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A Conference Panel Discussion: What Do We Know About How Monetary Policy Affects the Economy?

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This conference addressed two broad issues. First, can Fed policies affect real and nominal interest rates; and, if so, by what mechanisms? Second, by what channels do Fed actions affect real economic activity (if they do)?

On the issue of whether the Fed can affect interest rates: We have always been pretty sure that it could, but it's nice that we now have formal econometric methods that can both verify the existence of a "liquidity effect" and perhaps also obtain quantitative measures of the linkage between interest rate changes and changes in output, prices and other key macro variables. Since I have the opportunity, let me put in a few good words for one of these methods, the semi-structural VAR approach employed by Bernanke and Blinder (1992), Strongin (1992) and Christiano, Eichenbaum and Evans (1994), and discussed further here by Larry Christiano in his comment on Adrian Pagan's paper. This method, as described in more detail in the above-mentioned sources, involves three basic steps. First, based on institutional analysis (for example, of Fed operating procedures), identify a variable or combination of variables that measure the stance of policy (for example, Bernanke and Blinder opt for the federal funds rate; Strongin uses a measure closely related to the ratio of nonborrowed reserves to total reserves). Second, estimate a standard VAR system including the relevant endogenous variables and the policy variable, with the policy variable ordered last. This structure imposes the assumptions that the policymaker (potentially) responds to contemporaneous information, but that shocks to policy feed back to the economy with at least a one-period delay. Finally, calculate the implied impulse response functions for the endogenous variables in the system; these provide estimates of the dynamic response of the economy to an unanticipated policy change.

There are now a number of studies that show that this method can give robust and plausible measures of the behavior of interest rates, output and many other variables to a monetary policy shock, despite the minimalist identifying assumptions. Several caveats should be offered, however:

(1) The method depends on the choice of policy measure being a valid one. No simple or mechanical criterion, such as forecasting power, can determine the optimal policy measure. For the case of monetary policy, the choice of policy measure depends on the way the Fed chooses to implement its policies, for example, by an interest rate targeting rule or by targeting a component of bank reserves. As is well-known, the Fed's operating procedures have changed over time and, hence, no single policy measure may be best for an extended sample period. In ongoing research, Ilian Mihov and I have estimated models of the Fed's operating procedure for different sub-periods. We find that the funds rate is an excellent indicator of the stance of monetary policy for the 1965-79 period but, more recently, the best indicator is one that combines information from both the funds rate and measures of reserves.

(2) As Sims (1992) was the first to note, the VAR approach to identifying the results of policy shocks will give invalid results if the policy innovation is dominated by the policymaker's response to information not

captured in the VAR. This problem is the source of the infamous "price puzzle," the finding in some cases that a tightening of monetary policy is followed by a rise in the price level. Sims showed that this problem can be eliminated by including a variable in the VAR that proxies for the Fed's information about future inflation (for example, a commodity price index or the exchange rate). Christiano, Eichenbaum and Evans (1994) find that including a commodity price index and measuring the general price level by an index that treats housing costs correctly (for example, the GDP or Personal Consumption Expenditure, PCE, deflator) largely eliminates the price puzzle. My own experimentation with these systems suggests that the Christiano, Eichenbaum and Evans result is quite robust.

(3) Finally, although the identification method works by tracing out the effects of unanticipated policy shocks, this approach takes no stand on whether it is only unanticipated monetary policy that "matters." It may well be the case that forecastable changes in policy have a stabilizing effect on the economy; measuring this effect, however, requires the imposition of more economic structure in the analysis. Because the semi-structural VAR method does not account for the possibly stabilizing effects of predictable policy changes, this approach cannot tell us whether policy has, on net, been stabilizing or destabilizing during the sample period. Thus, mechanical variance decompositions that attribute a given percentage of the variance of output or prices to monetary policy can be misleading. At best, variance decomposition exercises may suggest the amount by which more predictable policies could have reduced the variance of output and prices in a given sample period.

Given the empirical support for the existence of a liquidity effect, the next task is to find theoretical models that rationalize this effect. Alan Stockman and Lee Ohanian's paper in this conference does a nice job of surveying the leading approaches. I was particularly interested in their model which assumes the existence of both flexible-price and sticky-price sectors; it seems both realistic and a promising source of empirical applications. A small suggestion: Stockman and Ohanian find in some of their simulations that the effect of a monetary shock on interest rates is ambiguous because of countervailing liquidity and Fisher effects. This ambiguity may be the result of the assumption of one-period price stickiness. I suspect that allowing multi-period, overlapping price contracts (thus adding more inertia to inflation) would generate a finding that monetary expansion unambiguously lowers the nominal interest rate in their model.

Stockman and Ohanian also discuss limited-participation models as an alternative theory of the liquidity effect. I find much interest in this approach also. In particular, it is quite realistic to assume that, in the short run, Federal Reserve purchases and sales of securities are absorbed by a relatively small number of Treasury dealers and other financial market participants. My main objection to existing limited-participation models is that they combine the limited-participation assumption with the "wrong" friction, that is, most of these models are closed by a structure that imposes a cash-in-advance constraint on consumers and firms. Not only is the cash-in-advance constraint not particularly plausible economically, but models that assume this constraint have great difficulty generating persistent effects of monetary policy changes.

