

Money Demand and Off-Balance Sheet Liquidity: Empirical Analysis and Implications for Monetary Policy

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In recent years, off-balance sheet credit facilities have grown dramatically and now represent the most prevalent contractual framework within which commercial and industrial borrowing from banks occurs. One important role of these facilities is to provide liquidity to bank customers that acts as a substitute for on-balance sheet liquidity or "money."

This paper discusses empirical evidence of the substitutability between on- and off-balance sheet liquidity for the business sector. It also discusses the implications of this relationship for interest rate determination and monetary policy. In particular, it is argued that monetary policy should pay more attention to off-balance sheet liquidity when choosing targets and operating procedures.

I. Introduction

In recent years, off-balance sheet credit facilities provided by banks have been one of the most rapidly growing financial instruments both within the United States and overseas. Loans "under commitment" account for 79 percent of American commercial and industrial loans, 80 percent of construction and land development loans, and 60 percent of farm loans.¹ Continuing credit facilities in the form of credit cards and lines of credit are important sources of funds for consumer loans as well. Investment banks and brokerage houses also offer credit to customers under arrangements somewhat like commercial bank credit facilities.

The increasing role of credit facilities has important implications for the

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structure of credit markets, the stability and risk exposure of financial institutions, and the operation of monetary policy. Until recently, most of the research on credit facilities has concentrated on issues of pricing and contract structure. Recent contributions include Campbell (1978), Thakor, Hong, and Greenbaum (1981), Melnik and Plaut (1986), and Ham and Melnik (1987). Yet an important role of private-sector credit facilities that has received less attention is the provision of liquidity, supplementing "ordinary" transactions account balances held by households and firms at banks and other depository institutions. They provide funds on short or no notice that can be used to finance transactions, generally as conveniently as writing checks or using cash.

This paper empirically explores the interrelationship between on- and off-balance sheet liquidity. In particular, it examines "money demand" in the presence of off-balance sheet liquidity taking the form of unused loan commitments. By analyzing the degree of substitutability among these different forms of liquidity, we attempt to shed more light on the channels through which monetary policy operates.

Off-balance sheet credit facilities generally have several characteristics in common. They establish maximum credit ceilings, which either may not be exceeded by the customer or may be exceeded only at substantial penalty. They are continuing medium-term or long-term arrangements, often extending over several years. They usually employ multiple pricing components, including an interest charge (often floating) and facility fees of one sort or another.²

Credit facilities can be seen as providing a number of services to bank customers. They may provide credit availability insurance; they may provide option-like hedging services by protecting customers against disadvantageous changes in the pricing of credit or in customers' credit ratings; they may reduce credit-related transactions costs. Finally, they provide liquidity by entitling the customer to utilize additional funds besides demand deposit balances in order to make transactions.³ In this paper we focus on this last aspect of facilities. Because these various services are provided jointly within the credit facility, it may be impossible to distinguish among them. For example, if credit utilized under a facility is diminished, it may be because the customer's credit needs have declined, because interest rate changes have motivated liability restructuring, or simply because the customer seeks to expand his liquidity by increasing his unused line of credit.

2. Facility fees are sometimes specified as a fixed amount, sometimes assessed on the total credit commitment, and at other times assessed on unutilized funds.

3. Technically, when funds are drawn under a credit line, they are credited to the customer's transactions account and are then used to complete transactions.

Off-balance sheet liquidity in the form of unused loan commitments may be regarded as providing bank customers with a stock of liquidity that is potentially a substitute for "money." The notion that off-balance sheet liquidity might be used as a substitute for on-balance sheet liquidity ("money") is appealing on both the theoretical and empirical levels. An individual may purchase merchandise using cash, checking account balances, overdraft facilities, credit cards, or personal lines of credit, all with more or less the same ease, convenience, and transaction costs. Similarly, a firm may purchase goods using cash, checking account balances, revolving credit facilities, or loan commitments, all with negligible differences in terms of convenience and transaction costs. Therefore, for an individual or firm, off-balance sheet facilities theoretically represent "stocks" of potential transaction-related purchasing power, exactly like money. An individual holding several credit cards, or an unused line of credit, would be expected to hold smaller balances in demand deposits than would a similar individual who did not have these sources of liquidity. Similarly, firms would decrease their demand for money when their holdings of off-balance sheet liquidity grow. The converse should also be true: Holding more funds in transactions accounts should mean lower demand for off-balance sheet liquidity.⁴

Much of the monetary literature in recent years has focused on how financial deregulation has affected the substitutability between $M1$ and other on-balance sheet items such as monetary market deposit accounts, passbook savings, and other forms of liquid savings.⁵ We argue that the substitutability of $M1$ and off-balance sheet liquidity may be similarly important.

