

The Final Topic: Taylor Rules

A Simple Characterization of Fed Policy

First proposed by John Taylor in 1993 – now widely used as a summary of the stance of monetary policy.

Before starting, useful to look at some of the statements made by McCallum in his article. See how far we have come in our understanding of policy.

First there was much resistance to the RE hypothesis, partly because it initially was associated with the **policy-ineffectiveness proposition**. But, it gradually swept the field in both macro and microeconomics, primarily because it seems extremely imprudent for policy analysis to be conducted under the assumption that any particular pattern of expectational errors will prevail in the future—and ruling out all such patterns implies RE. There were other misconceptions regarding rational expectations, the most prominent of which was that Lucas's famous "critique" paper (1976) demonstrated that policy analysis with econometric models was a fundamentally flawed undertaking. Actually, of course, Lucas and Sargent showed instead that certain techniques were flawed, if expectations are indeed rational, and that more sophisticated techniques are called for.

More from McCallum:

In recent years, in fact, these tools have been applied in a highly promising fashion. Thus a major movement has been underway to construct, estimate, and simulate monetary models in which the economic actors are depicted as solving dynamic optimization problems and then interacting on competitive markets, as in the RBC literature, but with some form of nominal price and/or wage “stickiness” built into the structure.

More from McCallum:

The objective of this line of work is to combine the theoretical discipline of RBC analysis with the greater empirical validity made possible by the assumption that prices do not adjust instantaneously. Basically, the attempt is to develop a model that is truly structural, immune to the Lucas critique, and appropriate for policy analysis.

McCallum notes how there is greater interaction between academic economists and economists at policy institutions (such as the Fed):

In the research presented at these two conferences there was not just a similarity of technique across groups, but also a considerable amount of agreement across authors about the outline of an appropriate framework for the analysis of monetary policy issues.

More from McCallum:

The nearly standard framework at the NBER and Riksbank conferences is a quantitative macroeconomic model that includes three main components. These are:

An **IS-type relation** (or set of relations) that specifies how interest rate movements affect aggregate demand and output;

A **price adjustment equation** (or set of equations) that specifies how inflation behaves in response to the output gap and to expectations regarding future inflation; and

A **monetary policy rule** that specifies each period's settings of an interest rate instrument.

More from McCallum

These settings typically are made in response to recent or predicted values of the economy's inflation rate and its output gap.

These models are intended to be structural (i.e., policy invariant) and in some cases this attempt is enhanced by a modeling strategy that features explicit optimization by individual agents acting in a dynamic and stochastic environment.

To study effects of policy behavior, stochastic simulations are conducted using the model at hand with alternative policy rules, with summary statistics being calculated to represent performance measured by average values of the **variability of inflation, the output gap**, and interest rates.

More from McCallum

One of the fortuitous events that led to today's era of cooperation between central bank and academic economists was the publication of a 1993 paper by John Taylor—the one in which he explicitly proposed the now famous Taylor rule. By writing his rule in terms of the instrument actually used by central banks and expressing his formula with brilliant simplicity, Taylor made the concept of a monetary rule more palatable to central bankers—especially as he showed that recent U.S. experience had in fact conformed to his formula rather closely. Simultaneously, the step was attractive to academics because it enabled them both to simplify their analysis, by discarding money demand functions, and also to be more realistic.

John Taylor of Stanford University has proposed a simple rule in which the Fed Funds rate is adjusted for movements in inflation and output.

Hence, we need only these two variables to predict what the Fed Funds rate should be.

Recall the interest rate rule from Walsh:

$$i = i^T + \underbrace{\left[1 + \frac{1}{b} \left(\frac{1}{a + \alpha} \right) \right]}_{>1} (\pi^e - \pi^T) + \frac{e}{b(a + \alpha)}$$

So the Taylor rule is not too different – rather than expected inflation, use actual inflation and include current output.

The Taylor Rule:

$$(1) \quad R_t = \pi_t + \alpha(\pi_t - \pi^*) + \beta(y_t - \bar{y}_t) + \bar{r}$$

Where:

R_t = the Fed Funds Rate

π_t = the inflation rate

π^* = the target inflation rate

y_t = output (GDP)

\bar{y}_t = potential output

\bar{r} = the long run average real interest rate

(α, β) = constants

Define $r_t = R_t - \pi_t$ = the ex-post real interest rate. Then eq. (1) can be rewritten in a useful form. First, re-writing eq. (1):

$$(1) \quad R_t = \pi_t + \alpha(\pi_t - \pi^*) + \beta(y_t - \bar{y}_t) + \bar{r}$$

Then subtracting inflation from both sides yields:

$$(2) \quad r_t = \alpha(\pi_t - \pi^*) + \beta(y_t - \bar{y}_t) + \bar{r}$$

Hence the Taylor rule says that the real interest rate (implied by the current Fed Funds rate and inflation) should be adjusted from the long run average real interest rate based upon deviations of inflation and output from their respective target levels.

