WHAT WE KNOW AND DON'T KNOW ABOUT MONETARY POLICY AND ITS EFFECTS

1. THE ISSUES

- How strong are the effects of monetary policy?
  - Real vs. nominal
  - Systematic vs. random
- Is the rise in US inflation in the 70's and the subsequent fall explained by bad, then good, monetary policy?

There is considerable disagreement still about the size and nature of the effects of monetary policy, but in this one lecture there is not time to review all the evidence on that. We focus mainly on the question about history — which is of course related to the question about policy effects.

2. SYSTEMATIC VS. RANDOM

Monetary policy can have a strong effect on the behavior of the economy without being erratic. That is, it could be that policy responds very systematically to the state of the economy, that changing that systematic response might have strong good or bad effects, and that at the same time very little of the economy's behavior is explained by the small non-systematic, or random, variations in monetary policy.

Policy-makers resist the idea that much of what they do is "random", and it is a relatively non-controversial result from the empirical structural VAR literature that they are right about this. Most variation in the Federal Funds rate, the main monetary policy instrument in the US, is predictable from the state of the economy. The finding that random components of monetary policy are relatively small and are a small part of the explanation of historical fluctuations in the US is not in conflict with the idea that monetary policy is important — though it is in conflict with the 1970's version of monetarism as reflected in the Cagan quote below.

3. MONETARISM

The position of the monetarists in the 1970's was that monetary policy could be characterized as determining the rate of growth of aggregate money, with the particular aggregate chosen not mattering a great deal. Furthermore, the claim then was that much or most observed cyclical fluctuation in the economy was due to erratic fluctuations in monetary policy, as measured by erratic fluctuations in the growth of monetary aggregates. For example, **?**, p.91 wrote

> Debates tend to accentuate extreme views. It should be emphasized, therefore, that monetarists do not claim that reasonably constant monetary growth (and its necessary corollary, freely floating exchange rates) will produce a millennium free of disturbances to the economy and of fluctuations in economic activity. They claim only that economic instability will be much less than in the past.

The argument was not that policy was deliberately bad, but rather that well-meaning attempts to intervene in the business cycle led regularly to miscalculations and mistakes. The view that stabilizing monetary growth would reduce economic instability depended on the idea that there were substantial real effects of monetary policy errors that accounted for much of historically observed cyclical fluctuation.

4. The story of the rise and fall of inflation

It is now widely believed that the rise in inflation in the US in the 1970's can be explained by bad monetary policy, with the decline after 1980 explained by a change to good monetary policy. In a seminal paper, Clarida, Galí, and Gertler (2000) claimed to show that monetary policy before the end of 1979 had made the Federal Funds rate respond less than proportionately to inflation, and that this violation of what is sometimes called the "Taylor principle" implied that the price level may have been indeterminate and subject therefore to "sunspot" shocks before 1979.

5. CGG identification problems

The CGG paper uses estimates of a single equation, meant to describe Fed interest-rate-setting behavior, to make its point. The equation sets the current interest rate to be a function of expected future inflation, expected future output growth or output "gap", and (in some specifications) lagged interest rates. Since expected future values are not observed, the paper substitutes actual values for expected future values and uses instrumental variables methods to estimate the equation. This setup is subject to two serious identification problems:

- The instrumental variables they use have to be assumed not to enter the policy reaction function directly, which is dubious.
- Because the full system of equations is never made explicit, there is no analysis of the possibility that other equations of the system than the policy reaction function might satisfy the same identifying restrictions. This is a real danger in this model. A Fisher equation equilibrium condition has very nearly the same form and identifying restrictions as the policy behavior equation.

