The Importance of Being Predictable

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Remarks Prepared for the Policy Panel on
"Monetary Policy Under Uncertainty"

23rd Annual Policy Conference
Federal Reserve Bank of St. Louis
October 19, 2007

It is a pleasure to participate in this conference and join in the recognition of Bill

Poole. My remarks build on two of Bill Poole's important contributions to monetary

theory: his 1970 *Quarterly Journal of Economics (QJE)* paper on monetary policy under

uncertainty and his more recent series of lucid short papers on predictability,

transparency, and policy rules, many of which were adapted from speeches and published

in the *Review* of the Federal Reserve Bank of St. Louis.

At the same time I want to express my appreciation for Bill's extraordinary

service in public policy: starting in the 1960s as a member of the staff of the Federal

Reserve Board where he wrote his 1970 QJE paper and many others; then later as a

member of the President's Council of Economic Advisers during the difficult disinflation

of the early 1980s, where his role in explaining and supporting the Fed's price stability

efforts was essential; and most recently as President of the Federal Reserve Bank of St.

Louis, where his emphasis on good communication and good policy has contributed, and

will continue to contribute, to improvements in the conduct of monetary policy.

Regarding these contributions I give two of my favorite examples of Bill Poole's many

pithy phrases which I hope will ring in monetary policy makers' ears for many years to

come: "We ignore the behavior of the monetary aggregates at our peril." (Poole (1999))

and "Clearly, more talk does not necessarily mean more transparency." (Poole (2005a))

The Beginnings of Research on Policy Rules in Stochastic Models Circa 1970

Let me begin by reviewing Bill Poole's deservedly famous 1970 *QJE* article. In my view that paper conveyed two novel messages, one about *dealing with* uncertainty and the other about *reducing* uncertainty.

An Approach to Monetary Policy That Could Deal with Existing Uncertainty

The first message was presented in the form of a simple graphical ISLM analysis, and soon textbook writers incorporated this analysis in their macroeconomics and money and banking textbooks. At the time Poole wrote his paper, the typical IS and LM curves were drawn without a notion that they could move around stochastically. Bill Poole showed how adding exogenous disturbances to the curves provided a simple framework for monetary policy decision making under uncertainty.

While the framework was simple, the message was extremely useful: When shocks to money demand are very large, central banks should target the interest rate because those shocks would otherwise cause harmful swings in interest rates. When shocks to investment demand or consumption demand are very large, central banks should target the money supply because the interest rate will move to mitigate these demand shocks. Hence, the Poole analysis showed explicitly how policy makers could deal with exogenous uncertainty in a formal mathematical way.

An Approach to Monetary Policy That Could Reduce Uncertainty

The second message was more complex and profound, and also more relevant for my purpose here. Poole investigated what he called a "combination policy" involving both the interest rate and the money supply, and he examined its properties in an economy-wide dynamic stochastic model. The model, with the combination policy inserted, could be written as a vector autoregression. Poole showed how to compute the steady state stochastic distribution implied by the model. He also showed how to find the optimal policy to minimize the variance of real GDP around the mean of this stochastic steady state distribution. The method involved finding the homogeneous and particular parts of the solution and then writing the endogenous variable as an infinite weighted sum of lagged shocks—what is now commonly called an impulse response function.

The combination policy had key features of active monetary policy rules in use today. The policy involved the money supply (*M*), the interest rate (*r*), and lagged values of real GDP (*Y*). Poole wrote it algebraically as:

$$M = c_1' + c_2'r + \text{lagged values of } Y \text{ ,}$$

where the coefficients c_1' and c_2' were determined to minimize the variance of real GDP in the steady state stochastic distribution. He showed that the optimal policy yielded a smaller loss than the fixed interest rate policy, the fixed money supply policy, or a combination policy that ignored the reactions to lagged real GDP.

Note that, although the rule was active, there was no discretion here. Once those parameters were chosen they would stay for all time. People criticized Poole for this rule

approach, and argued instead in favor of discretion. They said that policymakers could see or forecast the shocks to the LM curve and the IS curve and adjust the policy instruments as they saw fit without having to stick to any one policy rule. For example, I have a vivid memory of discussing the Poole paper with Franco Modigliani after I presented a paper at MIT later in the decade. He insisted that there was no reason to constrain policy makers the way Poole did. There was still an enormous resistance to policy rules, even the active sort, at this time.

However, while discretionary actions might improve performance in a given situation, the possibility of discretion, and especially its misuse, could add to the uncertainty already in the markets. The advantage of Poole's active policy rules was that they were more predictable and could therefore reduce uncertainty. The second lesson from Poole's 1970 paper was thus that policy making based on rules would improve economic performance by reducing uncertainty compared with policy making based on pure discretion.

