

Overview

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For the past 26 years, participants in the Jackson Hole symposium have enjoyed an annual banquet of provocative papers, rich discussion, and pointed debate on issues central to monetary policy. The Kansas City Fed again deserves our thanks for this end-of-summer feast.

I want to focus my remarks on the implications of uncertainty for monetary policy and the role of instrument rules in the policy process. Carl Walsh summarized and extended a burgeoning literature on instrument rules. I believe it provides valuable insights for policy. As I see it, simple instrument rules are useful to codify the main elements of good monetary policy. They also provide a benchmark to interpret and internalize the lessons of history. They deserve a seat at the policy table. But they should not be in the driver's seat. I agree with Alan Greenspan's assessment that they are a "helpful adjunct to policy." But they're not a substitute for policy judgments derived from a broad range of economic analysis and risk assessments. In my allotted time, I want to explain my reasoning, picking up on themes at the symposium.

Let me begin by explaining why instrument rules are useful. The starting point for research on policy under uncertainty is its assumption about the loss function of central banks. It assumes they want to minimize a loss function that depends on the weighted sum of squared

deviations of inflation from a target level and output from potential. I believe these are the primary goals embraced, with differing weights, by most central banks. It is conceptually possible to derive monetary policy prescriptions (or dynamic programs) that are fully optimal for this purpose, taking into account all of the information available to a central bank at a given time. Lars Svensson has urged policymakers to take exactly this approach, forecasting the paths of inflation and output under alternative policy paths, and choosing the policy that minimizes discounted losses. When uncertainty is nonadditive, conditional probability distributions of the target variables, not just means, must be constructed. Not surprisingly, optimal policies commonly turn out to be complex, model dependent, and unintuitive.

The forecasts on which they are based may also suffer from behavioral biases. One of the most valuable functions of rules, in my opinion, is as a check against these biases. Brad DeLong joked yesterday about how difficult it is to alter a long-held view in the face of evidence to the contrary. He gave it as an example of a behavioral bias. As a former participant in the Fed's forecasting process, I recall worrying that judgmental forecasts, including my own, might suffer from the kinds of biases that psychologists and behavioral economists have found to afflict the decisionmaking of lesser mortals. For example, decisionmakers commonly overweight vivid but anecdotal information. The experience of one's brother-in-law with his Volvo may outweigh the judgment of the large sample of Volvo owners in *Consumer Reports*. The reports of a handful of business executives concerning the robustness of their sales may override aggregate information and forecasts derived, say, from econometric equations. Impatience also leads to problems. When the policy dial has been turned, and no immediate response is forthcoming, it becomes easy to underestimate lags and the size of the long-run policy multiplier. Alan Blinder has compared the pitfalls to those that can befall a hotel guest who arrives in a room that is initially too cold for a comfortable night's sleep. In such an environment, rules can serve as a check on decisions reached through an entirely different process involving forecasts and judgment. This partly explains my enthusiasm for the research on instrument rules that Walsh described.

My intuition concerning the value of instrument rules as guidance in a forecast-based policy process is reinforced by two findings. First, a significant body of work shows that simple feedback rules relating the central bank's policy rate to current and lagged values of inflation, output, and interest rates produce excellent results. This conclusion applies to a wide array of models. It applies to models that are large and small, backward and forward looking. Simple rules perform nearly as well as complicated, fully optimal policies. This is all the more remarkable since optimal policies take hundreds of variables into account. Research suggests that well-designed instrument rules come "close" to the "policy frontier" relating the minimum attainable inflation and output volatilities.

Second, linear reaction functions relating the short-term interest rate to a handful of macro variables do, in fact, provide a remarkably good summary of the monetary policy choices of the G-7 central banks over decades, as Stock and Watson's paper shows. This holds in spite of the fact that these institutions relied on a wealth of data, analysis, forecasts, and judgment. According to Lars Svensson,¹ such rules explain about two-thirds of the variability of policy rates. According to Gregory Mankiw, a slightly modified version of the Taylor rule explains 85 percent of variation in the federal funds rate during the 1990s.² Since central banks systematically respond to output and inflation, and since instrument rules provide guidance on the size and timing of those responses, it is natural to take them into account. But "taking them into account" does not mean tying the central bank to the mast of a policy rule. After all, the 15 percent residual in Mankiw's federal funds equation includes, for example, the Federal Reserve's responses to the 1987 stock market crash, the Russian debt default, and the bank failures and financial headwinds of the early 1990s. These are precisely the situations where the Fed's "risk management" approach was essential to counter large, negative shocks posing serious asymmetric risks.