The total quantity of unused credit under off-balance sheet facilities is in fact about the same order of magnitude as $M1$ itself. In June 1987 the level of unused commercial and industrial ($C + I$) commitments at the 110 banks surveyed by the Federal Reserve System represented 51 percent of $M1$. (This figure does not include $C + I$ lines of credit at other institutions or non- $C + I$ lines.)⁶

Although data are available for the off-balance sheet liquidity maintained by businesses (in the form of unused $C + I$ credit lines), comparable data for the household sector are not. We therefore concentrate here primarily

4. Of course, firm and individual decisions regarding holdings of on- and off-balance sheet liquidity are not made independently. Moreover, they are not necessarily made *simultaneously*, since purchasing off-balance sheet facilities involves recontracting. (Typically, one alters his checking account balance more often than he does the number of his credit cards.) Hence, adjustments in on-balance sheet liquidity would be expected to occur more often, and faster, if taken in aggregate.

5. See Simpson and Porter (1980) and Judd and Trehan (1987).

6. The loan commitment data were provided by the Federal Reserve Board's Banking Studies Section. These data, which are no longer collected, were published in Federal Reserve Board Statistical Release G-21. Monthly figures are available for July 1973 through June 1987 only.

on the business sector and, in particular, on the degree of substitution between business-held off-balance sheet liquidity and on-balance sheet liquidity in the form of gross business demand deposits.⁷

For the period 1974Q1 through 1987Q2, the simple correlation coefficient between percentage quarterly changes in unused $C + I$ commitments and in gross business demand deposits was -0.12 . When business holdings of demand deposits rise (fall), unused business credit lines tend to be adjusted downward (upward).

Business holdings constitute the bulk of all gross demand deposit holdings. Although these are available on a quarterly basis only, total $M1$ is available monthly. The simple correlation coefficient between percentage monthly changes in $M1$ (which includes nonbusiness holdings) and unused $C + I$ commitments is -0.27 for the period 1976:1 through 1987:6, and -0.34 for the period 1979:1 through 1987:6. This casual analysis supports the notion that money and loan commitments may serve as substitute forms of liquidity.

The substitutability between money and off-balance sheet liquidity has important implications for the transmission channels of monetary policy. In recent years, attention has refocused on the issue of how monetary changes are transmitted to the real sector. The traditional view was that money is held primarily due to its usefulness and efficiency in conducting transactions and that changes in money aggregates influence real economic activity through the interest rate channel by affecting the opportunity cost of funds. Such an approach may be traced back at least to Baumol (1952) and Tobin (1956).

More recently, the monetary literature has attempted to connect off-balance sheet credit facilities with monetary policy through the phenomenon of credit availability and rationing. The credit rationing literature has grown following Jaffee and Modigliani (1969), Jaffee and Russell (1976), and Stiglitz and Weiss (1981). As noted by Melnik and Plaut (1986), the most common institutional form for such rationing is the loan commitment contract. Blinder (1981) and Blinder and Stiglitz (1983) have theoretically addressed the question of the operation of monetary policy under credit rationing. They have shown that in a rationing equilibrium, monetary policy has little if any effect on real activity through interest rate changes, but does have an effect through its impact on credit availability.

On the empirical side, a number of papers have attempted to determine

7. The gross demand deposit data are published in Table 1.31 of the *Federal Reserve Bulletin*. The raw data were available only in seasonally unadjusted form and were seasonally adjusted by taking the residuals from a regression with seasonal linear dummies.

whether credit quantity variables have real effects. Friedman (1982, 1983) has argued that total (net) credit is more closely related to real economic activity than narrower measures of liquidity, as measured by the various monetary aggregates. However, King (1986) and Bernanke (1986) have found little evidence that bank loans have predictive power for real economic activity or that banks ration loans.⁸ Wojnilower (1985) and Sofianos, Wachtel, and Melnik (1987) have argued that the growth of off-balance sheet liquidity may explain the weakness of the credit rationing channel. In particular, Sofianos et al. empirically analyze the relation of credit utilized under loan commitments with monetary policy and real economic activity. They argue that loan contracts provide bank customers with a kind of insurance against credit rationing, and hence affect monetary policy by eliminating the quantity availability effects for these borrowers. They find evidence that money supply changes affect the volume of loans under commitment.

