

---

---

## NINE

---

---

# THE DUAL NATURE OF FORECAST TARGETING AND INSTRUMENT RULES

*John B. Taylor*

Michael Woodford's chapter is filled with fascinating ideas and insights, each carefully explained. Most importantly, he proposes an ambitious future research program with the specific practical purpose of implementing "forecast targeting" by central banks.

By forecast targeting Woodford means a policy framework in which monetary policymakers set their policy instruments so that the expected future values of certain target variables follow optimal paths. For example, policymakers would set the interest rate so that the forecast of a linear combination of the inflation rate and the GDP gap follow a certain path.<sup>1</sup>

Why do we need a research program on forecast targeting? 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 related to inflation

---

John B. Taylor is the George P. Shultz Senior Fellow in Economics at the Hoover Institution and the Mary and Robert Raymond Professor of Economics at Stanford University.

1. In the models Woodford considers, the GDP gap is the percentage difference between actual GDP and its potential level. The GDP 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.

and the GDP gap—he suggests that the focus now should be on “translational economics” or translating the theoretical ideas on forecast targeting into “the actual actions of the central bank.”

He draws a useful analogy between this proposed research program and my research program of the 1980s and 1990s which endeavored to translate theoretical work on instrument rules into practice by focusing on workable suggestions—for example, that central bank staff should present simulations of policy rules at monetary policy committee meetings—and by examining robustness and learning issues. Similarly, with forecast targeting, policymakers 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, Woodford suggests that forecast targeting rules are better than instrument rules. For example, he argues that forecast targeting “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 and instrument rules are duals to the same policy optimization problem. One is a condition for optimality and the other is a decision rule. There are many examples in economics where optimality conditions and decisions rules are used together. Economists do not need to choose, for example, between the condition that a firm sets marginal cost equal to price versus 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 duality has been a significant help in the design of instrument rules.

The illuminating exchange between Lars E. O. Svensson (2005) and Bennett T. McCallum and Edward 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. The Great Moderation of the 1980s and 1990s was closely associated in time with a monetary policy shift toward 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 gets better—exemplified by 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), where I used an equation to investigate the nature of optimal monetary policy using data from a number of countries. Here is the equation:

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

where  $p_t$  is the price level,  $y_t$  is the GDP gap, and  $v_t$  is a random shock. The left-hand side of this equation is a linear combination of two target variables much in the spirit of Woodford's equation (2.3) with the policy lag due to the moving average disturbance. The policy objective is to maximize stability of  $y$  and  $p$ . Higher  $\beta$  means more weight on price stability; lower  $\beta$  means more weight on output stability. Under the assumption that some temporary price rigidities exist, one can derive a variability trade-off curve between these two stability goals, with output stability on one axis and price stability on the other axis. Note that this was price level targeting rather than inflation targeting.

The temporary price rigidities were described with a forward-looking staggered price setting model 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 price setting model, but the properties are very similar to equation (2.1) in Woodford's chapter, as is clear from John Roberts' (1995) work.

I estimated  $\beta$  for ten countries including Norway, Sweden, the United Kingdom, 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.

	$\beta$
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  $\beta$  at .37. The United States had a value of .29. Norway and Sweden were close together at

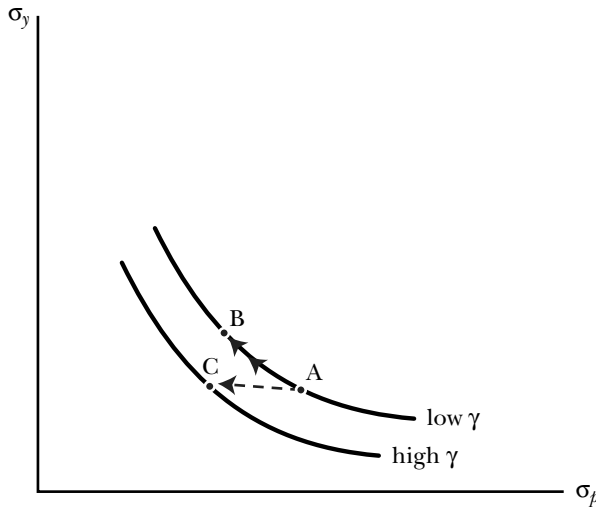


Figure 1. Effect of a policy induced shift in the output-price stability tradeoff.

