The Dual Nature of Forecast Targeting and Instrument Rules: A Comment on Michael Woodford's "Forecast Targeting as a Monetary Policy Strategy: Policy Rules in Practice"

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I thank Michael Woodford for writing such a thoughtful and useful paper on monetary policy. It is filled with fascinating ideas and insights, each carefully explained. As befits this final "Looking Ahead" session of the conference, he proposes an ambitions future research program with the specific practical purpose of implementing "forecast targeting" by central banks.

The Proposed Monetary Policy Research Program

By forecast targeting Michael Woodford means a policy framework in which monetary policy makers choose their policy instruments so that the expected future values of certain target variables are related to each other in every future period. For example, the forecast of an optimally-chosen linear combination of the inflation rate and the GDP gap, or the change in the gap, would be made equal to zero by choosing the instruments of policy appropriately.[1]

[1] In the models Woodford considers, the level of the gap appears in the case of the "discretionary" solution to the optimization problem, while the change in the GDP gap appears in the case of the "optimal" solution. I agree that the latter solution concept is more appropriate in this normative oriented work, though not all models will yield the same results regarding the level of the gap versus its change.

Why do we need such a research program? While some central banks follow procedures similar to forecast targeting, none do it the way Woodford proposes here. Hence, as with early work on instrument rules—in which the interest rate is linearly related to inflation and the real GDP gap—he suggests that the focus now should be on "translational economics" or translating the theoretical ideas into "the actual actions of the central bank."

He draws a useful analogy between this proposed research program and the research program of the 1980s and 1990s which endeavored to translate theoretical work on instrument rules into practice by focusing on practical suggestions—for example that staff should present simulations of policy rules at monetary policy committee meetings—and by examining robustness, uniqueness, and learning issues. Similarly, with forecast targeting, policy makers still must decide on settings for the instruments and need procedures to do so. As Woodford puts it: "Certainly one cannot compare a forecast targeting strategy to [an instrument] rule, without also describing what forecast targeting means for the way in which the policy instrument should be adjusted over time."

Forecast Targeting *Versus* Instrument Rules?

I have no doubt that the proposed research program will be very useful, probably in more ways than we can imagine now. However, in giving a rationale for the proposed research, the paper suggests that forecast targeting rules are better than instrument rules. For example, the paper argues that the forecast targeting approach "provides greater protection against political pressure," is "more predictable," and is more deserving of

being called a policy rule because, in practice, instrument rules are used as guidelines rather than as mechanical formulas.

As I see it, forecast targeting and instrument rules are complementary, rather than alternatives. I think it is important that researchers pursue both approaches. Forecast targeting equations and instrument rules are duals to the same optimization problem. One is the first order condition and the other is the decision rule. There are many examples in economics where first order conditions and decisions rules are used together. Economists do not need to choose, for example, between the first-order condition that a firm sets marginal cost equal to price and the supply curve showing the quantity the firm supplies at each price. They can and do use both. Indeed, as I will try to show below in the case of monetary policy, this dual has been a significant help in the design of instrument rules

The illuminating exchange between Svensson (2005) and McCallum and Nelson (2005) brings out many of the important differences between instrument (mostly interest rate) rules and forecast targeting, but viewing forecast targeting and interest rate rules as mutually exclusive misses important aspects of policy in practice. For example, in the countries where central banks have operating procedures similar to Woodford's proposed forecast targeting—the United Kingdom, Norway, and Sweden— instrument rules serve as a cross-check on policy decisions. Moreover, outside analysts—including those in the private sector, in other branches of government, and even at other central banks—use instrument rules to help assess the policies of these central banks.

One reason why research on monetary policy rules should continue even as the research program Woodford proposes proceeds is that the currently popular interest rate rules, which were derived from monetary models developed in the 1970s and 1980s,

embed key principles of monetary policy that have led to significant improvements in the macro economy. In other words, the Great Moderation was closely associated in time with a Great Monetary Policy Shift as documented by shifts in the reaction coefficients of monetary policy rules. Even if we were sure about a causal connection between this rule-like behavior of central banks and the improved economic performance, we should not be complacent. As the world economy changes and our ability to model the monetary aspects of the economy get better—exemplified Michael Woodford's own contributions—policy rules will likely have to adapt in order to preserve this improved economic performance.

The Road to Instrument Rules Went Through the Land of Forecast Targeting

To illustrate the close link between forecast targeting and instrument rules, let me consider several "case studies" and try to draw some lessons. The first two come from my own research and the third from observing Federal Reserve policy during the past two decades.

