

Editors' Introduction

The conventional wisdom once held that *money doesn't matter*. Now there is wide agreement that monetary policy can significantly affect real economic activity in the short run, though only the price level in the long run. Considerable debate remains, however, about how monetary policy affects the real economy and prices. The Nineteenth Annual Economic Policy Conference was devoted to assessing and deepening our understanding of how monetary policy works. This volume of the *Review* contains the proceedings of that conference. We believe that the careful and wide-ranging analyses presented here will focus the debate and perhaps further the profession's understanding of the monetary transmission mechanism.

The conference focused on what many consider to be the two principal channels of monetary policy: 1) its effect on interest rates; and 2) its effect on the availability of credit. These channels are sometimes referred to as the *money* (or *interest rate*) channel and the *credit* channel, although the conference made clear the difficulties associated with these labels. For example, some participants noted that monetary policy could affect the real economy even if it had little or no effect on real interest rates. Consequently, they objected to equating the money channel with the interest rate channel. Furthermore, one form of what is generically referred to as the credit channel requires that monetary policy actions significantly affect the real interest rate. This form of the credit channel differs from the interest rate channel in the way that changes in the real interest rate affect output. Consequently, calling one the interest rate channel and the other the credit channel is potentially misleading.

THE LIQUIDITY EFFECT

The first article, by Lee Ohanian and Alan Stockman, defines the liquidity effect as "the purported statistical relation between

expansion of bank reserves or a monetary aggregate and short-run reductions in short-term interest rates." Ohanian and Stockman then explore the liquidity effect in general-equilibrium, representative-agent models.

Ohanian and Stockman's analysis shows that in a general-equilibrium environment, exogenous changes in money can, in principle, affect real output, prices or the interest rate. If money is neutral and prices adjust instantaneously, monetary policy changes the price level, but not output or the real interest rate. If prices do not adjust instantaneously, a liquidity effect occurs—the real interest rate declines in response to a monetary expansion. The failure of the price level to adjust immediately to its new long-run equilibrium, however, also produces expectations of inflation. From the Fisher relation, the nominal interest rate may either rise or fall, depending on the relative size of the liquidity and price expectations effects. If the liquidity effect is dominant, both the nominal and real rates fall. If the price expectations effect is dominant, the nominal rate rises.

Ohanian and Stockman show that within this class of models, variants differ in both the mechanisms that produce sluggish price adjustments and in how monetary policy actions influence the real economy. Their review considers a wide variety of equilibrium models: one- and two-sector sticky-price models, two-country models, limited-participation models (with and without representative agents), and even models where the only role for money is to reduce intermediation costs. In the last case, the liquidity effect is perverse: An increase in the money supply causes the real interest rate to rise because a monetary innovation represents a technological change. Many of these models include a cash-in-advance constraint and all require a mechanism that causes prices to adjust slowly to their equilibrium level.

In his discussion of Ohanian and Stockman's paper, Kevin Hoover re-interprets

many of these models within a standard IS-LM aggregate-supply/aggregate-demand framework. Hoover questions whether the research agenda on which Ohanian and Stockman report, namely the modeling of monetary policy within a representative agent, cash-in-advance constraint framework, is useful for understanding the liquidity effect. Specifically, he questions whether the liquidity effect in such models truly reflects what most of the profession thinks of as the liquidity effect. First, he notes that in general-equilibrium models all of the endogenous variables are determined simultaneously and, hence, the interest rate cannot be "causally efficacious," as in most discussions of the liquidity effect. Second, Hoover argues that the liquidity effect is a feature of financial markets and that the financial sectors of these models are simply not sufficiently rich to capture the liquidity effect adequately. In models of the type presented by Ohanian and Stockman, the interest rate is solely determined by the shadow prices associated with consumption, leisure and saving choices. In the end, Hoover concludes "that we still are a long way from understanding the liquidity effect."

THE EMPIRICAL EVIDENCE

While the theoretical foundations for the liquidity effect remain controversial, the article by Adrian Pagan and John Robertson, and commentary by Lawrence Christiano, narrow the disagreement about the empirical relevance of the liquidity effect. Pagan and Robertson thoroughly review the empirical literature on the liquidity effect, differentiating between single-equation and systems-modeling approaches. Arguing for a systems approach, they focus their attention on the estimation of vector autoregressions (VARs), which is the most promising tool for identifying a statistically significant and empirically relevant liquidity effect.