An historical analysis of monetary policy using the Taylor rule.

$$r_t = \alpha(\pi_t - \pi^*) + \beta(y_t - \bar{y}_t) + \bar{r}$$

Recently, the parameters of the Taylor rule have been estimated for different sample periods. These estimates are presented below:

	60:1 - 79:4	87:1 - 97:3
Variable	Coefficient	Coefficient
<i>alpha</i>	-0.187	0.533
<i>beta</i>	0.252	0.765

Note critically that the coefficient on inflation was negative during the 60's and 70's. This means that increases in inflation **lower** the real interest rate which causes demand to increase -- this results in even higher inflation. Hence, inflation becomes unstable.

Graphically we can show the difference by assuming output is always equal to full employment and the long run real interest rate = 2%. Then the Taylor rules in the periods become:

$$1960 - 1979 : R_t = 2.045 + 0.813\pi_t$$

$$1987 - 1997 : R_t = 1.174 + 1.533\pi_t$$

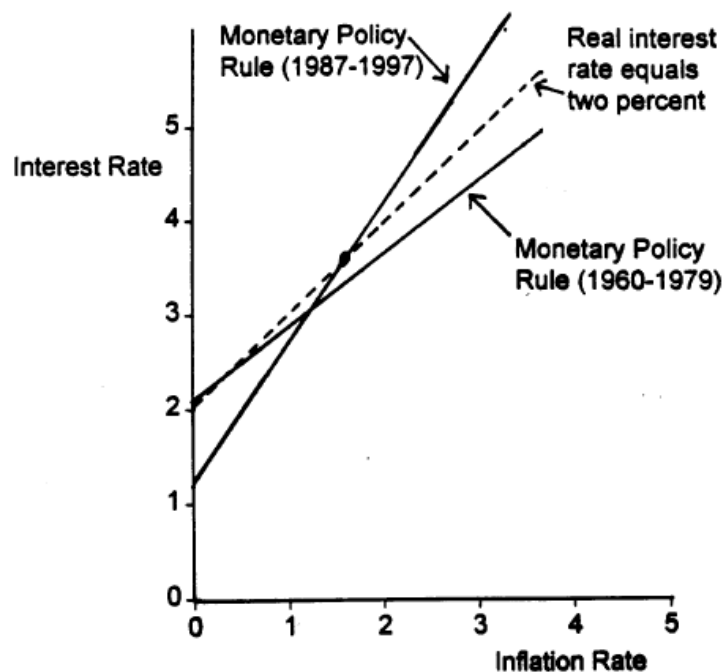


FIGURE 3.

Two estimated monetary policy rules: 1960-79 versus 1987-97.

In the early period, inflation is unstable – departures from equilibrium grow.

Comparison of actual and predicted Fed Funds Rate using the Taylor rule

The following graphs examine the path of the Fed Funds rate predicted by two Rules.

Rule 1: $\alpha = 0.5$, $\beta = 0.5$. Rule 2: $\alpha = 0.5$, $\beta = 1.0$

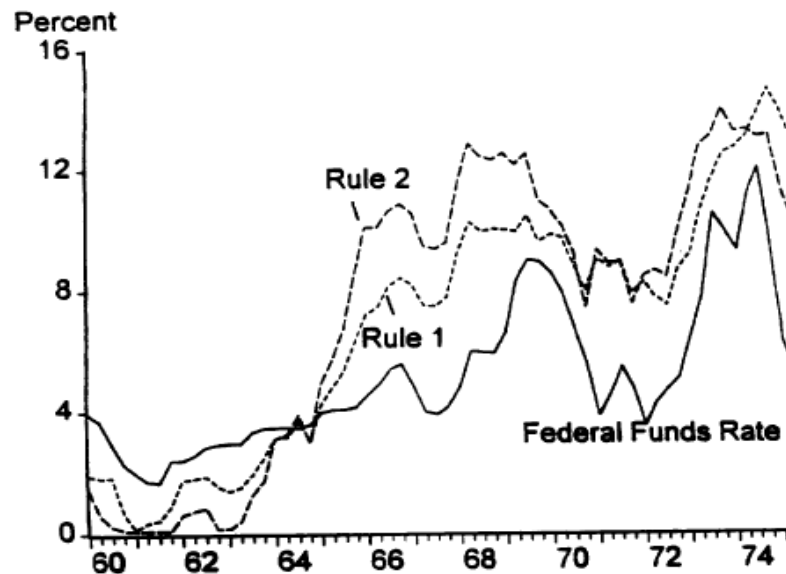


FIGURE 4.

