NBER WORKING PAPER SERIES

CREDIT, MONEY, AND AGGREGATE DEMAND

Ben S. Bernanke

Alan S. Blinder

Working Paper No. 2534

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
March 1988

The research reported here is part of the NBER's research program in Economic Fluctuations. Any opinions expressed are those of the authors and not those of the National Bureau of Economic Research.

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ABSTRACT

Standard models of aggregate demand treat money and credit asymmetrically; money is given a special status, while loans, bonds, and other debt instruments are lumped together in a "bond market" and suppressed by Walras' Law. This makes bank liabilities central to the monetary transmission mechanism, while giving no role to bank assets.

We show how to modify a textbook IS-LM model so as to permit a more balanced treatment. As in Tobin (1969) and Brunner-Meltzer (1972), the key assumption is that loans and bonds are imperfect substitutes. In the modified model, credit supply and demand shocks have independent effects on aggregate demand; the nature of the monetary transmission mechanism is also somewhat different. The main policy implication is that the relative value of money and credit as policy indicators depends on the variances of shocks to money and credit demand. We present some evidence that money-demand shocks have become more important relative to credit-demand shocks during the 1980s.

Ben Bernanke
Woodrow Wilson School
Princeton University
Princeton, NJ 08544

Alan Blinder
Department of Economics
Princeton University
Princeton, NJ 08544

Whether or not they use the name, most macroeconomists use something like IS/LM to organize their thinking about how various events affect aggregate demand. No one boasts about the microfoundations of this simple model, no one interprets it literally, and no one thinks it directly suitable for econometric estimation. But its utility for telling simple yet coherent stories about the transmission of monetary, fiscal, and other shocks is evident. Furthermore, IS/LM analysis often does seem to describe what happens to the economy, at least in a rough way.

Of course, any simple model may sometimes be too simple. A case in point is the IS/LM model's asymmetric treatment of money and credit. The LM curve treats money as a special asset while assuming that all debt instruments can be lumped together in a "bond market," which is conveniently suppressed by Walras' Law. This approach makes bank liabilities central to the monetary transmission mechanism, while giving no role to bank assets.

There are both theoretical and empirical reasons to question this asymmetric treatment. A growing theoretical literature stresses the importance of intermediaries in the provision of credit. According to this alternative view, banks and other credit-granting institutions specialize in gathering information and monitoring the performance of borrowers in ways that elude the anonymous auction market. Because they can finance activities that cannot be financed in the bond market, loans by banks and other intermediaries acquire a special status. If financial intermediation is reduced, either by rationing or by price, aggregate supply and demand may be affected.[1] Empirically, the well-documented instability of econometric money-demand equations, itself probably a product of deregulation and innovation by financial intermediaries, has reduced the utility of money as a measure of and guide to central bank policy. Finally, a series of papers by Benjamin Friedman has argued that a particular measure of credit correlates with nominal GNP as well -- or as badly -- as money does. All of this suggests that the traditional focus on money may be inappropriate.

However, credit will not mount a serious challenge to money as a transmission mechanism until we have a simple macro model that does for the "credit view" what IS/LM does for the prevailing "money-only" view, that is, provides a framework for thinking through how various shocks affect the economy. We have developed several such models, of varying complexity, in our research to date, but discuss only the demand side of the simplest one here. Though it has a simple graphical representation like IS/LM, the model permits us to pose a richer array of questions than the traditional money-only framework.

I. The Model

The LM curve is a portfolio-balance condition for a two-asset world: asset-holders choose between money and bonds. Tacitly, loans and other forms of customer-market credit are viewed as perfect substitutes for auction-market credit ("bonds"), and financial markets clear only by price. Models with a distinct role for credit arise when either of these assumptions is abandoned.

Credit rationing may or may not be important empirically; but it is not necessary to rationalize a credit channel for monetary transmission and is not considered further here.[2] We base our model instead on the notion that customer- and auction-market credit are imperfect substitutes because of informational problems, differences in liquidity, or the high transactions costs of raising funds in the open market. (One factor does not preclude the others.) In some cases, there may be no substitute for customer-market credit. But to minimize the departure from IS/LM, we deal with the intermediate case of imperfect substitutability. In this regard, we follow in the tradition of Tobin (1969) and Brunner and Meltzer (1972).

