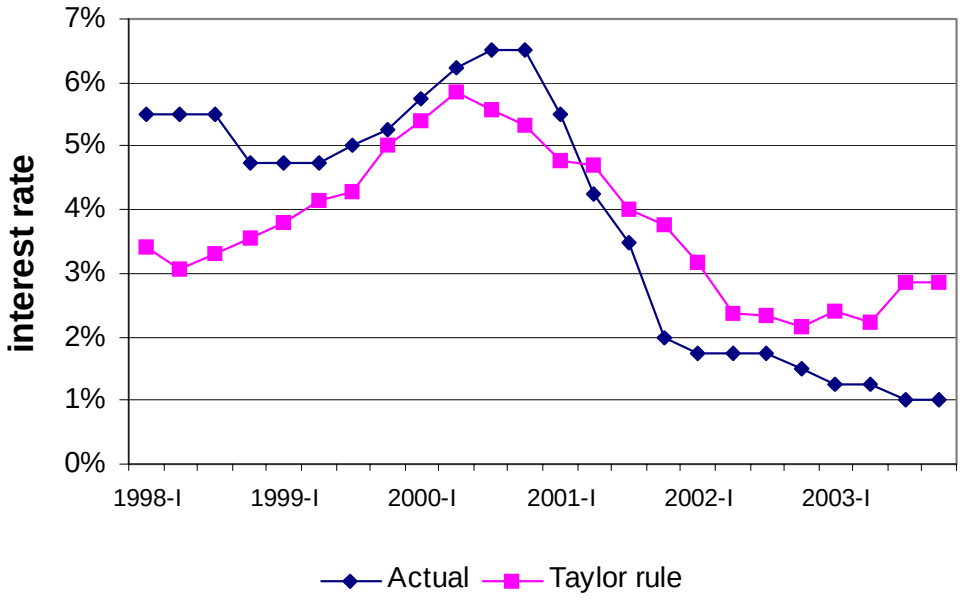
[5] A major drawback to Taylor rules is that they cannot cover all contingencies. For example, in times of crisis, the other goal of monetary policy, to act as a lender of last resort, could not be adequately executed by a rule. Arguably, the Fed's more aggressive stance in 2001 than the rule would suggest was partly motivated by the unique circumstances surrounding September 11, which a rule cannot take into account. On the other hand, some economists argues that, because of uncertainty over the proper way to model economic activity, simple rules perform more robustly than complex rules across different models.

[6] Athanasios Orphanides, "Monetary Policy Rules Based on Real-Time Data," Federal Reserve Board of Governors, *Finance and Economics Discussion Series 3*, 1998.

As can be seen in **Figure 1**, while interest rates under this rule followed the same general pattern as actual rates — monetary tightening in the 1990s followed by easing in the 2000s — there were some short-term differences. The rule called for lower interest rates in 1998 because inflation was below the target. The rule called for similar interest rates in 1999-2000, but a less aggressive policy response to the economic downturn that began in 2001. (If the rule was based on data available at the time, the rate reduction would have been even smaller since the GDP data have since been revised downward.) This rule would have tightened policy slightly in the second half of 2003 as the economy picked up speed, rather than leaving interest rates at 1% as the Fed did.

Figure 1. Federal Funds Rate, Actual and Prescribed by Taylor Rule, 1998-2003



Source: CRS calculations based on Federal Reserve, BEA, CBO data.

The Taylor Rule used so far is one out of an unlimited number of possibilities. It is useful to see in **Table 1** how other rules based on different policy goals compare to current policy. For example, economist Lars Svensson argues that since monetary policy affects the economy with a lag, if policy is based on current data it will always be backward looking, and "fighting the last war." Since policy decisions made today affect future economic conditions, he argues they should be based on projections of future growth and inflation.[7] Of course, different forecasters have different projections of future growth, but this problem can be mitigated by using the Blue Chip "consensus forecast." Blue Chip is a private company whose monthly consensus forecast is the average forecast of 50 different private sector forecasters. Based on the September 2007 consensus forecast, GDP one year from now is projected to be 0.3% below potential GDP and inflation will fall to 2.2%. A rule with the same weights as the "Traditional" Taylor rule above calls for a current federal funds rate of 4.25%. Of the Taylor rules considered, this

[7] Lars Svensson, *Inflation Forecast Targeting: Implementing and Monitoring Inflation Targets*, National Bureau of Economic Research, Working Paper no. 5797, October 1996.

one prescribes the lowest interest rates, because forecasters believe that inflation will fall despite its recent rise.

Table 1. Current Policy According to Various Taylor Rules

Type of Rule (See text for details)	Federal Funds Rate =	Current Interest Rate Predicted by Rule (Actual=4.75%)
Traditional Taylor Rule	(2+I) + 0.5 x (output gap) + 0.5 x (I-2)	5%
Taylor Rule based on forecast	(2+I) + 0.5 x (output gap_{proj}) + 0.5 x ($I_{proj.}$-2)	4.25%
"Strict" Inflation Target	(2+I) + 1.0 x (I-2)	5.25%
"Fine tuning" Taylor Rule	(2+I) + 1.0 x (output gap) + 1.0 x (I-2)	5%
Taylor Rule based on history	(2.2+I) + 0.8 x (output gap) + 0.5 x (I-2)	5%

Source: CRS calculations based on quarterly data from BEA, Federal Reserve, CBO, Blue Chip.
Note: FFR = federal funds rate; output gap = percent difference between actual GDP and potential GDP; I = inflation rate, measured by GDP deflator. Results are rounded to nearest quarter point.