Pagan and Robertson start with an interesting discussion of some basic differences between Sim's VAR approach and the older Cowles Commission methodology, which involves estimation of a simultaneous-equation structural model. The authors point out that the assumptions used to identify the structural

parameters in VARs, that is, that the covariance matrix is diagonal and that the structure is recursive are, a priori, no more or less credible than the identifying restrictions adopted by the Cowles Commission approach. Since the Cowles Commission approach frequently results in over-identified systems, and the Wold causal ordering exactly identifies the structural parameters of the system, Pagan and Robertson state that "One might...categorize the difference as simply amounting to whether one wants to work with an exactly identified system or not."

Pagan and Robertson also point out the similarity in the approaches to selecting among what are essentially observationally equivalent structures. VAR practitioners frequently select from alternative Wold causal orderings by choosing the one whose impulse response functions are most consistent with their prior beliefs. Researchers in the Cowles Commission tradition generally perform dynamic simulations of alternative models, choosing the one whose dynamic responses most closely correspond to their prior beliefs.

Pagan and Robertson go on to confirm what previous empirical work suggests, namely, that finding a statistically significant liquidity effect depends critically on the definition of money used. A statistically significant liquidity effect is generally found only with nonborrowed reserves or the ratio of nonborrowed to total reserves. No statistically significant liquidity effect is found using total reserves, the monetary base or M1.

The authors investigate the robustness of the estimated liquidity effect to alternative specifications of the system by including first commodity prices, and then exchange rates and foreign interest rates. While these variables affect the magnitude and persistence of the liquidity effect, the overall conclusion remains; that is, a statistically significant liquidity effect is obtained only when non-borrowed reserves is used.

Pagan and Robertson also find that the magnitude of the estimated liquidity effect depends on the sample period. Specifically, the liquidity effect essentially vanishes when the VAR is estimated over the period 1982:12 to 1993:12. Christiano investigates whether

this marked change is due to the small sample size or to a fundamental change in the variance-covariance matrix and concludes: "The primary reason for the shift in the impulse response function appears to lie in a shift in the variance-covariance matrix of the VAR disturbances." He notes, however, that the presence of autoregressive conditional heteroskedasticity (ARCH) in the covariance structure during this period means that this result could be a statistical artifact, rather than a true shift in the structure. Nevertheless, noting that the Fed's operating procedure changed in late 1982, Christiano speculates whether the observed change in the liquidity effect might be due to a change in policy regime.

Even ignoring the apparent disappearance of the liquidity effect recently, Pagan and Robertson find the liquidity effect to have been a relatively unimportant determinant of the behavior of the federal funds rate in the past. They find that a 1 percentage point increase in the level of nonborrowed reserves reduces the funds rate by about 13 basis points. Since the average absolute monthly change in nonborrowed reserves is about 0.9 percentage point, the immediate effect of policy actions on the funds rate seems modest. Moreover, even when they allow the effect to accumulate until the impulse response function turns positive, they find it was rare for the sum to be smaller than -60 basis points. Hence, they conclude that "most of the factors historically driving the federal funds rate do not seem to be due to the Fed... ."

THE CREDIT CHANNEL FOR MONETARY POLICY

Articles by Stephen Cecchetti and R. Glenn Hubbard survey the credit channel for monetary policy. Although these papers discuss much of the same literature and evidence, the confluence of their approaches provides a richer understanding of the issues than either article alone. Both make clear that there are two possible credit channels for monetary policy, and that both require asymmetry in the access of "small" and "large" firms to credit. The *bank credit channel* operates directly on the ability of depository institutions to make loans through the effect

of monetary policy actions (open market operations) on bank reserves. For example, restrictive monetary policy actions reduce reserves and, thereby, loans. Unable to obtain bank or other external finance, bank dependent firms curtail planned spending.

The second credit channel, which goes by various names (such as the financial accelerator, excess sensitivity or the broad lending view), works through the effect of a policy-induced change in interest rates on the balance sheets of borrowers. For example, by reducing their real net worth, a policy-induced increase in the real interest rate makes it difficult for some, typically smaller, firms to attract capital. Unable to attract funds, these firms curtail planned spending. This view differs from the traditional analysis, whereby a policy-induced increase in interest rates makes marginal investment opportunities unprofitable.