6. A SIMPLE MODEL TO DISPLAY THE CGG IDENTIFICATION PROBLEMS

The model is written in terms of the interest rate r, logarithmic deviation from steady state of output y, and inflation π. Its equations are

$$\text{M policy:} \qquad r_t = \alpha_0 \pi_{t-1} + \alpha_1 y_{t-1} + \alpha_2 r_{t-1} + \varepsilon_t \tag{1}$$

$$\text{IS:} \qquad E_t y_{t+1} = y_t + \gamma(r_t - E_t[\pi_{t+1}] + \log\beta) + \xi_t \tag{2}$$

$$\text{Phillips curve:} \qquad \pi_t = \theta_0 E_t[\pi_{t+1}] + \theta_1 E_t[y_{t+1}] + \omega_t \tag{3}$$

$$\tag{4}$$

With reasonable parameter values[1], this model's solution implies that inflation is serially uncorrelated, that other variables follow MA(2) processes, and that there is a single state variable (the linear combination of lagged variables appearing on the right-hand-side of the monetary policy equation). With reasonable parameter values ($\alpha_0/(1-\alpha_2) > 1$) The policy rule implies a strong long-run response of interest rates to any sustained increase in inflation (which of course does not occur in equilibrium), so there is no problem with existence or uniqueness of a solution.

Any attempt to estimate a purely forward-looking Taylor rule from data generated by this economy by instrumental variables methods would fail. Because of the one-dimensional state, there is really only one instrument available for the two expected future values on the right-hand-side of a forward-looking Taylor rule. Indeed, if twice-lagged variables were used as instruments, they would have no correlation at all with the variables they were instrumenting for. As is well known, in this weak-instrument situation, results might easily nonetheless appear to be significant.

While this result is extreme, resulting from the simplicity of the model, it illustrate problems that will be present in any model. If policy succeeds in keeping inflation low and stable, it will make variation in expected future inflation small, and may easily make high current nominal rates predict low, not high, future inflation. This is likely to make IV results erratic, as well as necessarily misleading when the Taylor rule is not in fact forward-looking.

Furthermore, if we expanded this model, say by adding more lags on the right-hand-sides of the first and third equations, so that IV methods are at least possible, they would estimate the IS equation, not the policy rule. If the second (IS) equation is renormalized to have r_t on the left, it relates current r to expected future inflation, expected future output growth, and a shock. Since this is the same form as the forward-looking Taylor rule, and the equation is distinguished from the other two by the identifying assumptions, IV methods to estimate such an equation would reproduce the IS curve, normalized on r_t as left-hand side variable. This would of course give a coefficient on expected future inflation of approximately one, implying a high probability, given the data, of values less than one. But this would not indicate any problem with existence or uniqueness of equilibrium.

[1]For example, $\alpha_0 = .3$, $\alpha_1 = .4$, $\alpha_2 = .8$, $\gamma = 2$, $\theta_0 = .9$, $\theta_1 = .3$.

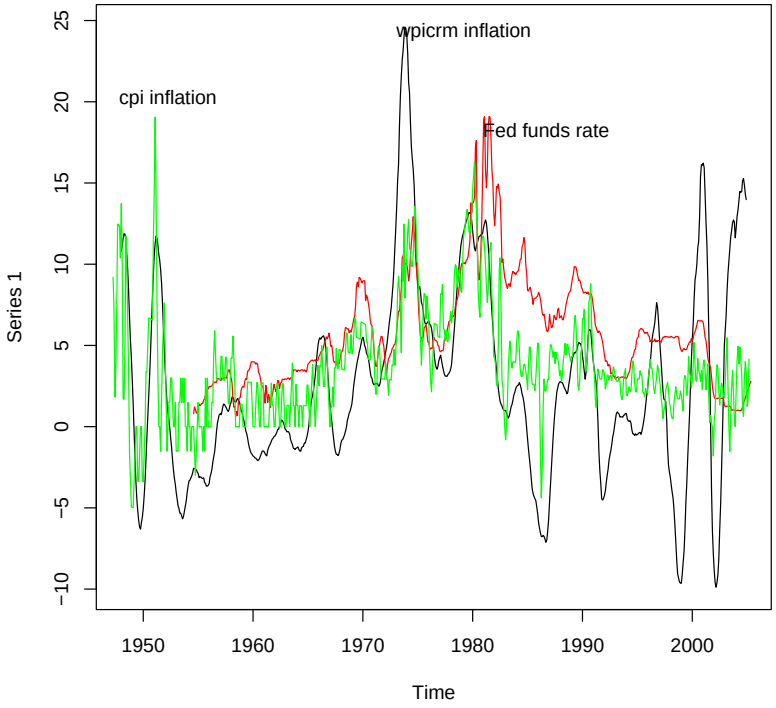
7. RESULTS FROM MULTIPLE-EQUATION STUDIES

Multiple equation studies of these same issues (Primiceri, 2003a; Cogley and Sargent, 2005; Hanson, 2001; Sims and Zha, 2004) have tended to conclude that monetary policy variation has been modest, except for the period from October 1979 until about 1982 when then-chairman Volcker announced a reserve-targeting policy and allowed interest rates to fluctuate much more widely than they have before or since. These multiple-equation studies imply that the rise and fall of inflation was not mainly the result of policy changes.