My conclusion is, thus, that rule-based input should serve as a supplement to the important insights that come from careful analysis

of data, assessment of risks, preparation of forecasts, and the detective work that provides insight on structural change—the bread and butter work of the lion’s share of economists on the staffs of central banks. How rules and forecasting should be combined, however, is an open question that deserves systematic thought. The issue is tricky: The use of rules as mere internal “guidelines” contradicts the assumptions critical to some forward-looking evaluation models—that central bank’s commitment is ironclad and verifiable.

I mentioned at the outset that simple instrument rules help to codify the principles of good policy. Let me elaborate. The Taylor rule is a sensible and intuitive policy guide because it incorporates two core requirements for effective monetary policy. Policy must anchor inflation and inflationary expectations. It must also lean against the cyclical winds.

A comparison of the “reaction functions” of the G-7 central banks with the prescriptions of the Taylor rule helps to highlight where policy went wrong in the 1970s. Stock and Watson’s results show that prior to the 1980s, G-7 central banks systematically violated a cardinal principle of good policy enshrined in the Taylor rule: They raised nominal interest rates by less than inflation. This produced upward drift—a unit root—in inflation. Superficially, the G-7 central banks mistakenly and inappropriately focused on nominal rather than real interest rates.

The post-1979 reaction functions in the Stock and Watson paper show that this policy error has now been remedied. Ken Rogoff’s paper shows that with inflation properly anchored, inflation no longer follows a unit root. The decline in the level and volatility of inflation constitutes the major payoff, according to Stock and Watson. Policymakers have moved closer to the “policy frontier.” I agree with Rogoff, of course, that the real cause for the global policy failure of high inflation runs far deeper than some mere technical mistake. Rogoff’s paper and the discussion surrounding it highlighted many interesting alternative hypotheses.

Over the last few years, research on instrument rules has focused heavily on the important issue of “mismeasurement.” Issues relating to mismeasurement were central to monetary policy during the second half of the 1990s. The Federal Reserve struggled to understand why inflation continued to edge down as unemployment fell toward 40-year lows. Structural shifts, including an incipient productivity boom, perhaps also globalization and deregulation, were affecting potential output, the NAIRU, and the natural rate of interest. Greenbook forecasts, which are central in the monetary policy process, implicitly rely on such estimates. But estimates of the “natural rates” are not only necessary for optimal monetary policy, they are also required for implementation of the Taylor rule. If these inputs to the application of the Taylor rule are in error, so too would be its prescriptions for monetary policy. Walsh suggested that a robust approach to handling uncertainty about these time-varying parameters is to rely on “difference” rules, and this conclusion commands a growing consensus. I would like to comment on this conclusion because, to my mind, it epitomizes why rules should be used as a complement to, and not a substitute for, good judgment and forecasts.

To understand the motivation for difference rules, it is necessary to appreciate the shortcoming of the Taylor rule it is intended to solve. It turns out that continued application of Taylor rule prescriptions, with either of the two “natural rates” incorrectly estimated, produces outcomes that are dreadful, especially with respect to inflation. This occurs because the Taylor rule tolerates permanent deviations of inflation from its target. To illustrate the problem with the Taylor rule, consider an alternative interpretation of the policy failure of the 1970s advanced by Athanasios Orphanides. In Orphanides’ view, U.S. policymakers followed identical Taylor rule-type reaction functions throughout the postwar period, but produced high and volatile inflation in the 1970s because they consistently overestimated potential output following the productivity slowdown and oil shocks.

The research described by Walsh this morning suggests that to remedy this problem with the Taylor rule, policy rules should allow feedback

from the lagged interest rate and should focus on *changes* in unemployment or GDP *growth* instead of the noisy and mismeasured *level* of the output gap. Difference rules insist that deviations of inflation from target be eradicated by continued adjustments in the real federal funds rate. A policymaker following a pure difference rule simply would not have tolerated the persistent high inflation of the 1970s.