I think a more promising approach would be to combine the limited-participation assumption with the assumption of sticky prices. Allan Meltzer's paper gives a spirited defense of the price-stickiness assumption based on the notions of pervasive economic uncertainty and the difficulty in distinguishing between permanent and transitory shocks. More formally, recent work by Lucas and Woodford (1994) shows how price stickiness and monetary non-neutrality can be an equilibrium outcome in a non-Walrasian setting with sequential service of customers. Allegorically, one may illustrate the Lucas and Woodford model by thinking of the owner of a general store in a gold-mining town, who must set prices without knowing how much gold will be discovered in the surrounding hills that day. Although the general-store owner is free to raise prices

during the day if business is brisk, his inability to re-contract with earlier customers guarantees that unexpectedly high gold discoveries (positive monetary shocks) will be reflected in higher economic activity.

The second broad issue considered at this conference concerns the channels by which monetary policy has its effects on the economy. A common comparison is between the "money view" and the "credit view" of monetary transmission. Unfortunately, this terminology has created a great deal of confusion (in particular, what some have called the money view does little justice to the views of people like Milton Friedman, Karl Brunner and Allan Meltzer), and it should be abandoned. A better distinction is between the view represented by the standard textbook IS-LM model and what might be termed the capital-market-imperfections approach. The capital-market-imperfections approach is based on the premise that the same informational and agency problems that explain many aspects of financial structure (for example, the existence of financial intermediaries) also play a role in monetary transmission. A notable difference between the two approaches is that the IS-LM model assumes the existence of only two assets (money and "bonds"), while models based on capital market imperfections generally require a richer menu of assets.

As ably discussed in the papers by Glenn Hubbard and Steve Cecchetti, the capital market-imperfections approach suggests two new channels of influence for monetary policy, above and beyond the standard IS-LM-type effects. The first of these may be referred to as the balance sheet or net-worth channel: Here, the idea is that increases in interest rates weaken the financial conditions of consumers and firms, making it more difficult or costly for them to obtain credit. More formally, reductions in borrower net worth associated with a rise in interest rates increase the agency and information costs of making loans; see Bernanke, Gertler and Gilchrist (1994) for more discussion. For example, increased interest rates worsen the cash flows of indebted firms (if their debt is short-term or floating-rate) and reduce the capital values of assets (such as land) that are commonly used as collateral for loans. Reduced access to credit may lower both aggregate demand (because of declines in purchases of capital goods, consumer durables, and so on) and aggregate supply (because of reductions in working capital). As was discussed at this conference, there is a good deal of evidence for the balance sheet channel. In particular, it seems clear that monetary policy differentially affects agents who are more subject to agency and informational problems in credit markets, such as small firms and potential homebuyers.

The second channel suggested by the capital-market-imperfections approach may be referred to as the bank lending channel (Bernanke and Blinder, 1988). Briefly, put, the premise here is that a reduction in bank reserves by the Fed also reduces bank deposits and, hence, banks' loanable funds. To the extent that bank loans are imperfect substitutes for other forms of short-term credit (which seems incontrovertible), a reduced supply of bank loans will lower economic activity by bank-dependent borrowers.

Critics have noted that institutional changes and financial innovation have likely weakened the bank lending channel, if it ever existed (Romer and Romer, 1990; Thornton, 1994). Their strongest point is that, under current arrangements, banks need not rely on core deposits for funds. Large banks, at least, are able to raise funds by issuing certificates of deposits (CD), against which no reserve requirements are imposed. The response to this point is that the bank lending channel survives (at least in theory) as long as the demand by investors for bank CDs is not infinitely elastic: If demand is not perfectly elastic, that is, larger issuances of CDs require banks to pay higher rates, then the level of core deposits will be relevant to banks' willingness to supply loans. Indeed, the spread between CD rates and Treasury bill rates does increase, sometimes spectacularly, during periods of tight money.

There have been a number of interesting attempts to test for a bank lending channel, as Hubbard and Cecchetti describe. While

the evidence does not contradict the existence of this channel, a generic difficulty is that most tests of the bank lending channel do not cleanly distinguish it from the balance sheet channel. For example, Kashyap and Stein (1994) find that small banks reduce lending following a monetary tightening more than large banks do. Since small banks have less access to the CD market, this finding is consistent with the view that a drain of reserves forces a reduced supply of loans by small banks. Unfortunately, since a larger share of small bank loans goes to small borrowers, this result might also be explained by the differential effect of monetary tightening on small firms' balance sheets, which disproportionately reduce the effective credit demand by those firms. Matched bank-borrower data will probably be needed to resolve this issue.

Despite the difficulties, there are several reasons to continue to do empirical work on the links between credit market imperfections and monetary policy. First, as was discussed at this conference, there are serious quantitative problems with the IS-LM approach and other leading models of the transmission process; channels based on credit market imperfections may be necessary to explain the apparent strength and persistence of monetary policy effects on the economy. Second, making monetary policy in an environment of ongoing institutional change and financial innovation requires a sophisticated appreciation of how those changes affect the potency of policy and the interpretation of policy indicators. Models based on credit market imperfections, because they analyze monetary transmission using the same information-based theories that underlie our understanding of financial structure and function, are best placed to help us attain that appreciation.