The Federal Funds Rate: Too High in the Early 60s, Too Low in the Late 60s. (Rule 1 and rule 2 are given by the monetary policy rule in equation (1) with $g = .5$ and $g = 1$, respectively).

For the late 1970's and early 1980's we have:

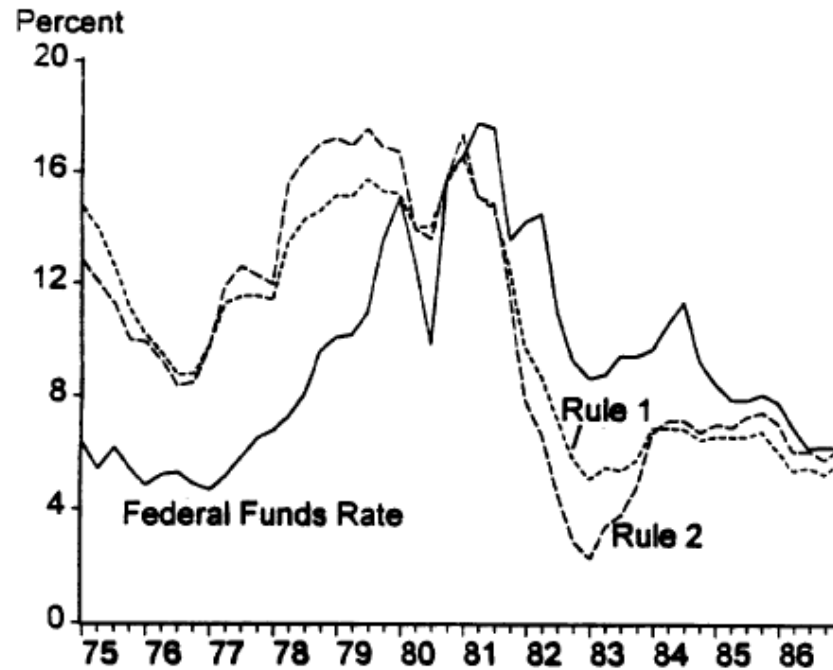


FIGURE 5.

The Federal Funds Rate: Too Low in the 1970s; On Track in 1979-81; Too High in 1982-84. (Rule 1 and rule 2 are given by the monetary policy rule in equation (1) with $g = .5$ and $g = 1$, respectively).

Greenspan through the 90's did a good job:

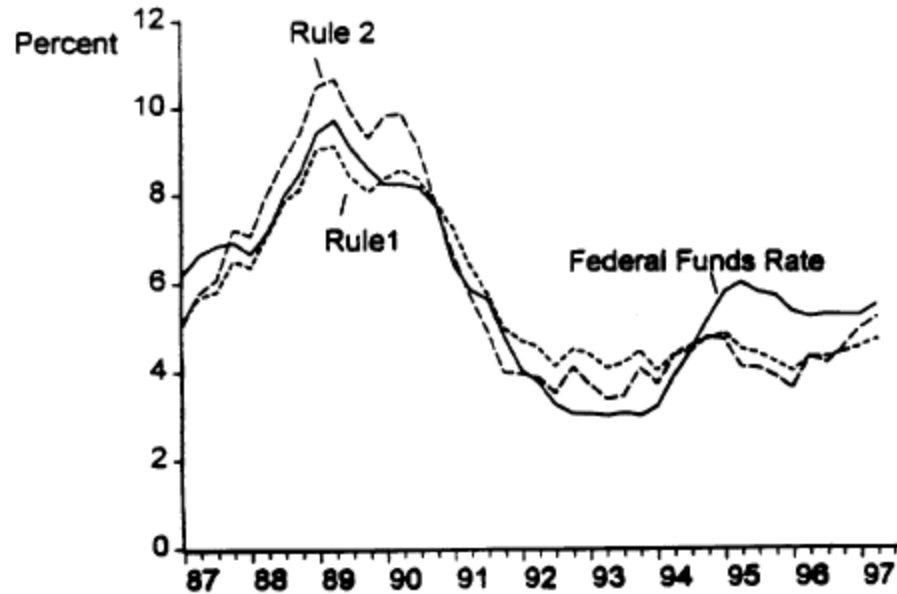
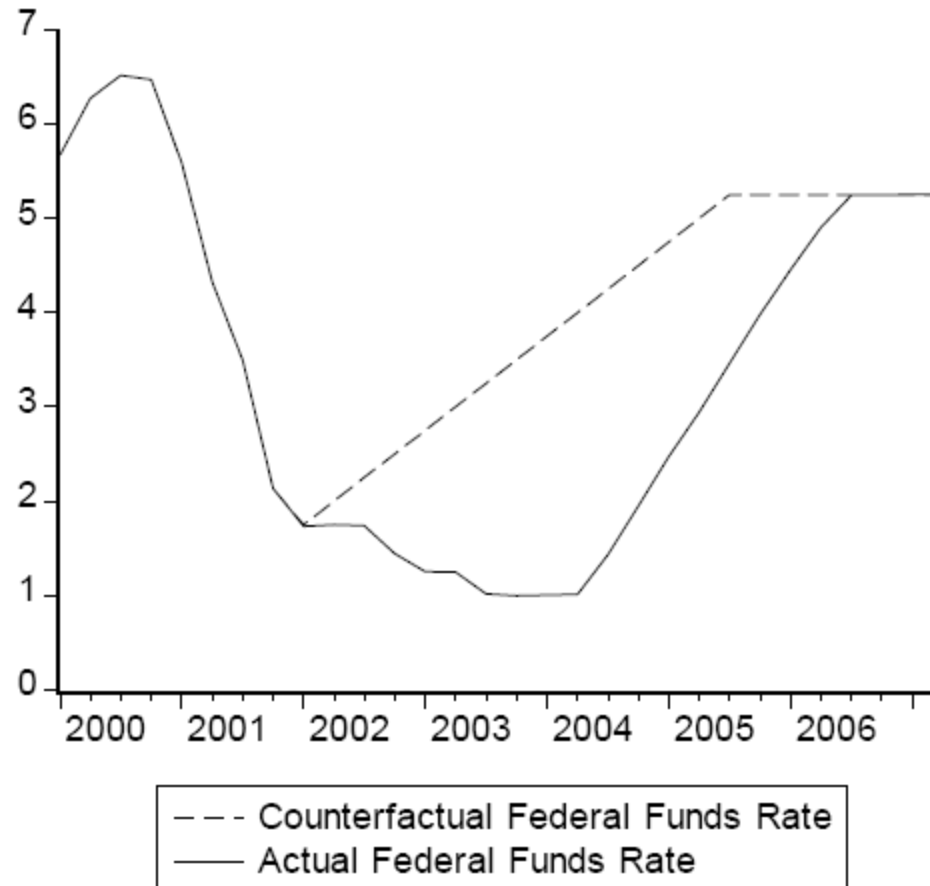


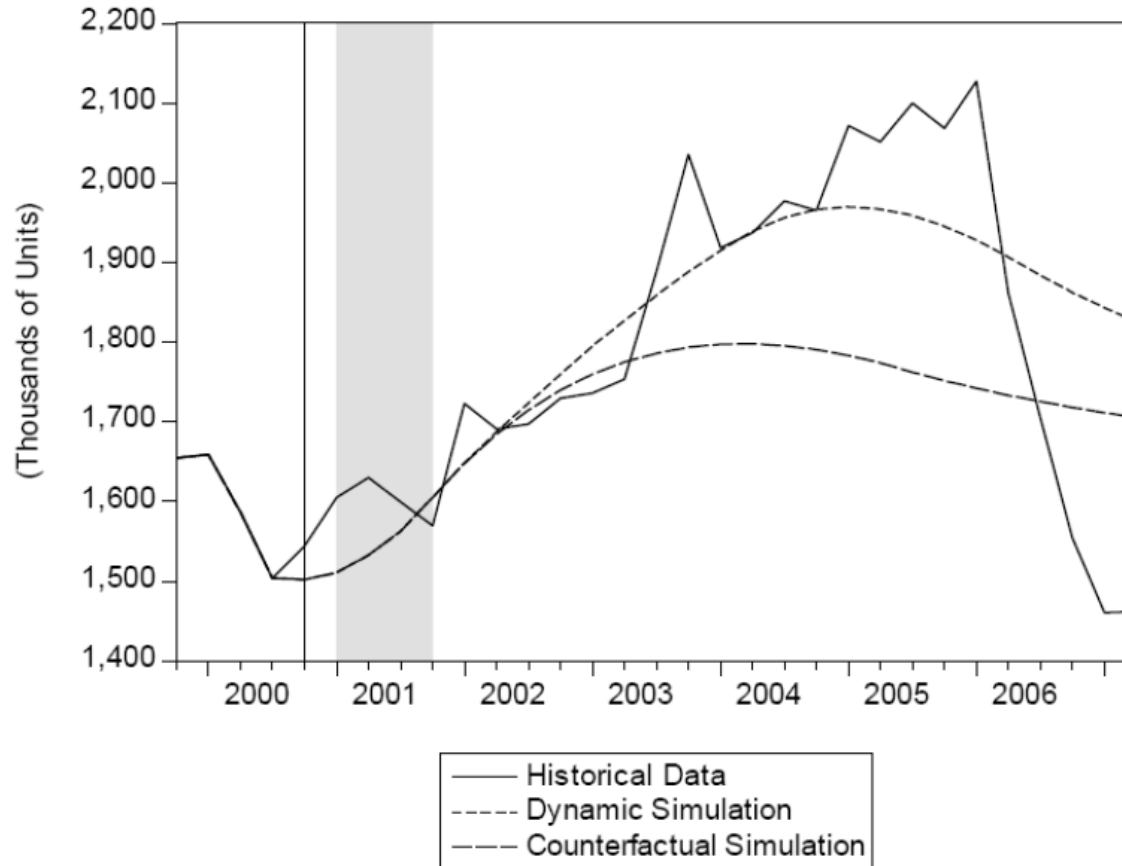
FIGURE 6.