This same basic stochastic dynamic modeling approach was applied again and again in the 1970s and 1980s, eventually to more complex empirically estimated models with rational expectations and sticky prices. Optimal rules were computed in these newer models. Over time the resistance to active policy rules began to weaken. Most surprising was that actual monetary policy decisions became more predictable and could even be described closely by policy rules. Most rewarding was that the more predictable rule-like behavior yielded improved policy performance. And most interesting is that we can now look back at this period of greater predictability and learn from it.

Rules of Thumb in the Private Sector

An unanticipated advantage—at least from the vantage point of 1970—of the more predictable behavior by central banks has been the response of the private sector. Recognizing that the central bank's interest rate settings are following more regular rule-like responses to such variables as inflation and real GDP, the private sector has taken these responses into account in projecting future variables and in developing their own rules of thumb for making decisions. An important example is the formation of expectations of future interest rates, which affect bond traders' and investors' decisions and thereby influence long term interest rates, as has been emphasized by Poole in his more recent writings. I quote from a paper he gave earlier this year (Poole (2007b):

"What our analysis missed a generation ago was that the typical model with only one interest rate could not possibly allow for stabilizing market responses in long rates when the central bank set the short rate. Of course, macro econometric models did have both short and long rates, but the structure of the models did not permit analysis of the sort I am discussing because the typical term structure equation made the long rate a distributed lag on the short rate. The model's short rate, in turn, was determined by monetary policymakers setting it directly or by the money market under a policy determining money growth. Once we allow expectations to uncouple the current long rate from the current short rate, the situation changes dramatically. The market can respond to incoming information in a stabilizing way without the central bank having to respond. Long bond rates can change, and change substantially, while the federal funds rate target remains constant."

In this example the private sector has adapted to a particular policy rule in which the short term interest rate rises by a predictable amount when inflation rises. Thus, if expectations of inflation rise, the private sector will predict that the central bank will raise short term interest rates in the future; traders will then bid down bond prices, raising long term interest rates, and thereby mitigating the inflationary impulse before the central bank action is needed.

There are other examples where private sector behavior has adapted to rule-like behavior of the central bank. Consider foreign exchange markets. Empirical studies show that when there is a surprise increase in inflation, the immediate reaction in foreign exchange markets is an appreciation of the currency. Yet conventional price theory would predict the opposite, a negative correlation between exchange rates and inflation, because higher prices make goods at home relatively expensive requiring a depreciation of the currency to keep purchasing power from moving too far away from parity. But the regular central bank interest rate response to inflation explains the empirical correlation. How? An increase in inflation implies that the central bank will raise the interest rate, which makes the currency more attractive, bidding up the exchange rate.

There are many other examples where individuals and institutions in the private sector adapt to policy induced correlations. In effect, they are creating their own rule-like behavior, their own rules of thumb, and we are probably unaware of most of them. Indeed, the individuals who act on them may not even know that they derive from the rule like behavior of policy makers. Of course, it is not only the private sector in the United States. Markets all over the world follow closely what the Fed is likely to do.

And it is not only the private sector. Central banks take account of the predictable behavior of the other central banks and in particular the behavior of the Federal Reserve, which matters greatly for their own decisions. For example, the recent June 2007 Monetary Policy Report of the Norges Bank states that "It cannot be ruled out that a wider interest rate differential will lead to an appreciation of the krone. This may suggest a gradualist approach in interest rate setting." In other words, actions by the Federal Reserve which affect the interest rate differential will in tern influence interest rates set by other central banks. This effect can also occur automatically—another rule of thumb—if model simulations used to set interest rates at central banks assume, as they usually do, that other central banks follow such policy rules.

An implication of this development is that if central banks depart from their regular responses, then they run the risk of disrupting private sector rules of thumb. Even if they explain the reason for the irregular behavior as clearly as possible, emphasizing that it is temporary, some individuals or institutions may continue operating with the old rules of thumb unaware that theses rules have anything to do with the monetary policy induced correlations.

For example, during the period from 2002 to 2005 the interest rate in the United States fell well below levels that would have been predicted from the behavior of the Federal Reserve during most of the period during the Great Moderation. Using modern time series methods, Jarociński and Smets (2007) showed in his paper for this conference that there was such a deviation, and they linked the deviation to the boom and bust in housing prices and construction. In Taylor (2007) I argued that the resulting acceleration of housing starts and housing prices, as well as the low interest rates, may have upset

rules of thumb that mortgage originators were using to assess the payment probabilities based on various characteristics of the borrower. Their programs are usually calibrated in a cross section at a point in time. If housing prices start rising rapidly, the cross section will show increased payment probabilities, but the programs will miss this time series element. When housing prices reverse, the models will break down. It would have been very difficult to predict a break down in the rules of thumb such as the mortgage underwriting programs, but if it had not been that rule of thumb it might have been another.