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How do changes in monetary policy get transmitted to the real economy? The papers presented at this conference have been sharply focused on this question and on three candidate answers. New research was presented on the liquidity effects channel. There was abundant discussion of the credit channel and several summaries of research on the sticky-price channel. The only transmission mechanism not discussed in these papers is the most venerable one: rigid wages.

The discussion has been focused with almost surgical precision on the circuitry of monetary policy—how actions of the Federal Reserve affect the behavior of banks, firms and consumers. Taken almost for granted in this discussion—I assume—is the view that shifts in monetary policy have important consequences for the real economy. Steve Cecchetti summarized some of the recent empirical research on the output effects of monetary policy. But, in general, the papers do not address very explicitly the sense in which monetary policy is important. Are there important growth effects associated with monetary policy? Are there important distributional consequences of monetary policy? Are there significant output effects at business cycle frequencies? These are quite distinct questions and all of them are important. Unfortunately, the papers presented here are unnecessarily vague about these bottom line issues.

If there is a liquidity effect in the sense that monetary expansions cause nominal interest rates to rise, but output is left unchanged over a horizon of two quarters or more as in the model economies studied by Ohanian and Stockman—aside from the descriptive value of understanding these liquidity effects, why should we care? Correspondingly, if some investment projects are not undertaken as a consequence of a shift in monetary policy, as occurs in some of the environments that Glenn Hubbard discussed, why is that important? One obvious answer is that there could be important growth or welfare consequences of these policy shifts, even though they may have little consequence for output at the business cycle frequency.

The traditional view is that monetary policy does have important effects on real economic activity at the business cycle frequency. Certainly the recent actions of the Federal Reserve suggest that the current interest rate smoothing policy is predicated on the belief that the Fed can moderate the growth of real output. The theoretical evidence for this is somewhat weak and the empirical evidence is extremely fragile. There is also theoretical evidence that monetary policy and the nature of financial institutions are important for economic growth but, again, the empirical evidence is thin. But these are the reasons why monetary economics is so appealing: We believe monetary policy is important but the evidence is elusive. For that reason it is important that we consider evidence from a variety of sources.

MONEY AND THE BUSINESS CYCLE

First, I want to discuss very briefly the empirical evidence on the role of money in business cycles and the efficacy of monetary policy. The empirical evidence based on VARs or structural VARs is well-known and known to be very sensitive to the set of conditioning variables, the sample period used, and the identification restrictions imposed. Pure reduced-form estimates which treat money as exogenous are meaningless. Structural VARs based on just identifying restrictions seem to be consistent with the proposition that money is neutral in the long run, but has a short-run effect on output. This evidence too is fragile (Cooley, 1994). More recently, economists have shifted to studying specific monetary episodes rather

than time-series models to identify more clearly when monetary policy shifts are taking place. Friedman and Schwartz (1963) have become the darlings of the new Keynesians because of their documentation of specific historical episodes when deliberate monetary actions were followed by declines in real economic activity. Romer and Romer (1989) follow a similar methodology to identify monetary disturbances in the post-war United States. They associate these episodes with recessions. But this evidence, like the Friedman and Schwartz evidence, is far from clear. Steve Cecchetti discussed some of the objections to their analysis in his article. There are other objections as well, some of them touched on by Kevin Hoover. Many of the episodes identified by the Romers are also associated with changes in reserve requirements, tax reforms, and other things that are at least arguably regarded as real shocks. Moreover, Hoover and Perez (1994a, b) have shown that the evidence of the Romers does not sustain the causal interpretation given to it and that the methodology cannot distinguish monetary shocks and oil shocks as a cause of recessions.

Whenever one raises these qualms about the evidence on monetary policy, advocates of the monetary view resort to their ultimate weapon—the Volcker recession.

A Real View of the Volcker Recession

The Volcker recession seems to be regarded as the incontrovertible evidence that monetary policy—in this case, the Volcker disinflation—can cause a decline in real economic activity. The case seems pretty strong. Paul Volcker announced his intention to squeeze inflationary expectations out of the economy and the FOMC acted to tighten monetary policy in a decisive way. This episode is a serious challenge for those who view real shocks as the most powerful driving forces of business cycles.

Could technology shocks also explain the Volcker recession? To answer this question, I conducted an exercise similar to that reported by Hansen and Prescott (1993), who asked the question, "Can technology shocks explain the 1990-91 recession?"