Our model has three assets: money, bonds, and loans. Only the loan market needs explanation. We assume that both borrowers and lenders choose between bonds and loans according to the interest rates on the two credit instruments. If ρ is the interest rate on loans and i is the interest rate on bonds, then loan demand is: $L^d = L(\underset{-}{\rho}, \underset{+}{i}, \underset{+}{y})$. The dependence on GNP (y) captures the transactions demand for credit, which might arise, for example, from working capital or liquidity considerations.[3]

To understand the genesis of loan supply, consider the following simplified bank balance sheet (which ignores net worth):

assets	liabilities
reserves, R bonds, B^b loans, L^s	deposits, D

Since reserves consist of required reserves, τD, plus excess reserves, E, the banks' adding-up constraint is: $B^b + L^s + E = D(1-\tau)$. Assuming that desired portfolio proportions depend on rates of return on the available assets (zero for excess reserves), we have:

$$L^s = \lambda(\underset{+}{\rho}, \underset{-}{i})D(1-\tau),$$

with similar equations for the shares of B^b and E. Thus the condition for clearing the loan market is:

$$(1)\ L(\rho, i, y) = \lambda(\rho, i)D(1-\tau).$$

The money market is described by a conventional LM curve. Suppose banks hold excess reserves equal to $\epsilon(i)D(1-\tau)$.[4] Then the supply of deposits (we ignore cash) is equal to bank reserves, R, times the money multiplier, $m(i) =$

$[\varepsilon(i)(1-\tau) + \tau]^{-1}$. The demand for deposits arises from the transactions motive and depends on the interest rate, income, and total wealth, which is constant and therefore suppressed: D(i,y). Equating the two gives:

$$(2)\quad D(\underset{-}{i},\underset{+}{y}) = m(\underset{+}{i})R.$$

Implicitly, D(i,y) and L(ρ, i, y) define the nonbank public's demand function for bonds since money demand plus bond demand minus loan demand must equal total financial wealth.

The remaining market is the goods market, which we summarize in a conventional IS curve, written generically as:[5]

$$(3)\quad y = Y(\underset{-}{i}, \underset{-}{\rho})$$

II. Graphical Representation

Use (2) to replace $D(1-\tau)$ on the righthand side of (1) by $(1-\tau)m(i)R$. Then (1) can be solved for ρ as a function of i, y, and R:[6]

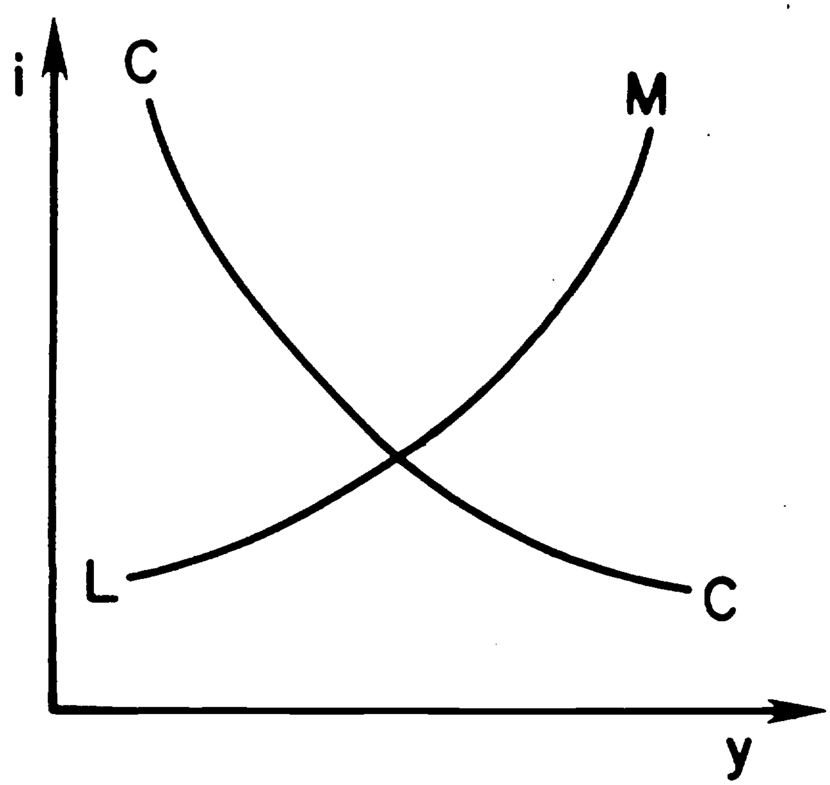
$$(4)\quad \rho = \phi(\underset{+}{i}, \underset{+}{y}, \underset{-}{R})$$

Finally, substitute (4) into (3) to get:

$$(5)\quad y = Y(i, \phi(i, y, R)),$$

which, in deference to Don Patinkin (1956), we call the CC curve (for "commodities and credit"). It is easy to see that the CC curve is negatively sloped like an IS curve, and for much the same reasons. However, it is shifted by monetary policy (R) and by credit-market shocks that affect either the L(.) or λ(.) functions, while the IS curve is not. The CC and LM curves are shown together in Figure 1.