The existence of an interrelationship between on- and off-balance sheet liquidity has a number of important implications. First, the traditional view that short-term interest rates are determined by supply and demand for on-balance sheet monetary aggregates may be incorrect if off-balance sheet facilities represent a nonnegligible alternative source of liquidity. Second, the channels through which monetary policy operates are considerably more complex when both "types" of liquidity coexist. Open market expansions or contractions of on-balance sheet liquidity may trigger adjustments in off-balance sheet liquidity. Interest rates and prices will then have to clear "both" liquidity markets, resulting in equilibria seemingly at odds with money demand analysis. Third, since off-balance sheet liquidity (in the form of unused loan commitments) is created through private-sector contracting between financial institutions and their customers, the total stock of liquidity (on and off the balance sheet) may be essentially beyond the control of the monetary authorities. An attempt to alter liquidity through open market operations may lead to countervailing adjustments in off-balance sheet liquidity. The latter may be expanded or contracted by private-sector agents in order to counter the on-balance sheet effects of monetary policy.⁹

The plan of the paper is as follows. In Section II we investigate the

8. The evidence provided by Bernanke is actually mixed. Using vector autoregression (VAR) techniques, he finds no support for the existence of credit rationing. However, using a mixed VAR-structural approach, he finds evidence that credit flows may influence real activity as strongly as monetary aggregates.

9. See Glick and Plaut (1988), a theoretical companion paper. There it is argued that monetary authorities lose control of interest rates and real variables due to such countervailing adjustment.

effects of off-balance sheet liquidity in the form of unused loan commitments within a conventional money demand equation. In Section III we discuss the implications of our analysis for monetary policy. Finally, in Section IV we discuss conclusions.

II. Money Demand in the Presence of Off-Balance Sheet Liquidity

Traditionally, money demand analysis has dealt with on-balance sheet liquidity separately from off-balance sheet liquidity. If, however, the two forms of liquidity are substitutes or if interest rates depend on total "liquidity demand," then analyzing money demand separately from off-balance sheet liquidity demand will lead to an incorrect representation of the interest rate determination process as well as misleading guidelines for monetary policy.

To shed some light on the interrelationship between on- and off-balance sheet liquidity, we investigate the effects of including loan commitments in a conventional money demand equation by adapting the error-correction specification approach of Hendry (1980). This specification is employed to take account of the lagged adjustment of private demand for money to changes in macroeconomic variables that determine this demand.¹⁰ More specifically, we posit the following long-run relationship between money and its determinants:

$$\log M_t = a_0 + a_1 \log Y_t + a_2 R_t + a_3 \log UC_t + e_t \quad (1)$$

Here M is the monetary aggregate, Y is an income scale variable, R is a short-term money market rate, UC is unused loan commitments, e is an error term representing the extent to which the public's actual money stock diverges from its equilibrium level, and t is a time subscript.

The short-run adjustment of money demand in a given period is assumed to depend on the divergence between its actual and equilibrium level at the beginning of the period, e_{t-1} , and on current (and possibly lagged) changes in the explanatory variables:

10. An advantage of the Hendry specification is that it does not require the long sample period needed for the estimation of explicit distributed lags, and it implies fewer restrictions on the response of money to its determinants than the partial adjustment model. It also allows the short-run impacts of changes in macroeconomic variables to differ from their long-run effects. For an application of this specification see Motley (1988).

$$\Delta \log M_t = b_0 - b_1 e_{t-1} + \sum_p \Delta b_{2p} \log M_{t-p} + \sum_q b_{3q} \Delta \log Y_{t-q} \quad (2)$$

$$+ \sum_s b_{4s} \Delta R_{t-s} + \sum_v b_{5v} \Delta \log UC_{t-v}$$

where Δ denotes the first difference operator.

Substituting (1) into (2) gives:

$$\Delta \log M_t = b_0 + \sum_p b_{2p} \Delta \log M_{t-p} + \sum_q b_{3q} \Delta \log Y_{t-q}$$

$$+ \sum_s b_{4s} \Delta R_{t-s} + \sum_v b_{5v} \Delta \log UC_{t-v}$$

$$- b_1 (\log M_{t-1} - a_0 - a_1 \log Y_{t-1})$$

$$- a_2 R_{t-1} - a_3 \log UC_{t-1} \quad (3)$$

In this equation a_1 represents the long-run income elasticity of demand for money; and a_2 multiplied by the level of R is the long-run interest elasticity. As the stock of money approaches its long-run equilibrium level more quickly, the larger are the coefficients on the lagged level of money (b_1) and the smaller are those on the changes in money, income, and the interest rate (b_{2p} , b_{3q} , and b_{4s} , respectively). The coefficient a_3 may be interpreted as the long-run substitutability of loan commitment liquidity for on-balance sheet liquidity (or M).