An International Comparison of Output and Price Stability in the Bad Old Days

The first example is drawn from Taylor (1980b). In this paper I used the following equation to investigate the nature of optimal monetary policy using data from a number of countries:

$$y_t + \beta p_t = v_t \qquad (1)$$

where $v_t = \eta_t + \theta\eta_{t-1}$ and where p_t is the detrended log price level, y_t is detrended log GDP, and η_t is a serially uncorrelated zero mean random variable. The left hand side of this equation (which is equation (5) from the 1980 paper) is a linear combination of two target variables much in the spirit of Woodford's equation (2.3) with the policy lag parameter $\underline{h} > 0$ due to the moving average disturbance. The policy objective function in my 1980 paper was to minimize a quadratic in y about its target of zero and p about its target of zero. Each choice of β corresponded to different weights in the loss function. Higher β meant more weight on price stability; lower β meant more weight on output stability. There was also a variability tradeoff curve between these two stability goals. Output stability was represented on the vertical axis and price stability was represented on the horizontal axis. Note that this was price level targeting rather than inflation targeting.

The other equation in the model was a forward-looking staggered price setting equation of the form I had recently proposed (Taylor (1980a)). This was still a few years before Calvo (1983) proposed a geometric weighting in the staggered contract model, but the forward looking price setting equation in my paper had properties very similar to equation (2.1) in Woodford's paper. I think this is clear from John Roberts (1995) work, but in any case, I doubt one could distinguish the weighting schemes using the annual observations I estimated the model with.

Using full information maximum likelihood I estimated β and other parameters in the model for ten countries including Norway, Sweden, the U.K. Germany and the United States. The sample period was from the bad old days of high and rising price and output

volatility (1956-1976). The estimates are shown in the following table with the asterisks indicating statistical significance at the 5 percent level.

	β
Austria	0.0114
Canada	0.0901*
Denmark	0.0373
Germany	0.3727*
Italy	0.2967*
Netherlands	0.0008
Norway	0.1255*
Sweden	0.1317*
United Kingdom	0.1165*
United States	0.2936*

Note that Germany had the highest value of β at .37. The United States had a value of .29. Norway and Sweden were close together at .13. Canada and the U.K. were somewhat lower. In my view all these values of β implied too little weight on price stability. I speculated—thinking about the Lucas critique—about the possibility that the tradeoff curve might shift in a favorable direction if β were higher. If so, we could get more output stability and more price stability with a higher β. Such a shift would occur if the speed of price adjustment increased. The speed was determined by a parameter γ in the staggered pricing equation.

I illustrated this possibility with the following tradeoff curve (which is Figure 1 from the 1980 paper). If shifting policy to increase β had the effect of increasing γ, then economic performance would not have to move from A to B; it could move from A to C or to any other point on the improved tradeoff curve.

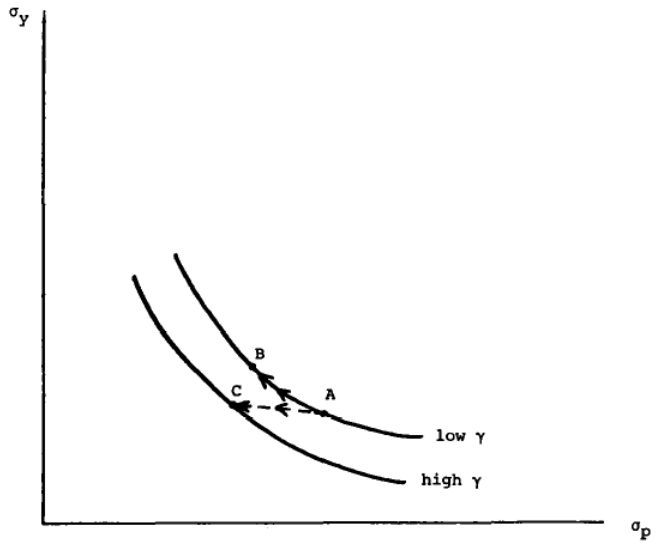

Fig. 1. Effect of a policy induced shift in the output–price stability tradeoff.

The history since the early 1980s shows that a shift in monetary policy did lead to improvements in both price and output stability, which can be explained by a shift in the tradeoff curve, as shown above and as mentioned in the opening remarks by Ben Bernanke at this conference and in Bernanke (2004). To be sure, other things may have led to a decline in output and price level variability, such as a reduction in the variance of the shocks.

But the question back in the late 1970s and early 1980s was: How could the procedures for setting the instruments of monetary policy change in order to increase β? Using the terminology of Woodford, the challenge was to use the result that a larger coefficient in the "high level" targeting rule was needed in order to find a "low level" instrument rule that would bring this about. The monetary policy transmission channel in this 1980 paper was too rudimentary to answer that question.