Our CC curve reduces to the IS curve if loans and bonds are assumed to be perfect substitutes either to borrowers ($L_\rho \to -\infty$) or to lenders ($\lambda_\rho \to \infty$), or


i
C
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y

if commodity demand is insensitive to the loan rate (Y_ρ=0) -- which would make the loan market irrelevant to IS/LM.[7] This clarifies the special assumptions implicit in the money-only view.

The opposite extreme, or "credit-only" view, would arise if money and bonds were perfect substitutes ($D_i \to -\infty$), which would make the LM curve horizontal. Keynes' explanation for the liquidity trap is, of course, well known. We think of high substitutability as more likely to arise from financial innovations which create new money substitutes. However, even with a liquidity trap, monetary policy still matters because it influences the CC curve.

Now let us turn to the intermediate cases represented by Figure 1.

III. Comparative Statics[8]

Most conventional shocks work in our model just as they do in IS/LM. For example, an expenditure shock shifts the CC curve along a fixed LM curve, and a money-demand shock shifts the LM curve along a fixed CC curve. The effects are familiar and need not be discussed. The only noteworthy difference is that a rise in bank reserves might conceivably raise the rate of interest in the credit model.[9] Graphically, the ambiguity arises because an increase in R shifts both the CC and LM curves outward. Economically, the credit channel makes monetary policy more expansionary than in IS/LM and therefore raises the transactions demand for money by more than in the conventional model.

Greater interest attaches to issues that elude the IS/LM model. An upward shift in the credit supply function, $\lambda(\cdot)$ (which might correspond, for example, to a decrease in the perceived riskiness of loans) shifts the CC curve outward along a fixed LM curve, thereby raising i and y. The interest rate on loans, ρ, falls, however. An upward shift in the credit demand function, L(.), which might correspond to a greater need for working capital, has precisely the opposite effects.

We find it difficult to think of or identify major shocks to credit demand, that is, sharp increases or decreases in the demand for loans at given interest rates and GNP. But shocks to credit supply are easy to conceptualize and to find in actual history. For example, Bernanke's (1983) explanation for the length of the Great Depression can be thought of as a downward shock to credit supply stemming from the increased riskiness of loans and banks' concern for liquidity in the face of possible runs. According to the model, such a shock should reduce credit, GNP, and the interest rate on government bonds while raising the interest rate on loans. Another notable example with the same predicted effects is the credit controls of March-July 1980. In this instance "tight money" should, and apparently did, reduce interest rates on government bonds.

IV. Implications for Monetary Policy

We turn next to the traditional target and indicator issues of monetary policy. The so-called monetary indicator problem arises if the central bank sees its impact on aggregate demand only with a lag but sees its impacts on financial-sector variables like interest rates, money, and credit more promptly. What does our model say about the suitability of money or credit as indicators?

Table 1 shows the qualitative responses of GNP, money, credit, and bond interest rates to a wide variety of shocks, assuming that bank reserves is the policy instrument.[10] Columns (1) and (2) display a conclusion familiar from IS/LM: money is a good qualitative indicator of future GNP movements except when money demand shocks are empirically important. Columns (1) and

Table 1

Effects of Shocks on Observable Variables

	(1) Income	(2) Money	(3) Credit	(4) Interest Rate (on bonds)
1. Rise in bank reserves	+	+	+	-
2. Rise in money demand	-	+	-	+
3. Rise in credit supply	+	+	+	+
4. Rise in credit demand	-	-	+	-
5. Rise in commodity demand	+	+	+	+

(3) offer the corresponding conclusion for credit: credit is a good qualitative indicator except when there are important shocks to credit demand. As we just indicated, money demand shocks appear to have been very important in the 1980s while it is hard to think of major credit demand shocks. If this empirical judgment is correct, credit may be a better indicator than money.