We estimated equation (3) using quarterly data for the period 1974Q1-1987Q2. Since the off-balance sheet data are available for the business sector only, we restrict the analysis to gross deposit holdings by the business sector. The other explanatory variables are defined in the usual way. Y is measured by nominal GNP, R by the three-month Treasury bill rate, and UC by total unused commercial and industrial loan commitments, as reported by the sample of large U.S. banks in the Monthly Survey of Commercial and Industrial Loan Commitments. Three dummy shift variables are used to remove outlying observations—one for a period of sharp increase in loan commitment usage in 1975Q1, a second for the "credit crunch" period 1980Q2, and a third for a short period of unusually large monetary growth, 1986Q4. Seasonal adjustment dummies are also included.

Representative results are reported in column 1 of Table 1. Observe that changes in income, unused loan commitments, and (lagged) money are all statistically nonsignificant, whereas the lagged change in the interest rate is significant. However, the lagged levels of these variables, representing the

TABLE 1

OLS Regression Estimates, 1974Q1-1987Q2

Dependent Variable	(1) $\Delta \log M_t$	(2) $\Delta \log UC_t$
Constant	1.78 (2.78)***	.208 (.266)
$\Delta \log M_t$	-.007 (-.048)	-.193 (-1.08)
$\Delta \log Y_t$	.397 (1.52)	.606 (1.90)*
ΔR_t	.002 (1.02)	.004 (1.27)
ΔR_{t-1}	-.004 (-1.83)*	.001 (.289)
$\Delta \log UC_{t-1}$	.032 (.358)	.386 (3.48)***
$\log M_{t-1}$	-.293 (-3.28)***	-.102 (-.933)
$\log Y_{t-1}$	.305 (3.73)***	.206 (2.06)**
$\log R_{t-1}$	-.001 (-1.23)	.005 (3.56)***
$\log UC_{t-1}$	-.120 (-3.37)***	-.124 (-2.84)***
R ²	.95	.77
SEE	.015	.019
DW	2.05	2.22

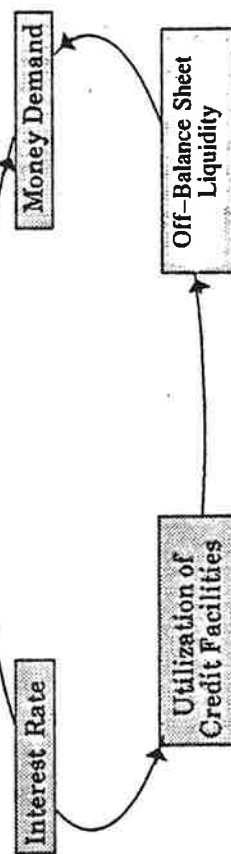
Note: t-statistics are given in parentheses below coefficients, with statistics significant at the .10, .05, and .01 significance levels indicated by *, **, and *** respectively. Coefficients for dummy and seasonal variables are not reported.

long-run determinants of money demand, are all significant except for the interest rate. As expected, changes in current money demand depend positively on income and negatively on the interest rate and lagged money holdings. Most importantly for our purposes, money demand depends negatively on the level of unused loan commitments (UC). An increase in the level of unused loan commitments leads to a fall in money demand.

Although UC is an important explanatory variable for money demand, the converse was not the case. Column 2 in Table 1 reports the results of estimating an equation for the demand for unused off-balance sheet liquidity, analogous to Column 1. We observe that neither changes nor levels of money seem to affect the demand for unused loan commitment facilities.¹¹ Interestingly, the sign of the coefficient of the interest rate in the demand for off-balance sheet liquidity is opposite that for money demand. When the interest rate rises, businesses demand less money but more off-balance sheet

11. This may reflect the fact that recontracting to alter UC occurs infrequently.

FIGURE 1



liquidity. This may be so because they substitute the latter for on-balance sheet liquidity, the holdings of which drop due to increases in opportunity costs. Similarly, it may be due to the fact that utilization of credit under these lines decreases, leaving greater unused liquidity. As we have seen, a change in off-balance sheet liquidity subsequently causes changes in M .