The Federal Funds Rate: On Track in the late 1980s and 1990s
(Rule 1 and rule 2 are given by the monetary policy rule in equation (1) with $g = .5$ and $g = 1$, respectively).

Recently, Taylor has criticized the Fed for keeping interest rates too low:



Taylor claims that this is in part to blame for the housing boom
(Greenspan responded in yesterday's WSJ – the problem was long rates)



The Taylor rule predictions can be monitored via the St. Louis Fed's web site *Monetary Trends*.

(<http://research.stlouisfed.org/publications/mt/>)

Here is what the latest version shows:

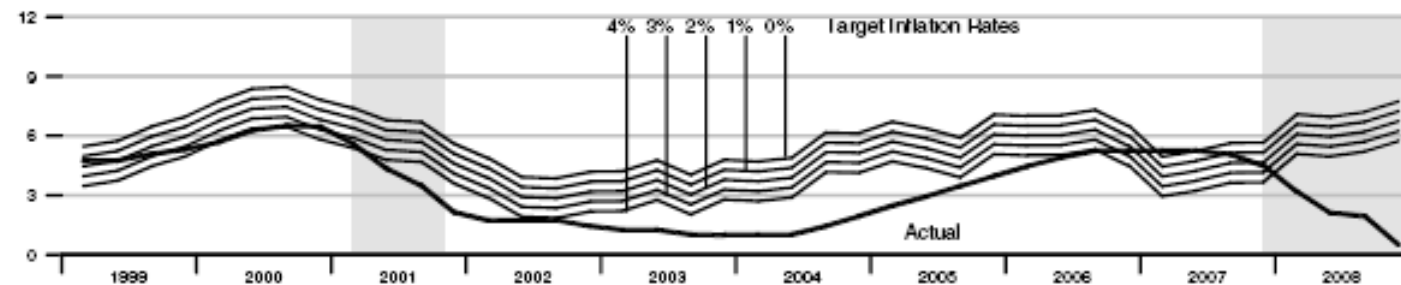
Monetary Trends (St. Louis Fed)

Monetary Trends

updated through
03/02/09

Federal Funds Rate and Inflation Targets

Percent



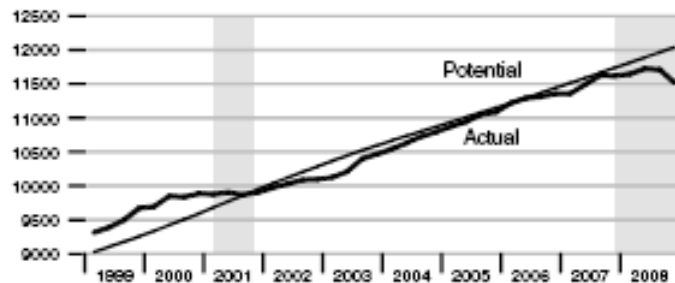
Calculated federal funds rate is based on Taylor's rule.

See notes on page 19.

Components of Taylor's Rule

Actual and Potential Real GDP

Billions of chain-weighted 2000 dollars



PCE Inflation

Percent change from year ago



That completes our coverage of
Macroeconomic Policy!!