PUBLICATIONS

FRBSF Economic Letter

1998-17 | May 22, 1998

More Economic Letters

Central Bank Inflation Targeting

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This Economic Letter *summarizes the papers presented at a conference on Central Bank Inflation Targeting held March 6-7, 1998, under the joint sponsorship of the Federal Reserve Bank of San Francisco and Stanford University's Center for Economic Policy Research.*

The five conference papers (listed at the end) were centered around measuring or evaluating the degree to which inflation should be the focus of the operating framework used to implement monetary policy. Explicit inflation targeting has been adopted by a number of central banks around the world. In practice, inflation targeting is best described as an operational framework for policy decisions in which the central bank makes an explicit commitment to conduct policy to meet a publicly announced numerical inflation target within a particular time frame. All the conference papers — like much of the research literature — model this framework by focusing on "policy rules," that is, specific formulas for adjusting the policy instrument in response to inflation (or forecasts of inflation) and, in some cases, to the state of the economy as measured by the gap between GDP and potential. The research reported in these papers suggested that these simple inflation targeting rules do a good job of capturing the way many central banks behave and that these rules perform well in achieving a balance between output variability and inflation variability.

Four of the conference papers compare the performance of various policy rules in model simulations: The better a policy rule's performance, the more stable output and inflation. This focus reflects a common emphasis in recent policy discussions on the trade-off between variability in output and variability in inflation (Walsh 1998).

The fifth paper takes a different tack. Rather than simulating data from a model, this paper uses historical data to estimate the policy rules that central banks have used. This exercise, by providing evidence on how central banks have actually implemented policy, served to complement the results from the first four papers on which rules perform best.

Policy rules for inflation targeting

The Rudebusch-Svensson paper uses a small empirical model of the U.S. economy to examine the performance of policy rules that are consistent with a policy regime of inflation targeting. Two special features of this research are the choice of an empirical model and the large set of policy rules explored.

The authors choose their model based on three considerations: it is a small linear model with fairly clear and tractable results, it exhibits properties that accord with the spirit of many policy discussions (e.g., a plausible interest rate elasticity), and it is able to reproduce the salient dynamic features of the data relative to an unrestricted model (such as a Vector AutoRegression). However, unlike the other three papers evaluating policy rules, the Rudebusch-Svensson model has no forward-looking expectational terms in the equations for price and spending determination. While the Rudebusch-Svensson model appears to fit the data quite well without these forward-looking terms, their absence raises some questions about the robustness of the policy evaluation results.

The authors find that some simple policy rules that use inflation forecasts do remarkably well in minimizing output and inflation variability. In particular, an implicit rule that adjusts the policy instrument so that the forecasted inflation rate matches the target rate at a horizon of about three years does surprisingly well. Such a rule also appears to be close to the actual decision framework of many central banks under inflation targeting.

Operational policy rules

The McCallum-Nelson paper provides a different example of the type of small, econometrically estimated model that can be used to investigate monetary policy questions. Their model had two distinguishing features. First, savings and portfolio decisions are consistent with optimizing behavior by households. This is important, since it serves to incorporate forward-looking expectations into the model. The expected effects of monetary policy in the future can then have real effects in the present as decisions about consumption, savings, and money holdings adjust in response to these expectations. Second, McCallum and Nelson employ two alternative specifications designed to capture the sluggish adjustment of prices to changes in macroeconomic conditions.

In addition to differing from the Rudebusch-Svensson paper in the choice of model, the McCallum-Nelson paper differs in the approach taken to evaluating policy rules. Rudebusch-Svensson generally start by specifying an objective function for the policymaker and then deriving an optimal policy rule. In contrast, McCallum and Nelson start with policy rules that seem to capture actual central bank behavior and then report the value of output and price level volatility for

different values of the response coefficients in the policy rules. The general type of policy rule they evaluate is of the form suggested by Taylor in which the policy instrument (a nominal rate of interest) is adjusted in response to inflation and the output gap. In addition to Taylor type rules, the McCallum-Nelson paper includes an analysis of interest rate and base money growth rate rules designed to target nominal income.

One advantage of the McCallum and Nelson approach is that it avoids the need to assume an objective function. A disadvantage is that there is no natural way to rank the resulting outcomes with different policy rules. One interesting finding, though, was that policy rules that incorporated some degree of interest rate smoothing seemed to lower both price and output variability. The nature of the inflation-output variability trade-off also appears to be sensitive to the specification of the price adjustment equation.

Implementing price stability

Like the McCallum-Nelson paper, the Tetlow-Williams paper also examines simulations of a forward-looking model. However, the model Tetlow and Williams used — which is the Federal Reserve Board staff's main model of the U.S. economy — is large (containing about 30 behavioral equations and several hundred identities). Consistent with the other conference papers, monetary policy is represented by a rule for setting a nominal short-term interest rate, in this case, the federal funds rate.

The Tetlow-Williams paper analyzes two issues related to inflation targeting. The first is whether target bands for inflation can improve macroeconomic performance. Under a target band system, the near-term inflation target is allowed to fluctuate but must remain between upper and lower limits. The role of such target bands is of interest since some inflation targeting countries have used bands. Tetlow and Williams conclude that with forward-looking expectations, bands can be useful in concentrating the public's expectations of future inflation. To serve this purpose, however, the bands need to be reasonably narrow.