To address this question, I use a model similar to the basic real business cycle (RBC) model but modified to take account of some important features of the post-war U.S. economy. The most important modification is that there are three sectors producing consumption goods, consumer durables and producer durables. The technologies for producing these goods include land explicitly as a factor of production:

$$(1)\qquad \begin{aligned} C_t &= Z_t K_{1t}^{\theta_1} h_{1t}^{\theta_2} L_{1t}^{1-\theta_1-\theta_2} \\ X_{dt} &= Z_{dt} Z_t K_{2t}^{\theta_1} h_{2t}^{\theta_2} L_{2t}^{1-\theta_1-\theta_2} \\ X_{kt} &= Z_{kt} Z_t K_{3t}^{\theta_1} h_{3t}^{\theta_2} L_{3t}^{1-\theta_1-\theta_2}, \end{aligned}$$

where K, h and L denote the stock of capital, the hours and the stock of land employed in each sector, respectively. The variables Z_{dt} and Z_{kt} are the investment-good, sector technology shocks relative to the consumption-goods sector technology shock. Their inverses give the relative prices of consumer durables and capital relative to consumption. Specifying technology shocks in this way makes it possible to capture the fact that the relative prices of consumer and producer durables have declined over the post-war period. The processes for the Z's are:

$$\begin{aligned} Z_t = \lambda^t z_t,\ Z_{dt} = \lambda_d^t z_{dt},\ Z_{kt} = \lambda_k^t z_{kt} \\ \log z_{t+1} = (1-\rho)\log \bar{z} + \rho \log z_t + \varepsilon_{t+1} \\ \log z_{dt+1} = \rho_d \log z_{dt} + \varepsilon_{dt+1} \\ \log z_{kt+1} = \rho_k \log z_{kt} + \varepsilon_{kt+1}. \end{aligned}$$

The economy is populated by a continuum of identical households of measure N that grows at the rate η-1. Households have utility given by

$$u(C_t, D_t, h_t) = \alpha \log C_t + (1-\alpha)\log D_t - Ah_t,$$

where D represents the service flow provided by the stock of durables and the linear term in hours results from assuming that labor is indivisible, as in Rogerson (1988) and Hansen (1985). The rest of the details of the model economy are exactly as in Hansen and

Prescott (1993) so I won't repeat them here.

The important features of the calibration follow the procedures outlined in Cooley and Prescott (1995), except that for this exercise we choose the parameters so that the steady state for the model matches the data for the first quarter of 1987. We then construct the sequence of technology shocks, Z_t. These shocks are then fed into the model to generate a sequence for consumption, investment, productivity, hours and output for the actual economy. The results of this exercise are shown in the next two figures.

Figure 1 shows the path of real GNP as predicted by the basic real business cycle model and as it is in the data. The vertical line is approximately the trough of the Volcker recession. Figure 2 shows the path of hours worked as predicted by the model and as in the data. Hours in the model are much less smooth than in the data because the indivisible labor assumption causes them to respond sharply to the technology shocks. The behavior of the other variables is much the same; the model tracks actual values quite closely.

As the figures show, the basic real business cycle model can account quite well for the Volcker recession without recourse to a monetary mechanism. What are we to conclude from this? One might assert that this exercise reveals that the RBC modeling strategy is completely vacuous: The identification of technology shocks is so imprecise that monetary shocks—along with any other economic variables legitimately affecting output—are included in the estimated technology shock series. There are several reasons why I think such a conclusion would be wrong. First, we know that there were important real shocks occurring over this period. There were oil price increases in 1979 and 1981 and changes in reserve requirements in 1979 and 1980. There were also some credit controls imposed in 1979-80. These are all the kinds of events that would legitimately show up as technology shocks because they change the productivity of existing inputs. Second, the tax treatment of capital changed fairly dramatically during this period. The Economic Recovery Act

Figure 1

Gross National Product: Model and Data 1979:1 = 100

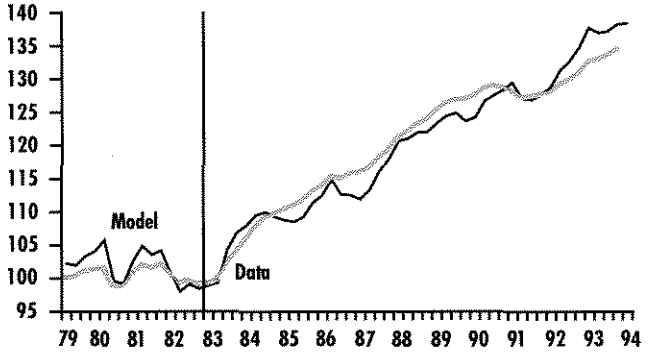
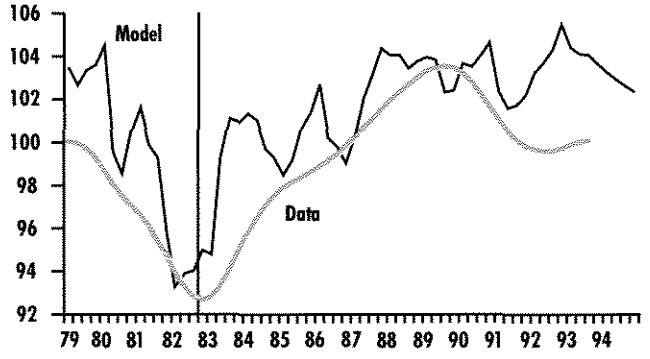


Figure 2

Hours Worked: Model and Data 1979:1 = 100



of 1981 introduced major changes in the economic life and cost recovery rules for capital assets. The Act of 1982 reversed, at least partially, many of those changes, effectively increasing again the tax on capital income. These were real shocks to the economy that had a big affect on the investment decisions of firms and, again, would legitimately show up as technology shocks in a highly aggregated model.