Both Cecchetti and Hubbard evaluate the state of the macroeconomic and cross-sectional evidence on the credit channel. Cecchetti focuses on the aggregate evidence and frames his analysis in an interesting discussion of the difficulties associated with identifying changes in monetary policy, an analysis of several commonly used indicators of policy, and a discussion of how to differentiate alternative views using both aggregate time-series and cross-sectional data.

Hubbard, on the other hand, focuses on cross-sectional evidence. He concludes that there is considerable evidence that "the spending decisions of a significant group of borrowers are influenced by their balance sheet condition in the ways described by financial accelerator models."

The discussions of these papers by Mark Gertler and Bruce Smith follow very different lines. Agreeing with essentially all of what Cecchetti said, Gertler emphasizes the complementarity between the credit and traditional views of the effect of policy-induced changes in interest rates on spending. He illustrates how what he calls the financial propagation mechanism can magnify the traditional effect of policy-induced changes in interest rates. Gertler's emphasis on the propagation mechanism makes clear that this effect comes into play whatever the source of the impulse to interest rates. Hence, this

propagation mechanism may have important implications for output and interest rates even if Pagan and Robertson are correct that the influence of monetary policy on interest rates is small.

Smith's analysis, on the other hand, undercuts the significance of the empirical research that Hubbard finds most supportive of the broad credit view. Smith shows that a general-equilibrium, modified-neoclassical growth model capturing several key features of models associated with the broad credit view of monetary policy, has considerably different implications. In contrast with most models generating a credit channel, Smith's model has multiple equilibria, with both a low capital stock, low-income equilibrium, and a high capital stock, high-income equilibrium. In the latter, a low marginal efficiency of capital and high income provide firms with significant amounts of internal finance. In this equilibrium, an expansionary monetary policy reduces output, the capital stock and credit. Hence, in one equilibrium, credit market imperfections magnify the effect of monetary policy in a way consistent with the broad credit view. In the other, the outcome is inconsistent with the credit view. Moreover, even when monetary policy produces results consistent with the credit view, it is not for the reason given by proponents of the credit view.

MICRO-FOUNDATIONS, ENDOGENOUS PRICE STICKINESS AND MONETARY POLICY

The last paper of the conference, by Allan Meltzer, revisits a theme of the first, namely, that sluggish price adjustment is necessary for monetary policy to have real effects. Meltzer's purpose is to provide microeconomic foundations for price setting and the gradual adjustment of prices to new information.

Meltzer argues that differences in information and costs associated with acquiring information explain three facts about price setting behavior: 1) that many prices are set; 2) that price setters choose to set nominal

rather than real prices; and 3) that many prices change slowly over time. While not rejecting a role for menu prices, imperfect competition, relative and absolute price confusion and aggregation in explaining sticky-price behavior, Meltzer argues that these alternative explanations are not consistent with one or more features of price data. Instead, he argues that the cost of acquiring information and the inability of individuals to fully distinguish permanent from transitory shocks provide better micro-foundations for the sluggish adjustment of nominal prices observed in the data.

Meltzer argues that the now widely adopted approach to providing micro-foundation to macroeconomics, which features representative agents and complete Arrow-Debreu markets, have not, and will not, prove useful. He contends that this framework provides no role for monetary disturbances. Hence, he concludes that "it is not the appropriate micro-foundation for macroeconomics. No amount of squeezing, cutting and pasting will make it so."

In his discussion, Randall Wright focuses on Meltzer's remarks about the state of macroeconomics. Wright defends the use of general-equilibrium modeling in macroeconomics, arguing that this methodology has produced great strides in the professions' understanding of business cycles, labor markets and economic growth. Moreover, he argues that the use of overlapping-generations models has produced significant contributions to our understanding of the properties of monetary economies and the monetary policy debate, as well as about economics generally. While conceding that overlapping-generations models have not captured the medium of exchange function of money, he points out that there are other general-equilibrium models that explicitly capture this function of money and the private information problem. Finally, Wright concedes that these models "sometimes take the pricing aspect of the Arrow-Debreu paradigm too seriously." He notes, however, that the effect of sticky prices has been addressed by such models and states that Meltzer's article has not convinced him of the value of explaining endogenously sticky prices.