What about the target question, i.e., about the choice between stabilizing money versus stabilizing credit? Rather than try to conduct a complete Poole (1970) style analysis, we simply ask whether policymakers would respond "correctly" (i.e., in a stabilizing way) to various shocks if they were targeting money or targeting credit.

Consider first an expansionary IS shock. Table 1 (row 5) shows that bot money and credit would rise if bank reserves were unchanged. Hence a central bank trying to stabilize either money or credit would contract bank reserves which is the correct stabilizing response. Either policy works, at least qualitatively. A similar analysis applies to shocks to the supply of credit or to the money multiplier.

But suppose the demand for money increases (row 2), which sends a contractionary impulse to GNP. Since this shock raises M, a monetarist central bank would contract reserves in an effort to stabilize money, which would destabilize GNP. This, of course, is the familiar Achilles heel of monetarism. Notice, however, that this same shock would make credit contrac So a central bank trying to stabilize credit would expand reserves. In this case, a credit-based policy is superior to a money-based policy.

The opposite is true, however, when there are credit demand shocks. Ro 4 tells us that a contractionary (for GNP) credit demand shock lowers the money supply but raises credit. Hence a monetarist central bank would turn expansionary, as it should, while a creditist central bank would turn contractionary, which it should not.

We therefore reach a conclusion similar to that reached in discussing indicators: If money demand shocks are more important that credit demand shocks, then a policy of targeting credit is probably better than a policy of targeting money.

V. Empirical Evidence

The foregoing discussion suggests that the case for credit turns on whether credit demand is, or is becoming, relatively more stable than money demand. We conclude with some evidence that this is true, at least since 1979.[11]

Table 2 shows the simple correlations between GNP growth and growth of the two financial aggregates during three periods. Money was obviously much more highly correlated with income than was credit during the period of stable money demand, 1953-1973. But the two financial aggregates were on a more equal footing during 1974:1-1979:3. Further changes came during the period of unstable money demand, 1979:4-1985:4; money-GNP correlations dropped sharply while money-credit correlations fell only slightly, giving a clear edge to credit.[12]

More direct evidence on the relative magnitudes of money-demand and credit-demand shocks was obtained by comparing the residuals from estimated structural money demand and credit demand functions like D(.) and L(.) in our model. We used the logarithmic partial adjustment model, with adjustment in nominal terms, which we are not eager to defend but which was designed to fit money demand. Hence, our procedure seems clearly biased toward finding relatively larger credit shocks than money shocks.

TABLE 2

Simple Correlations of Growth Rates of GNP with Growth Rates of Financial Aggregates, 1973-1985 (a) (b)

Period	With Money	With Credit
1953:1 - 1973:4	.51,.37	.17,.11
1974:1 - 1979:3	.50,.54	.50,.51
1979:4 - 1985:4	.11,.34	.38,.47

(a) Growth rates are first differences of natural logarithms.

(b) Correlations in nominal terms come first; correlations in real terms come second.

Unsurprisingly, estimates for the entire 1953-1985 period rejected parameter stability across a 1973:4/1974:1 break, so we concentrated on the latter period.[13] Much to our amazement, we estimated moderately sensible money and credit demand equations for the 1974:1-1985:4 period on the first try (standard errors are in parentheses):

$$\log M = \underset{(.34)}{-.06} + \underset{(.059)}{.939}\log M_{-1} - \underset{(.089)}{.222}i + \underset{(.052)}{.083}\log P + \underset{(.059)}{.012}\log y$$

$$SEE = .00811 \qquad DW = 2.04$$

$$\log C = \underset{(0.63)}{-1.75} + \underset{(.076)}{.885}\log C_{-1} \underset{(.285)}{-.424}\rho + \underset{(.389)}{.514}i + \underset{(.086)}{.075}\log P + \underset{(.107)}{.292}\log y$$

$$SEE = .00797 \qquad DW = 2.44$$

Here y is real GNP, P is the GNP deflator, ρ is the bank prime rate, and i is the three-month Treasury bill rate. Although the interest rate coefficients in the credit equation are individually insignificant, they are jointly significant, have the correct signs, and are almost equal in absolute value -- suggesting a specification in which the spread between ρ and i determines credit demand. Notice that the residual variances in the two equations are about equal.

Since the sample was too short to test reliably for parameter stability, we examined the residuals from the two equations over two subperiods with these results:

period	variance of money residual	variance of credit residual
1974:1-1979:3	$.265 \times 10^{-4}$	$.687 \times 10^{-4}$
1979:4-1985:4	$.888 \times 10^{-4}$	$.435 \times 10^{-4}$

The differences are striking. By this crude measure, the variance of money demand shocks was much smaller than that of credit demand shocks during the first subperiod but much larger during the second.