A better conclusion to draw from these results is that models like this don't go far enough—they rely on a formulation of the technology shock that is too abstract. Any variable that helps to track output can get rolled into the technology shock. To better exploit their potential as analytical tools for

understanding the role of money in the macroeconomy, we need to do two things. First, if we want to understand a broader set of observations than those captured by the basic neoclassical growth model, then we have to add more theory—theory that admits the possibility that monetary shocks get transmitted. Second, if we want to understand the role of "shocks" in these models, we need a more explicit account of what these shocks are. Obviously, the nature of technology shocks is such that a lot of things can get rolled into them. As noted above, one obvious example is oil price shocks. A recent paper by Finn (forthcoming) does an impressive job of documenting how explicitly accounting for oil price shocks and capacity utilization improves the ability of models to match features of the data and account for the behavior of Solow residuals. What about changes in reserve requirements, borrowing constraints, the tax treatment of depreciation? These also may be reflected in technology shocks and the only way to try to sort out their quantitative importance is to try to construct economic environments that explicitly account for them.

One of the advantages of using artificial economies to study the role of monetary shocks is that the questions addressed can be made fairly precise. Thus, if we are interested in studying the precise channels by which changes in monetary policy affect the real economy, then the challenge is to construct plausible models that address this question.

CHANNELS OF MONETARY POLICY

It is easy to think of many objections to the economic environment I used previously to simulate the Volcker recession. Nevertheless, the study of similar economic environments that include money has yielded some useful insights about the channels of monetary policy. The evidence is far from conclusive, but it probably compares favorably with empirical evidence based on aggregate data. Accordingly, it seems worthwhile to review briefly some of the evidence from artificial economies that have tried to incorporate monetary transmission mechanisms.

Signal Extraction

For a long period, the main mechanism that macroeconomic theory focused on as the transmission mechanism for monetary policy was signal extraction problems of the sort made famous by Lucas. Kydland (1989) was the first to study signal extraction problems in the context of an equilibrium business cycle.[1] Signal extraction problems caused by monetary policy are proxied by confronting agents with a signal extraction problem. In these models, agents only observe a noisy version of the shocks to technology. This is intended to reflect the signal extraction problem caused by imperfectly observed monetary policy. Cooley and Hansen (1995) studied a similar model. The conclusion of this work is that signal extraction problems provide very little propagation of monetary shocks. In fact, the addition of "monetary noise" can actually reduce the size of fluctuations in the economy.

Wage Rigidities

Cho (1993) and Cho and Cooley (forthcoming) study a standard real business cycle model in which money is introduced by a cash-in-advance constraint, and workers and firms agree to some contracting rule which specifies the nominal wage in advance. Workers cede to firms the right to determine the level of employment. In this setting, monetary shocks do get propagated and the most interesting finding is that it doesn't take a lot of rigidity for these shocks to have substantial output effects. The major problem with this account of how monetary shocks have real effects is that the cross-correlations in the data generated by these models are inconsistent with the properties of U.S. data. This suggests that money is not a primary cause of output fluctuations.

Sticky Prices

Cho (1993), Cho and Cooley (forthcoming) and King (1991) followed a similar approach in studying sticky prices as a propagation channel for monetary shocks. Workers and firms agree in advance to fix prices, firms agree to supply all that is demand-

[1] Kydland and Prescott (1982) built this feature into their models but didn't do much with it because it didn't seem very important. Their paper was actually written much earlier in the 1980s. It pioneered the analysis of monetary transmission in real business cycle models.

ed at that price. Money does have big output effects in such economies as long as the equilibrium quantities are determined by the demand curve rather than the supply curve. Only a very small amount of rigidity is necessary for monetary shocks to have a big output effect. Again, however, the cross-correlations don't match those observed in U.S. data and this casts doubt on monetary shocks as the mechanism that produces real effects of monetary shocks.

Ohanian, Stockman and Kilian (1994) extend these sticky-price models in a useful way. They consider a two-sector version in which consumer goods prices are sticky for one period but investment goods prices are perfectly flexible. In this setting, they find that monetary shocks have no big output effects. This seems to cast further doubt on this propagation mechanism. Monetary shocks are more powerful in the multiple-equilibrium setting of Beaudry and Devereux (1994). In their model, final goods are produced under monopolistic competition between firms using a technology that exhibits increasing returns and requires multiple intermediate goods as inputs. There is a rudimentary intermediation sector in which the Fed can manipulate total reserves. One of the model's equilibria in which prices are fixed one period in advance, seems to match the dynamic responses in the data very well. However, the equilibrium selection story seems very weak and the model requires an implausibly high degree of increasing returns.

Limited-Participation Models

These models have been developed and exploited by Lucas (1990), Fuerst (1992) and Christiano and Eichenbaum (1992). Christiano and Eichenbaum have done the most in exploiting the quantitative implications of these models for output. In these models, the financial arrangements break the temporal link between the consumption decisions of households and monetary injections. This generates a transient liquidity effect in which both real and nominal interest rates change. The controversies regarding the existence and size of this liquidity effect have been pretty thoroughly represented in Adrian Pagan's article and the ensuing discussion. What seems clear is that the empirical evidence for a liquidity effect is pretty strong but the magnitude of it is probably very small. More importantly, the empirical evidence has been focused almost exclusively on the liquidity effect itself without much discussion of the corresponding output effects. The quantitative evidence from studying artificial economies in which this channel is present shows that monetary shocks will have small but significant effects on real output.