The second issue Tetlow and Williams consider involves the constraint that nominal interest rates cannot be less than zero. This lower bound reflects the fact that no one would lend money with the sure prospect of getting less of it back in

nominal terms (a negative nominal interest rate) because just holding on to the cash (say, under a mattress) will ensure a zero nominal interest rate. With central banks typically using the level of short-term interest rates as the instrument of monetary policy, the zero bound on nominal interest rates might affect the ability of central banks to implement monetary policy, and, particularly, to lower interest rates sufficiently to stimulate the economy from recession. This constraint is more likely to be a factor for very low inflation targets (recall that the nominal interest rate is approximately equal to the sum of the inflation rate and the real interest rate). Tetlow and Williams suggest that, except with an inflation target of zero, the lower bound on interest rates is unlikely to be a serious problem.

When economic behavior changes

The Amano-Coletti-Macklem paper also examines monetary policy rules with a large forward-looking econometric model—in this case, a model of the Canadian economy developed at the Bank of Canada. The authors focus on how changes in economic behavior, and hence the equations of the model, change the nature of the optimal monetary policy rule. The authors consider three changes in economic behavior that are motivated by developments in the 1990s: an increase in monetary policy credibility, a flattening of the Phillips curve linking inflation and unemployment, and a greater degree of counter-cyclical activism of fiscal policy.

The policy rules analyzed are "inflation-forecast-based" (IFB) rules. According to this class of rules, the central bank raises (lowers) short-term interest rates whenever the rule-consistent inflation forecast is above (below) the target for inflation. As Amano, Coletti, and Macklem note, this type of rule plays an important role in policy analysis at two leading inflation targeting central banks, the Bank of Canada and the Reserve Bank of New Zealand. (IFB rules are similar in spirit to the implicit rule in the Rudebusch-Svensson paper, but they are too restrictive to perform well in that analysis.)

Perhaps the most interesting results in this analysis concern changes in central bank credibility, that is, changes in the degree to which the public believes the central bank will meet its inflation target. The central bank is assumed to follow a rule that alters short- term interest rates by some proportion of the difference between the two-year-ahead inflation forecast and the inflation target. As credibility increases, the central bank can attain more stable inflation and output,

but this is typically true only if the central bank adjusts its rule and changes the amount by which it reacts to inflation forecasts. Thus, the best rule for policy may have to adjust to changes in the macroeconomy, even within a framework of inflation targeting.

Some international evidence

In contrast to the other four papers, the conference paper by Clarida, Galí, and Gertler provides empirical evidence on the way policy actually has been implemented since 1979 by the central banks of Germany, France, Italy, Japan, the United Kingdom, and the United States. Clarida, Galí, and Gertler begin by assuming policy responds to expected future inflation and to the current expected output gap. For the Bundesbank, the Bank of Japan, and the Federal Reserve, the empirical evidence supports the view that each responds to movements in expected inflation, with a rise in expected future inflation causing a contractionary shift in policy. In each case, however, there is evidence that policy responds to output conditions as well. They also find that the Bundesbank and the Bank of Japan seem to respond to exchange rate movements and to the U.S. federal funds rate, although these effects are small.

Estimating the policy rule followed by the Banks of England, France, and Italy is complicated by their participation in the European Exchange Rate Mechanism (ERM). From 1990 until the European currency crisis in September 1992, these countries abandoned independent monetary policy in order to fix their exchange rates with the Deutschmark. In an interesting approach to understanding monetary policy during this period, the authors conduct a counterfactual experiment in which they estimate the domestic interest rate that would have occurred in each country if policy had been conducted using the same rule as employed by the Bundesbank. Thus, they estimate the interest rate the Bank of England, for example, would have set if it had responded to domestic inflation and output as the Bundesbank did without being constrained to maintain a fixed exchange rate. The difference between this estimated policy setting and the actual interest rate needed to maintain the fixed exchange rate provides a measure of the economic stress in each country as a result of ERM membership.

For England, France, and Italy, Clarida, Galí, and Gertler find that their stress measure provided evidence of growing stress in the period immediately preceding the exchange rate crisis in September 1992.

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Conference Papers

Amano, Robert, Don Coletti, and Tiff Macklem. "Monetary Rules when Economic Behavior Changes." Bank of Canada.

Clarida, Richard, Jordi Galí, and Mark Gertler. "Monetary Policy Rules in Practice: Some International Evidence." Columbia University.

Rudebusch, Glenn, and Lars E.O. Svensson. "Policy Rules for Inflation Targeting." Federal Reserve Bank of San Francisco.

McCallum, Bennett T., and Edward Nelson. "Performance of Operational Policy Rules in an Estimated Semi-Classical Structural Model." Carnegie-Mellon University.

Tetlow, Robert, and John Williams. "Implementing Price Stability: Bands, Boundaries and Inflation Targeting." Federal Reserve Board.

Reference

Walsh, Carl E. 1998. "The New Output-Inflation Trade-off." *FRBSF Economic Letter* 98-04 (Feb. 6).