Making price stability the sole goal of monetary policy (inflation targeting) has been widely implemented abroad in economies such as the United Kingdom and the euro area, and bills to switch to inflation targeting have been introduced in the 109th Congress (H.R. 498).[8] Proponents support inflation targets for three reasons related to this report. First, many economists have reservations with "fine tuning" in monetary policy. Since the Fed can make mistakes and markets can (eventually) adjust on their own, they argue that the best monetary policy is a "hands off" one that does not try to respond to every small change in the economy. Second, some economists have argued that monetary policy should focus less on stabilizing output since only the inflationary effects of monetary policy are permanent. Third, in the context of a Taylor Rule, a strict inflation target could be justified on the grounds that measurements of the output gap are too uncertain to be useful (as discussed below).[9]

To see how a "strict" inflation target would operate, the traditional Taylor rule can be adapted by removing the output gap and increasing the weight on the inflation target to, say, 1.0.[10] Under this rule, the current interest rate would equal 5.25% — above the equilibrium rate because inflation is 0.7 percentage points above its presumed target. When inflation does not follow the business cycle closely, a strict inflation rule causes

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[8] See CRS Report 98-16, *Should the Federal Reserve Adopt an Inflation Target?*, by Marc Labonte and Gail Makinen.

[9] Bennett McCallum, *Should Monetary Policy Respond Strongly to Output Gaps?*, National Bureau of Economic Research, Working Paper no. 5952, April 2001.

[10] The output gap might not be removed if future (rather than current) inflation were targeted under a strict inflation target. In that case, the rule might still react to changes in the output gap in so far as changes in the output gap affect future inflation. See Laurence Ball, *Efficient Rules for Monetary Policy*, National Bureau of Economic Research, Working Paper no. 5952, March 1997.

monetary policy to become less counter-cyclical, and this rule would not have followed actual policy very closely in the past few years. As practiced abroad, monetary policy has still attempted to stabilize economic growth under an inflation target, usually under the principle that stable growth helps maintain stable prices. Therefore, the strict inflation target used here does not reflect international experience with inflation targeting.[11] Alternatively, policymakers may prefer a more aggressive response to changes in economic conditions — more "fine tuning" — than the traditional Taylor Rule provides. More fine tuning can be incorporated by raising both coefficients on the original rule from 0.5 to, say, 1.0. When this change is made, the current interest rate would be 5% (see **Table 1**).

As has been discussed, there are an unlimited number of weights that can be placed on the inflation and output factors because there are an unlimited variety of policy preferences. Rather than arbitrarily assigning a set of preferences to the Taylor rule, another approach is to determine what weights best parallel actual Federal Reserve policy historically. Taylor does this in a 1999 paper and shows that a Taylor rule has a high goodness of fit (the R-squared is 0.83 and the coefficients are highly statistically significant) in the Greenspan era.[12] In other words, most of the decisions that the Fed made in the Greenspan era through the third quarter of 1997 are the same as if the Fed had been following a Taylor rule; this is reassuring for the use of Taylor rules to aid oversight. The "historical" Taylor rule turns out to have similar weights to the "traditional" one suggested by Taylor: the weight on the output gap would be raised from 0.5 to 0.8 and the weight on inflation would remain 0.5. The real equilibrium interest rate is slightly higher in this period (2.2%) than assumed in the original Taylor rule (2%). A comparison of current interest rates and those predicted by this "historical" Taylor rule can be interpreted as showing whether current monetary policy decisions are similar to ones taken by the Fed in the past. If the Fed had continued its historical behavior, interest rates would have tended to be a little higher than they actually were since the second half of 2003, and interest rates would currently be 5% (see **Table 1**).

One drawback to evaluating monetary policy using a Taylor rule is that the policy prescriptions made by the Taylor rule are very sensitive to the choice of data sources and coefficient weights. In particular, since the output gap is a constructed series that can be estimated using a number of different methods, different output gap series produce widely different results. Likewise, there are several equally valid measures of inflation available, and sometimes these series diverge for short periods of time. Kozicki shows that different data sources can change the Taylor rule's recommended interest rate by as many as several percentage points.[13] Discretionary policy is able to weigh conflicting data in a way that a rule cannot. Nevertheless, discretionary policy still must be based on the same conflicting data as rules, so this advantage should not be overestimated.

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[11] See CRS Report RL31702, *Price Stability (Inflation Targeting) as the Sole Goal of Monetary Policy: The International Experience*, by Marc Labonte and Gail Makinen.

[12] John Taylor, "A Historical Analysis of Monetary Policy Rules," in John Taylor, ed., *Monetary Policy Rules* (Chicago: University of Chicago Press, 1999), p. 319.

[13] Sharon Kozicki, "How Useful are Taylor Rules for Monetary Policy?," *Federal Reserve Bank of Kansas City Economic Review*, vol. 84, no. 2 (1999:2), p. 5.