.13. Canada and the United Kingdom were somewhat lower. In my view all these values of  $\beta$  implied too little weight on price stability. I speculated—thinking about the Lucas critique—about the possibility that the trade-off between output and price stability might shift in a favorable direction if  $\beta$  were higher. If so, we could get more output stability and more price stability with a higher  $\beta$ . Such a shift would occur if the speed of price adjustment increased. The speed was determined by a parameter in the staggered pricing model.

I illustrated this possibility with the following trade-off curve (which is figure 1 from the 1980 paper). If shifting policy to increase  $\beta$  had the effect of increasing the speed of price adjustment, 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 trade-off curve.

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 trade-off curve, as shown above and as discussed by Ben Bernanke elsewhere in this book.

The question I was addressing in the late 1970s and early 1980s was: how could the rule for setting the instruments of monetary policy be changed in order to increase  $\beta$ ? Using the terminology of Woodford, the challenge was to get a larger coefficient in the “high level” targeting rule with a new “low level” instrument rule.

*Nominal GDP targeting and the business cycle*

My second example is from a paper prepared for a conference several years later (Taylor 1985). In this paper I considered what would now be defined as forecast targeting in which the growth rate of nominal GDP would be held constant.<sup>2</sup> The targeting equation in that paper was written as follows:

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

Though not fully optimal, this nominal GDP rule was widely discussed at the time; 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 Woodford is proposing in order to evaluate the robustness of forecast targeting rules in different models.

By studying the dynamic properties 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:

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

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

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

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

in which the slope  $\beta$  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

---

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.

are quite different. Equation (4) does not work as well as equation (2) in the model that Woodford studies, but it works better than (2) in the model I was using. 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 looking at different models in robustness studies.

The finding that targeting rule (3) or (4) worked better than targeting rule (2) suggested that any 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 the decisions of some central banks have come close to simple monetary policy rules and to the so-called Taylor "greater than one" principle, even if they do not literally follow such rules or principles. Of course, the fact that they use 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 Woodford suggests in his chapter. I wrote in this commentary that "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 policymakers do not have a good model or do not use it properly.

## Conclusion

In sum, while I have no criticisms of Woodford’s research proposal on the practical application of forecast targeting rules, the case for such research, in my view, does not rest on defects with instrument rules, which have helped—and are continuing to help—guide policy.

Though monetary policy rules have accomplished a lot already, they can and must be improved and reassessed as theory and the world change. 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 new research shows that closer adherence to policy rules would be advisable. If past experience is any guide, and I have argued it is with some simple historical examples in this chapter, then research on forecast targeting will improve the performance and design of monetary policy rules for the instruments in the future.

## REFERENCES

- Calvo, Guillermo. 1983. “Staggered Contracts in a Utility-Maximizing Framework.” *Journal of Monetary Economics* 12:282–398.
- McCallum, Bennett T., and Edward Nelson. 2005. “Targeting Versus Instrument Rules for Monetary Policy.” Federal Reserve Bank of St. Louis *Review* 87(5) (September/October): 597–612.
- Roberts, John M. 1995. “New Keynesian Economics and the Phillips Curve.” *Journal of Money, Credit and Banking* 27(4) (November): 975–84.
- Svensson, Lars E. O. 2005. “Targeting Versus Instrument Rules for Monetary Policy: What Is Wrong With McCallum and Nelson?” Federal Reserve Bank of St. Louis *Review* 87(5) (September/October): 613–26.
- Taylor, John B. 1980a. “Aggregate Dynamics and Staggered Contracts.” *Journal of Political Economy* 88(1) (February): 1–23.



- . 1980b. “Output and Price Stability: An International Comparison.” *Journal of Economic Dynamics and Control* 2(1) (February): 109–32
- . 1985. “What Would Nominal GNP Targeting Do To the Business Cycle?” *Carnegie-Rochester Series on Public Policy* 22 (Spring): 61–84.
- . 2005. “Commentary: Understanding the Greenspan Standard.” In *The Greenspan Era: Lessons for the Future*. Proceedings of Jackson Hole Symposium, Federal Reserve Bank of Kansas City.