Another related example was negligible response of long term interest rates when the Federal Reserve raised short term interest rates in 2004 and 2005. This might be explained by this same deviation. Investors my have felt that the Fed had departed from the kind of rule that formed the basis of the longer term interest rate responses of the kind discussed in the above quote by Poole.

Two examples from international monetary policy issues are also worth noting. Following the Russian debt default and financial crisis of 1998 there was a global contagion which affected emerging markets with little connection to Russia. The contagion even reached the United States, led to the Long Term Capital Management crisis, and caused enough of a freeze-up in U.S. markets that the Federal Reserve reduced the interest rate by 75 basis points. In contrast following a very similar default and financial crisis in Argentina in 2001, there was virtually no contagion. The main difference between these two episodes in my view is predictability. In the case of Russia the IMF suddenly removed financial support, only one-month after renewing it. This surprise disrupted the world's financial markets. In contrast, in the case of Argentina, the

IMF gradually reduced support and was clear as it possibly could be in its intentions. Hence, there was little surprise. The default and currency crisis were discounted by the time they happened.

Another international example is the currency intervention policy of the United States and the other key currency countries. There has been no intervention by the United States and Europe in these markets since September 2000. And since March 2004 Japan has not intervened. Moreover, most policy makers in these countries have suggested a strong aversion to intervention in the currency markets. In effect, compared to a policy of frequent intervention, as in the 1980s and 1990s, the currency policy has become much more predictable. The assumption of zero intervention in most circumstances is a good one. What has been the result? The behavior of the major currencies has been less volatile and even the volatility of volatility has come down.

It is difficult to prove causality in any of these examples, and certainly more research is needed. Our experience with different degrees of predictability is increasing and strongly suggesting of the advantages of predictability of policy and the risks of unpredictability.

Toward Greater Predictability

There have been great strides in improving monetary policy predictability at the Federal Reserve and other central banks in recent years, as Bill Poole has documented and explained (Poole (2003a, 2003b 2005a)). Can we make monetary policy even more predictable?

One suggestion is to publish the Fed's balance sheet on a daily basis, or at least the Fed balances that commercial banks hold at the Fed. This would make it easier to interpret episodes where the central bank decides to provide additional liquidity in the over night money market as on August 9th and 10th of this year. The available data on repos does not provide the information that analysts need to interpret these actions and to distinguish them from monetary policy actions aimed at overall macroeconomic goals of price stability and output stability.

Another suggestion would be to publish some of the key assumptions used in formulating policy, including potential GDP and/or the GDP gap, or at least publish these with a shorter lag. This would make it easier for the private sector to assess the deviations from policy rules. In this regard it is interesting that Bill Poole's recent analysis of the Fed's policy rule (2007a) could not go beyond 2001, because the data on the GDP gap was not released beyond that date.

What about the Federal Reserve formally announcing numerical inflation targets as other central banks have done? I have suggested moving slowly in this direction because a sudden change could be misunderstood, and because policy has worked well for two decades with a more informal inflation target. A further lengthening of the inflation forecast horizon for the Monetary Policy Report would be an example of a more gradual change and would be a good step in my view.

I have been concerned that placing more emphasis on a numerical inflation target could take emphasis away from predictability in setting the instruments. From the perspective of a policy rule approach, publishing one part of the rule—the inflation target—and not publishing other parts—the reaction coefficients—would create an

asymmetry in a direction away from the regular reactions of the instruments which I have stressed in these remarks. Perhaps there is a way to prevent creating such an asymmetry. For example, the possibility of a joint announcement might be considered, perhaps both a target range for the inflation rate from 1.5 percent to 2.5 percent and a target range for the reaction coefficient of the interest rate to the inflation rate from 1.5 to 2.5 percent, but there are many other possibilities.

Conclusion

In these remarks I have tried to convince you of the importance of being predictable in monetary policy, building on Bill Poole's paper written nearly four decades ago and on more recent experience with different degrees of predictability in practice. One of the key points, which needs much more research, is how the private sector and other public sector institutions develop rules of thumb that are based, perhaps unknowingly, on the systematic rule-like behavior of the monetary authorities. These private sector rules of thumb can improve the operation of the economy, but they can be broken in unanticipated and disruptive ways if policy becomes less predictable even for a short time and even if policymakers make their very best efforts to explain why.

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