Endogenous Monetary Policy

One of the biggest problems that plagues empirical researchers is the issue of defining exactly what monetary policy shifts are and the extent to which changes in monetary policy can be treated as exogenous. Artificial economies also help to understand this issue. Coleman (1994) studies an artificial economy in which monetary policy is endogenous. The monetary authority chooses a supply of currency to meet inflation and nominal interest rate targets. Banks provide checkable deposits in the amounts desired by households, given the supply of currency. In this environment, the Federal Reserve can raise interest rates in response to changes in output. Coleman then estimates the parameters of his model economy to determine how the Fed responds. The estimated parameter values imply that a substantial portion of the conditional and unconditional variance of nominal interest rates is endogenous, but not all of it is. Coleman analyzes the implications of his estimated parameters for the cross-correlations between money and output. He finds that endogenous money creation causes money growth to be more strongly correlated with current and past output than with future output growth. In U.S. data, it is more strongly correlated with future output growth. This at least suggests that endogenous money creation cannot by itself explain the observed correlations between money and output.

The Credit Channel

The research on the credit channel for monetary policy was well-summarized in the

papers by Hubbard and Cecchetti. In a typical credit channel model, informational asymmetries between borrowers and lenders in credit markets imply that loan contracts are constrained by moral hazard or adverse selection. Entrepreneurs who must borrow in credit markets to finance new investments pay a higher price for borrowed funds or may be denied credit altogether. These asymmetries vary in degree over the business cycle: In periods of expansion, the information asymmetries are mitigated. A key feature of the credit view is that most of the empirical implications are cross-sectional and the mapping between time-series and cross-sectional evidence is not obvious or direct. There have been only a few attempts to incorporate this view into artificial economies.

Fisher (1994) constructs a model economy in which there is costly state verification by lenders. He finds that this does lead to asymmetric response of firms to monetary shocks, but he also finds that the quantitative impact of monetary shocks on output are quite small. Fuerst (1994) studied the property of a model economy which incorporates some elements of the credit channel view. He finds that adding these features to the basic real business cycle model adds little or nothing to the basic, real business cycle propagation mechanism.

I don't think this is the final story because there are aspects of the credit channel view that Fuerst's model may miss. As the papers and discussions made clear, the cross-sectional implications of credit issues are manifest in the wealth of different agents in the economy. It is difficult to capture this heterogeneity in wealth and make it fit in the context of a representative-agent type of business cycle model. Introducing heterogeneity in a serious way and keeping capital accumulation in the model is at the frontier of what we can analyze. The curse of dimensionality restricts our ability to analyze a heterogeneous–agent economy with capital accumulation.

Furthermore, even if the output effects at business cycle frequencies are small, previous experience with heterogeneous-agent models of money suggests that heterogeneity and asymmetric information problems may have very important welfare consequences. Finally, a lot of the theoretical work referred to stresses the important long-term growth effects of financial intermediation and borrowing constraints. In that respect, I think a lot of the discussion has been focused far too narrowly on the output effects at the business cycle frequency and not enough on these welfare and growth implications.

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The recent undertaking by the proponents of the credit view of broadening the simple Keynesian transmission mechanism is to be welcomed. Adding the credit channel to the traditional money channel permits studying the effects of monetary policy on the process of intermediation and provides a richer description of the transmission of policy actions to the real economy. Studying the interdependence of various types of credit markets appears to rank highly on the research agenda of this new literature. Although this is of interest in itself, from a macroeconomic point of view, it remains an unsettled issue how far to go in disaggregation, hence, differentiation of financial assets.

I divide my contribution to this panel into two parts. First, I will examine the aggregative structure of the new credit view and compare it with other theories of transmission, notably the monetarist analysis. The conclusion will be that the latter theory is the more comprehensive one and permits studying the issues that are on the research agenda of the credit view. Thereafter, I will discuss whether this new view of the transmission mechanism has any novel implications for monetary policy. I believe that this is not the case.

THE CREDIT VIEW IN COMPARISON TO OTHER THEORIES OF TRANSMISSION

To understand the contribution of this recent literature to our knowledge about the channels of monetary transmission, I believe that it is useful to put the recent credit vs. money debate into the broader perspective of the transmission theory of relative prices. This theory dates from the early 1960s, when a growing dissatisfaction with the narrow Keynesian transmission channel of a single interest rate led neo-Keynesians (for example, Tobin, 1961) as well as monetarists (for example, Brunner, 1961) to adopt a broader view.