The evidence thus supports the idea that money-demand shocks became much more important relative to credit-demand shocks in the 1980s. But that does not mean we should start ignoring money and focusing on credit. After all, it is perfectly conceivable that the relative sizes of money-demand and credit-demand shocks will revert once again to what they were earlier. Rather, the message of this paper is that a more symmetric treatment of money and credit is feasible and appears warranted.

FOOTNOTES

*Princeton University. We are grateful to the NSF for supporting this research.

[1]See, among others, Stiglitz and Weiss (1981), Bernanke (1983), Blinder and Stiglitz (1983), and Blinder (1987).

[2]Blinder (1987) offers a model in which there is rationing and no substitute for bank credit.

[3]Regarding the latter, Mishkin (1976) argues that, if a large part of wealth is illiquid, consumers may want to borrow against this illiquid wealth in order to maintain an adequate buffer stock of liquid financial assets.

[4]For simplicity we assume that only i, not ρ, influences the demand for excess reserves.

[5]The interest rates in (3) should be real rates. But a model of aggregate demand takes both the price level and inflation as given; so we take the expected inflation rate to be constant and suppress it.

[6]ρ is an increasing function of i as long as the interest elasticity of the money multiplier is not too large.

[7]The loan market might still affect aggregate supply, however. See Blinder (1987).

[8]Most comparative statics results require no assumptions other than the ones we have already made. But, in a few cases, we encounter theoretical ambiguities that do not arise in IS/LM. Virtually all of these are of the following type: some comparative-statics derivative is the sum of several terms, one of which has the "wrong" sign. Every such case can be resolved by invoking one of the following three plausible assumptions:

1. The income elasticities of the demand functions for money and loans are not too different.

2. The absolute elasticities of loan supply and loan demand with respect to the two interest rates, ρ and i, are not too different, i.e., it is mostly the differential, $\rho-i$, that matters.

3. The interest elasticity of the money multiplier is not too large.

If output is fixed on the supply side, y would be replaced by P in Figure 1 and in the text discussion that follows.

[9]This cannot happen if assumptions 1 and 3 in footnote 8 hold.

[10]And that the aggregate supply curve is not vertical. If it is, replace y by P.

[11]In what follows, "money" is M1, "credit" is an aggregate invented by one of us: the sum of intermediated borrowing by households and businesses (derived from Flow-of-Funds data). For details and analysis of the latter, see Blinder (1985).

[12]Similar findings emerged when we controlled for many variables via a vector-autoregression and looked at correlations between VAR residuals.

[13]Estimation was by instrumental variables. Instruments were current, once, and twice lagged logs of real government purchases, real exports, bank reserves, and a supply shock variable which is a weighted average of the relative prices of energy and agricultural products.

References

Bernanke, Ben S., "Non-Monetary Effects of the Financial Crisis in the Propagation of the Great Depression," American Economic Review, June, vol. 73, No. 3, pp. 257-76.

Blinder, Alan S., "Credit Rationing and Effective Supply Failures," Economic Journal, June 1987, pp. 327-352.

Blinder, Alan S., "The Stylized Facts About Credit Aggregates," mimeo, Princeton, June 1985.

Blinder, Alan and Joseph E. Stiglitz, "Money, Credit Constraints, and Economic Activity," American Economic Review, May 1983, pp. 297-302.

Brunner, Karl and Alan H. Meltzer, "Money, Debt, and Economic Activity," Journal of Political Economy, Vol. 80, No. 5, September/October 1972, pp. 951-977.

Mishkin, Frederic S., "Illiquidity, Consumer Durable Expenditure, and Monetary Policy," American Economic Review, 1976, pp. 642-654.

Patinkin, Don, Money, Interest, and Prices, Harper and Row, 1956.

Poole, William, "Optimal Choice of Monetary Policy Instruments in a Simple Stochastic Macro Model," Quarterly Journal of Economics, 1970, pp. 197-216.

Stiglitz, Joseph E. and Andrew Weiss, "Credit Rationing in Markets with Imperfect Information," American Economic Review, June 1981, pp. 393-410.

Tobin, James, "A General Equilibrium Approach to Monetary Theory," Journal of Money, Credit and Banking 2, November 1970, pp. 461-72.