Nominal GDP Targeting and the Business Cycle

My second example is a paper prepared for a Carnegie-Rochester conference several years later (Taylor (1985)). I this paper I considered what would now be defined as a forecast target in which the growth rate of nominal GDP would be held constant.[2] The equation in that paper was written as follows

$$y_t - y_{t-1} + p_t - p_{t-1} = 0 \qquad (2)$$

Though not fully optimal, this nominal GDP rule was a widely discussed at the time, and I simulated it with a very simple macro model estimated with annual data in the United States. This is the kind of simulation exercise that Michael Woodford is proposing to evaluate the robustness of forecast targeting rules in different models.

By studying the infinite moving average representation of output and inflation with this rule inserted in a model, I found that the rule actually made the business cycle worse. The rule amplified the boom-bust cycle by slowing down the economy when it was far from potential and speeding up the economy when it was nearing potential.

So instead of this targeting rule, I proposed another targeting rule, a modified nominal GDP rule of the form:

$$y_t + (p_t - p_{t-1}) = 0 \qquad (3)$$

[2] Analogously, Svensson (2005) calls a constant growth rate rule for the money supply a forecast targeting rule because the central bank would likely achieve this target by using a money demand equation to determine the appropriate level of the interest rate.

This is also a forecast targeting rule according to Michael Woodford's definition, but one where the growth rate of real GDP is replaced by the level of GDP relative to potential. I found and reported in Taylor (1985) that this modified version of the rule significantly outperformed the nominal GDP rule.

Finally, I considered a slight generalization of equation (3)

$$y_t + \beta(p_t - p_{t-1}) = 0 \qquad (4)$$

in which the slope β could be chosen optimally to yield better performance than (3). Despite the similarity between equation (4) and the proposed forecast targeting rule in Woodford, the underlying models are quite different. Equation (4) does not work as well as equation (2) in the model that Michael Woodford studies, but it works better than (2) in the model I was using (even if the coefficient of unity on the inflation rate in (2) is allowed to take on any value). I believe this is because there is more inertia in the model I used (Taylor (1985)) than in Woodford's model, but the difference illustrates the importance of robustness studies.

The finding that equation (3) or (4) worked better than equation (2) suggested that an good instrument rule should have the interest rate reacting to the level of the GDP gap rather than to the rate of change in GDP, even though this had the disadvantage of making policy more sensitive to uncertain estimates of potential GDP. The obvious lesson from this experience is that research on forecast targeting rules helps us understand, find, and improve on interest rate rules.

Interest Rate Decisions at the Federal Reserve

A third connection between forecast targeting and instrument rules may help explain why some central banks have come as close as they have to following simple monetary policy rules and the key principles embodied in those rules, including the so-called Taylor "greater than one" principle. Of course, using monetary policy rules as a cross check is one explanation, but another is that a decision making process with some of the features of forecast targeting will tend to lead to such policy rule behavior.

In my commentary (Taylor (2005)) at the Jackson Hole conference celebrating the service of Alan Greenspan as Fed chairman, I provided an explanation based on the idea that the Fed practiced an informal type of forecast targeting, though not nearly as formal as Michael Woodford suggests in this paper. "I believe the literal description by which the FOMC has achieved the "greater than one" principle is close to the following. The Fed staff uses models, such as their FRB/US model. When there is an increase in inflation, or a forecast of an increase, the Fed staff, by simulating the model, will show the FOMC that an increase in the funds rate will be needed to reverse it, or prevent it. Now according to any good model that treats expectations and price adjustment sensibly (and FRB/US certainly is in this category), this will require an increase in the *real* interest rate, and will therefore require increasing the federal funds rate by more than one for one with the increase in inflation. So, if the Fed is using its model this way, as I believe it is, then the "greater than one' principle would be implemented by this procedure. To the extent that this process is regularized at FOMC meetings, then the Fed is effectively following the principles imbedded in the policy rule."

Of course, the caveat that the model "treats expectations and price adjustment sensibly" is essential. There is no guarantee that such a decision making process will lead to good monetary policy if the policy makers to not have a good model or do not use it properly.

Conclusion

In conclusion let me say that I greatly enjoyed and learned from Michael Woodford's paper. I have no criticisms of his research proposal to look at the practical application of optimal forecast targeting rules. The case for such research, however, does not rest on criticisms of monetary policy rules for the instruments, which have helped and are continuing to help guide policy as a number of researchers and policymakers have shown.

Though monetary policy rules have accomplished a lot already, they can and must be improved and reassessed as theory and the world changes. What are the most pressing issues confronting policy rules? Preventing the forces of globalization from reversing the good results already accomplished is an important goal of research in my view. Issues of international policy coordination and the role of the exchange rate should be reexamined with the newer more micro-founded models, including the ones presented at this conference.

We also need better principles for "off the rule" behavior as in the case of liquidity shortages, frozen markets, or risk management priorities. In my view such studies are beginning to show that closer adherence to policy rules would be advisable.

Finally, if past experience is any guide, and I have argued it is with some simple historical examples in these comments, then research on forecast targeting will improve the performance and design of monetary policy rules for the instruments in the future.

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