Policy evaluation exercises commonly find that difference rules are more robust to mismeasurement than Taylor-type level rules. But consider the potential pitfalls of a difference rule approach in the 1990s: With declining unemployment after 1994, and inflation at or above target, a difference rule would have called for the Fed to keep hiking the federal funds rate until growth slowed below trend. But unless the response coefficients in the rule, which are model-sensitive, were “just right,” such an approach would have caused overkill. Why then do difference rules look so good in policy evaluation exercises? I think that reason is because they are compared to strawman alternatives in which the central bank sits on its hands indefinitely, tolerating inflation outcomes persistently above target. This is not a sensible alternative.

The sensible alternative is for policy to respond to structural uncertainty by continually updating the natural rates that feed into Taylor-type rules. This process requires analysis and judgment. Indeed, this is what I think the Fed did in the second half of the 1990s. It also explains why it was so successful. It constantly re-estimated the “natural rates” as inflation came in below forecasts and demand growth surprised on the high side. The ingenious detectives at the Fed did well because they figured out a lot about what was going on and why.

In an interesting paper, Laurence Ball and Robert Tchaidze compared Fed policy with the predictions of a reaction function estimated with pre-1996 data. After 1995, the Fed reacted very little to the decline in unemployment, so Ball and Tchaidze find a growing gap between actual and predicted policy by the beginning of 1997. Only when the unemployment rate approached 4 percent did the Fed begin to tighten. Ball and Tchaidze argue that the FOMC, along with outside forecasters, was

lowering its estimate of NAIRU in response to favorable supply shocks as the productivity shock, in particular, became more evident and the linkages between faster productivity growth and NAIRU become more obvious. When the declining NAIRU estimates of forecasters are substituted in the Fed reaction function, Fed behavior looks quite normal. In other words, the Fed was updating its views concerning NAIRU throughout the period, not changing its reactions. It succeeded by mixing rules, forecasts, and judgment. I think this is the right approach.

I want to conclude by highlighting an issue relating to policy design under uncertainty where the research progress has been substantial. The issue concerns the appropriate handling of the zero bound. Here, the results from stochastic simulations are intuitive, and I suspect that they have been helpful to the Fed.³ First, the research shows that it is important to have a “cushion” in the inflation target to minimize the deterioration in macroeconomic performance due to the “zero bound” problem. For the United States, research suggests that a cushion of at least 1 percent (on top of measurement bias) is needed to avoid significant deterioration in macroeconomic performance, while a 2 percent cushion virtually eradicates economic problems relating to the influence of the zero bound. A larger inflation buffer becomes especially desirable if there is good reason to think that the “neutral real fed funds rate” is particularly low, as it might be in a post bubble economy, so that the odds of hitting the zero-bound are high.

The research also shows that the presence of the zero bound provides an argument for a nonlinear reaction function in which policy responds more aggressively and pre-emptively to a decline in inflation below target than to a movement above target. Here, the insurance principle that Alan Greenspan enunciated yesterday applies with a vengeance. The zero bound problem is easier to prevent than to cure. If policy is too easy and inflation rises above target, it is always possible to tighten to bring inflation down. But if inflation falls below target, the risk is that a central bank will lose its ability to stimulate the economy in the event of a prolonged downturn or further negative shocks with high costs. Since the risks are asymmetric, the policy response should be

asymmetric. A nonlinear policy would, for example, call for a central bank to lower its interest rate more rapidly toward zero and hold it at a low level for longer than the Taylor rule would suggest. It thereby reduces the odds that the zero bound will be a constraint. If understood, this policy should also flatten the yield curve, bringing long-term rates down sooner and more. The research shows that aggressive ease is justified even if the odds of outright deflation are low and a deflationary spiral remote. This logic seems quite consistent with the Fed's aggressiveness in responding to the downturn in the economy. The federal funds rate was, for quite some time, considerably below the level predicted by the Fed's usual reaction function.

Let me conclude where I began, with compliments to the chefs at the Kansas City Fed for another great feast.

Endnotes

¹Lars E. O. Svensson, "What is Wrong with Taylor Rules? Using Judgment in Monetary Policy through Targeting Rules," *Journal of Economic Literature*, 2003, p. 57.

²See N. Gregory Mankiw, "U.S. Monetary Policy During the 1990s," in Jeffrey Frankel, ed., *American Economic Policy in the 1990s*, MIT Press, 2002.

³See especially David Reischneider and John Williams, "Three Lessons for Monetary Policy in a Low Inflation Era," Finance and Economics Discussion Series, Board of Governors of the Federal Reserve System, September 1999.