The theory of relative prices provides an encompassing view of the transmission mechanism. It assumes that all assets, financial and real, are imperfect substitutes. This implies that a change in the stock supply of base money or government debt affects all relative prices and sets in motion a process of portfolio adjustment that extends to the full array of financial and real assets. The speeds of adjustment may differ between markets due to differential adjustment costs. As Brunner (1970, 1971) pointed out, the degrees of imperfect substitutability are shaped by differences in the levels of transactions costs and marginal information cost. These costs are generally low for money and securities, but much higher for loans and non-securitized real assets. Brunner conjectured that the relative magnitude of these costs changes with the level of interest rates. This led him to assume that securities are close substitutes to money when interest rates are low, but closer substitutes to real capital than to money when interest rates are high.

Although macroeconomic analysis can only deal with a few, highly aggregated asset markets, there is no compelling reason for ignoring intermediate assets by restricting the analysis to the components of private net wealth. In fact, both Tobin (1961) and Brunner (1961) already considered private debt, the difference being that private debt in Tobin's pure-asset model has no particular role to play, while the bank credit market in Brunner's analysis is a cornerstone of monetary transmission to aggregate demand.

Against the background of the general transmission theory of relative prices, any specific view or model of the transmission mechanism rests on simplifying assumptions that permit aggregating assets into a small number of representative assets. Different

aggregative structures yield different visions of the way in which the economy works (Leijonhufvud, 1968). I will compare three specific views of the transmission process: the traditional money view; the new credit view; and the monetarist view.

The money view was introduced by Keynes in his *General Theory*. This view aggregates all assets into two categories: money and non-money. The non-money asset represents all other financial assets as well as existing capital goods. The distinction between financial and physical non-money assets is eliminated by the straightforward assumption of perfect substitutability. For Keynes the non-money asset was long-term in nature, while Keynesians became used to equating the non-money asset with a short-term bond within the IS-LM framework.

The Keynesian IS-LM model provides the most restrictive analysis of monetary policy transmission. Due to the assumption that non-money assets are perfect substitutes, monetary policy is transmitted to aggregate demand through a single interest rate, the bond rate, and the efficacy of policy actions depends solely on the interest elasticity of money demand. The classroom interpretation of the result is: A reduction in the money stock raises the "cost of borrowing," which reduces investment demand by eliminating marginal projects. However, taken literally, the model does not contain a banking sector—hence, there are no bank loans and the money variable neither represents M1 nor M2, but just currency. The narrowness of the setup is rightly criticized by the proponents of the new credit view as it was before by monetarists during the debate of the late 1960s on whether money matters.

The credit view adds the credit channel to the Keynesian money channel by introducing bank loans as a third (intermediate) asset. In Table 1, I take the model by Bernanke and Blinder (1988) as representative of this view and compare it with the monetarist view as presented by the Brunner and Meltzer (1972, 1976) model. To be sure, the monetarist view of transmission is not to be equated with the money view, contrary to Gertler and Gilchrist (1993), because the monetarist model also contains the bank credit market.

Table 1

Alternative Views of Transmission

	Peer Group		
Variable	**IS-LM**	**Credit**	**Monetarist**
Markets			
Money	x	x	x
Government bonds	x	x	
Bank loans		x	x
Real assets			x
Prices			
Bond rate (i_B)	x	x	
Bank loan rate (i_L)		x	x
Asset price (P_A)			x
Real wealth (w)			
Financial		x	x
Real assets			x
Aggregate demand			
	$d(i_B)$	$d(i_B, i_L)$	$d(i_C, P_A, w)$
	−	− −	− + +

Note: The credit view is based on Bernanke-Blinder (1988) and the monetarist view based on Brunner-Meltzer (1972, 1976)

The credit view concentrates on the substitution relations between money, bonds and bank loans. Accordingly, the real loan rate, i_L, supplements the bond rate, i_B, as a determinant of aggregate demand. With the additional credit channel, the transmission of monetary policy no longer depends on the interest responsiveness of money demand alone. This is an improvement over the money view. But note that the credit view is silent on the role of existing real capital. Apparently, the implicit assumption is that the relevant transactions costs are infinite.

The monetarist analysis, in contrast, lumps together government bonds and bank loans and extends the range of substitution to the existing stock of real assets (equity, real estate, and so on). The asset price level, P_A, enters the aggregate demand function directly, reflecting the substitution between existing and new capital goods, and indirectly as a determinant of real wealth, w.

What are the implications of the credit and the monetarist models regarding the

transmission of shocks to aggregate demand? In both models, monetary policy shocks and money demand shocks affect the money stock, the stock of bank loans and aggregate demand in a comparable fashion regarding the signs of first derivatives. However, the early monetarist model of Brunner and Meltzer implies much stronger effects than the new credit model of Bernanke and Blinder, because the former permits substitution over the full array of financial and real assets. The asset price level is a particularly important transmission variable. Leaving it out of the picture is leaving out Hamlet. Changes in this price affect investment demand by changing the relative price of new capital goods (Tobin's q), and they affect the net worth of firms and households—hence, creditworthiness and investment demand as well as consumption demand.