PANEL DISCUSSION

A panel discussion provided a capstone to the conference. The panelists, Ben Bernanke, Thomas Cooley and Manfred Neumann, each took a different approach to summarizing the profession's understanding of the effects of monetary policy. Bernanke argues that the semi-structural VAR approach is a fruitful method for investigating how monetary policy actions are transmitted through the economy. He also finds limited-participation models to be a realistic approach but, sounding a theme reminiscent of Hoover's comments, argues that the cash-in-advance constraint is implausible. He suggests that a more promising avenue would be to combine the limited-participation and sticky-price assumptions.

Bernanke acknowledges recent criticisms of the bank lending channel of monetary policy, and points to the need to differentiate between the bank lending channel and the balance sheet channel. He argues that continued work on the credit channel is desirable because of quantitative problems with the other leading models of the transmission mechanism, and because ongoing institutional changes will likely affect both the potency of policy and the interpretation of monetary policy indicators.

Cooley argues that the papers presented at the conference seem to take as given that monetary policy can affect the real economy at cyclical frequencies. He argues that the theoretical evidence that the Fed can moderate cyclical fluctuations in economic activity is weak and that the empirical evidence for this proposition is "extremely fragile." He argues that the evidence based on VARs or structural VARs is sensitive to the set of conditioning variables, the sample period and the identifying restrictions. Moreover, he asserts that models that treat money as exogenous are simply "meaningless."

Cooley argues that a more interesting and fruitful approach is to investigate the growth and welfare consequences of monetary policy shifts by modeling artificial economies and examining them using calibration methods. He argues that this approach permits explicit modeling of essential features of the hypothesized transmission mechanism and broadens the scope of inquiry from output effects at

business cycle frequencies to growth and welfare.

Neumann examines the structure of what he terms the new money-credit view of monetary policy. Comparing this view with the monetarist view of the transmission mechanism of monetary policy, he concludes that the monetarist approach is the "more comprehensive." He points out that the monetarist approach assumes that all assets, financial and real, are imperfect substitutes. A change in base money sets in motion a broad process of portfolio substitution over a full array of real and financial assets, and over a broad array of financial institutions and firms. With this as background, Neumann points out how the monetarist approach of Brunner and Meltzer encompasses the traditional IS/LM analysis and the new money-credit view.

Neumann points out that the timing of the effect of monetary policy actions on bank holdings of government securities and loans, documented recently by Bernanke and Blinder (1992), is a direct implication of the monetarist theory of relative prices that Brunner (1970) had pointed out some time earlier. He also questions the need to find evidence in support of the broad credit channel because differences in financial assets and the existence of information cost are unassailable.

Finally, Neumann points out that the fact that monetary policy has distributional effects, impacting more on smaller, financially weaker firms, is not surprising. This has no implications for the conduct of monetary policy, he argues, except to reinforce the monetarist advice to avoid large swings in the creation of reserves or the monetary base.

The conference opened new areas of discussion and revisited others. It appears that the profession is progressing slowly toward a consensus view of the monetary transmission mechanism.

The theoretical foundation for the commonly accepted liquidity effect is disputed. Moreover, the empirical evidence indicates that the liquidity effect is relatively weak and short-lived. If monetary policy exerts relatively modest influence over the federal funds rate and if this influence has weakened significantly recently, for whatever reason, the

effect of monetary policy through the interest rate channel or broad credit channel is dubious. The support for the narrowly focused bank lending channel is also weak, being open to considerable criticism and lacking empirical support. Although the profession has yet to agree on how monetary policy impulses are ultimately transmitted to the price level, we hope that the empirical and theoretical scrutiny of alternative monetary transmission mechanisms reported in these proceedings will stimulate new research into the channels of monetary policy.

Finally, a nod to the analysts in the Research Department of the Federal Reserve Bank of St. Louis who helped to review the text and data for each of the articles: Jerram Betts, Kelly Morris, Tom Pollmann, Steve Stohs, Rich Taylor and Chris Williams.

Daniel L. Thornton and David C. Wheelock
St. Louis, Missouri
May 15, 1995