They differ from the CGG setup in that in most cases they make identifying assumptions on the full system of equations explicit and they check whether the full system response to exogenous monetary policy contraction or expansion makes sense. In some cases they also include a monetary aggregate in the reaction function. The Sims-Zha paper argues that to the extent there is evidence of monetary policy changes, it is mainly evidence for change in the degree of attention by the Fed to changes in monetary aggregates. This is unsurprising, given the prominence of monetarist policy arguments in the 1970's and their subsequent decline in influence. CGG, by omitting monetary aggregates from their estimated policy rules, not only miss a source of changed behavior, they are likely to have obtained bad estimates of behavior through having excluded an important variable from their estimated equation. The criterion for existence and uniqueness of the price level in simple macro models is that the sum of coefficients on growth rates of *all* nominal variables in the interest-rate reaction function should be greater than one. It is not surprising that if an important nominal variable (money) is excluded from the reaction function in the 1960's and 70's, estimates of the relevant sum of coefficients emerge as too small.

8. WHAT ACTUALLY HAPPENED, THEN?

The chart below plots two measures of inflation against the Fed Funds rate. The inflation measures are the CPI for all urban consumers, which gets a lot of media attention, and the wholesale price index for crude materials, which is a much more volatile series. The data shown are monthly, scaled to be at annual rates. The CPI numbers are three-month inflation rates, while the WPI numbers are constructed by exponential smoothing of annual inflation rates — the initial rate $\pi_w^*(1)$ is set to the annual inflation rate over January 1947 to January 1948, and then subsequent months are defined recursively by $\pi_w^*(t) = .92\pi_w^*(t-1) + .08\pi - w(t)$, where π_w^* is the smoothed series and π_w is the simple annual inflation rate calculated from changes over twelve months.



It can be seen from the chart that there were three, successively stronger, surges in inflation in the 70's. Each time, the Funds rate rose, choked off the inflation (and was followed by recession). Also each time, the Funds rate fell promptly as soon as inflation fell. It is not at all obvious that the responsiveness of interest rates to inflation was sluggish, weak, or less than proportionate. On the other hand, there are really just three episodes to look at, and the rates of inflation were successively higher in the three episodes, so it is not surprising that there is considerable uncertainty about what the coefficients in the reaction function were.

It is also interesting to note the two bursts of inflation in the late 40's and 50's, before there was a Fed Funds market. The first of these was the immediate postwar inflation, which was expected as price controls were relaxed. The second was the Korean war inflation, which sent commodity prices in particular rapidly upward. These episodes dissipated without any strong monetary policy intervention. Primiceri (2003b) argues that this early experience could have given policy makers a view of the economy that took time to unlearn, and that this could help explain the rise and fall of inflation. Of course another view might be that the right lesson was that commodity price spikes produce inflation that is likely to dissipate by itself, and that stringent monetary reactions to such spikes is unnecessary.

The Volcker period, which is usually credited with ending the inflation, did in fact differ from the previous episodes of rise and fall in inflation in the 80's. The main difference is that the funds rate stayed up for years after the inflation rate came down. This is not increased responsiveness of the funds rate to inflation, it is *decreased* response. If it reflects a change in the interest rate reaction function, the change is a new constant term, or else a changed coefficient on lagged interest rates that makes them move more smoothly.

9. Conclusion

There is still no consensus in this area. A future period of strong inflationary pressure, because of commodity price inflation or a sharp decline in demand for US government debt because of loss of confidence in US fiscal decision making, is quite possible. Sorting out the lessons from this previous period of strong inflationary pressure is important for guiding thinking about such potential future problems.

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