Qualitative differences between the two views arise when we study shocks to loan demand (see Table 2). The credit view attaches importance to such shocks, although the origins of such shocks need clarification. Let us assume these shocks reflect productivity shocks. Both models imply that an exogenous shock to the demand for bank loans raises the loan rate and the stock of loans. However, the credit view predicts a contraction of the money stock, while the monetarist view predicts a rise. More importantly, since the credit view assumes that the impact of the loan rate on aggregate demand dominates the impact of the bond rate, this view predicts a fall in real income. The monetarist view, in contrast, derives the opposite conclusion. A loan-demand shock effects an increase in real income, because it induces a rise in the asset price level, which dominates the contractionary effect on aggregate demand of the simultaneous increase in the loan rate. In the following section, we will check whether this conflicting result has any policy implication.

Before I turn to this, however, let me briefly point out two aspects of the credit versus money debate which I find puzzling. To begin with, I do not see why there is a need to search for evidence in support of the existence of the credit channel (Bernanke, 1993). Since neither the existence of the credit market nor the existence of differences between financial assets regarding transactions and information costs can be disputed, so cannot the existence of the credit channel. Once this is acknowledged, the effort put in testing for existence or relative importance of this channel is surprising.

Next, the evidence collected by the credit literature (for example, Bernanke and Blinder, 1992) on timing relationships between changes in monetary policy, banks' securities holdings and bank loans confirms the important role of differential information cost, and it may be noted that the principal pattern of adjustment—first securities, then loans—was predicted by Brunner (1970) as an implication of his theory of the relative price process. Banks hold stocks of information about customers and, hence, are reluctant to respond to monetary tightening by immediately cutting tailored loans instead of selling standardized securities first. Moreover, when finally forced to adjusting the loan portfolio, they will prefer to lend less to borrowers whose activities are less well-known or are less diversified and, hence, more risky.

However, in contrast to the credit view, the encompassing transmission mechanism of relative prices implies that the observed temporal pattern of adjustment is not exclusively determined by the banks' behavior. Instead, it is the result of the interaction of loan supply and loan demand. Any monetary policy change affects the asset price level, which is a determinant of loan demand (as well as of aggregate demand). A negative policy shock, for example, reduces the asset price level which, in turn, induces a rise in loan demand. Given that monetary policy shifts both curves, loan supply and loan demand, I do not see what we can learn from the attempt at identifying whether bank balance sheet contractions are due to shifts in supply or in demand, not to mention the identification problem raised by Cecchetti (1995).

Summing up, I conclude that the monetarist view provides a more comprehensive theory of transmission than the new credit view. Moreover, I believe that this new

literature would gain from accepting the monetarist framework and from employing the monetarist credit market theory of the money supply (Brunner and Meltzer, 1966) as a point of departure for the analysis of the issues that are on the new view's research agenda.

POLICY IMPLICATIONS

Does the credit view have any novel implications for monetary policy making? I believe not, at least not if one compares the credit view to the monetarist analysis instead of the standard textbook model.

Suppose, first, that the monetary authorities follow the traditional monetarist advice of concentrating on the objective of providing stable money rather than trying to dampen business fluctuations. The most extreme proposal is to provide a permanent rate of inflation of zero or some low level. In this case, under either view of the transmission mechanism, it is sufficient to estimate the long-run money demand function and use it for determining the target rate of money growth. Though the market for bank loans is an important channel of transmission, this has no bearing on the question of which particular monetary aggregate to chose for targeting. Also, implementation procedures are unaffected.

However, let us consider the issue of dampening the impact of money demand shocks and of loan demand shocks on aggregate demand. Regarding the negative impact of money demand shocks, all views of the transmission mechanism imply that stabilizing the money supply path makes things worse. Bernanke and Blinder (1988) find that stabilizing the path of bank loans provides a superior alternative. However, since the analysis by Poole (1970), we know that the ideal policy for this case is stabilizing the interest rate. Above, we saw that the competing views of the transmission mechanism deliver contradictory predictions regarding the impact of stochastic loan demand shocks on aggregate demand. Nevertheless, both views imply that stabilizing the money supply path would be an appropriate policy response. Ironically, the monetarist view permits stabilizing the aggregate loan portfolio of banks as an alternative while the credit view does not.

Table 2

Effects of a Loan-Demand Shock

	Credit View	Monetarist View
Bank loan rate	+	+
Bond rate	–	
Asset price level		+
Stock of bank loans	+	+
Money stock	–	+
Aggregate demand	–	+

Note: The credit view is based on Bernanke-Blinder (1988) and the monetarist view is based on Brunner-Meltzer (1972, 1976)

This is not to say that I recommend targeting a loan aggregate instead of the money stock. To make this change, one would need to know much more, notably the source of shocks to the demand for bank loans. Are they produced by productivity shocks or do they reflect shifts from credit markets outside the banking system into the market for bank loans? In the latter case, it would require integrating the outside credit markets into the analysis to know what would be the net effect on money stocks, bank loan aggregates, interest rates and aggregate demand. Apart from this, and more generally, my reading of the empirical literature is that the attempts at detecting loan demand functions that are more stable than money demand functions have been unsuccessful.

As a final remark, the credit view collects evidence on the unfavorable cross-sectional results of monetary tightening. Not unexpectedly, the smaller and financially weaker firms are hit the hardest. Due to the global nature of monetary policy, the authorities can do nothing to avoid this except, of course, that the results provide backing for the monetarist advice to be steady and to avoid, in particular, unnecessarily large swings in the creation of reserves or the monetary base.

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