A major implication that may be drawn from the above results seems to be that changes in interest rates feed into the components of liquidity demand through different channels. A rise (fall) in the interest rate lowers (raises) demand for M and raises (lowers) demand for UC. Changes in UC, in turn, have a further effect on M , by causing M to be substituted for UC. The two effects on M work in opposite directions (Figure 1).¹²

III. The Implications for Monetary Policy

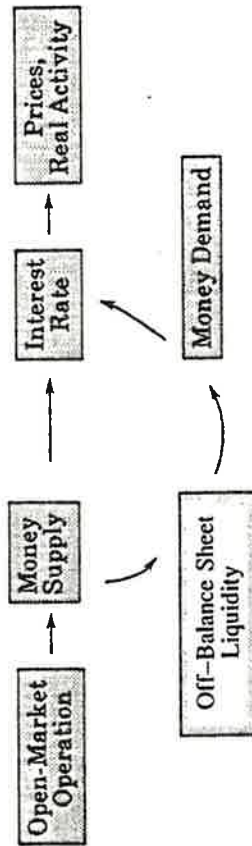
Under current regulations, off-balance sheet liquidity in the form of revolving credit facilities, lines of credit, and loan commitments represents a largely unregulated source of liquidity. These facilities are generally exempt from regulatory costs imposed on banks through reserve requirements, liquidity ratios, and so forth.¹³ Banks and their customers may fully expand or contract the quantity of this form of liquidity on the basis of their own needs and costs.

The existence of off-balance sheet liquidity may influence the effectiveness of traditional monetary policy. When monetary policy produces

12. The results in this section are illustrative. A more-refined technique should try to estimate simultaneously the demand for money and off-balance sheet liquidity.

13. New capital requirements for off-balance sheet items are currently being implemented in the United States and several other countries.

FIGURE 2



expansion or contraction of on-balance sheet liquidity (or "money"), private-sector agents may choose to offset this change to some extent through adjustments in their off-balance sheet liquidity "holdings." They may do so through altering the extent to which credit is utilized under existing lines of credit, raising or lowering the unused portion of the commitment. In addition, they may alter their off-balance sheet liquidity through recontracting, purchasing new lines, or canceling old lines.¹⁴

Thus, for example, an open-market operation involving the sale (purchase) of securities by the monetary authorities would initially contract (expand) liquidity and increase (decrease) the supply of bonds. If the private sector subsequently increased (decreased) its off-balance sheet liquidity through reducing (increasing) credit utilized under commitments, then the impact of the open-market operation on interest rates and real sector is unclear (Figure 2). If interest rates are determined by the aggregate supply and demand for "credit," then the open-market operation and the off-balance sheet adjustment response work in opposing directions, resulting in a small (or even ambiguous) net shift in credit demand. Similarly, the net stock of liquidity would decline by less than the change in "money," which might cushion the impact of open-market operations on interest rates and real activity. In a sense, monetary policy would become less effective.¹⁵

Another aspect of the role of off-balance sheet facilities in monetary policy relates to the proper aggregate to be targeted. Traditionally, *M1* was considered to be the appropriate aggregate for money targeting, in the sense that it measured the quantity of the medium of payment and was thought

14. Because contracting for facilities occurs infrequently, adjustments in off-balance sheet liquidity may occur slowly. Hence, the monetary implications of off-balance sheet liquidity are likely to be different in the long and short run. This indeed is supported by the findings in the above empirical section, where lagged unused commitment levels and anticipated future adjustments therein seem to affect money demand.

15. See Glick and Plaut (1988).

to be the aggregate most closely correlated with prices and real activity. In recent years *M1* has been increasingly abandoned, both by researchers and by policymakers. Monetarists today often speak of *M2* or some broader monetary aggregate as their recommended target. The Federal Reserve System currently focuses more on *M2* and *M3* (to the extent that it targets any monetary aggregate) rather than on *M1*.

The abandonment of *M1* seems to have been motivated by the fact that *M1* velocity has shifted excessively in recent years. Over the same period, quasi-money aggregates have expanded rapidly and the *M1*-based money demand equations have seemed to lose much of their predictive powers and some of their econometric fit.¹⁶ However, off-balance sheet liquidity also grew rapidly over this period. Financial innovation related to these facilities probably occurred as quickly as it did for the nontransactions account components of *M2* and *M3*. It remains for future empirical research to determine whether a "liquidity" measurement, consisting of *M1* plus off-balance sheet unused facilities, performs better than *M2* or *M3* in terms of explaining market equilibria and as a guideline or target for monetary policy. In any case, *M2* and *M3* may reflect substitution away from *M1*, but so again may off-balance sheet facilities.

Finally, there seems to have occurred in recent decades a general increase in the volatility of interest rates. Certainly the 1970s and 1980s have been "noisier" than the 1950s and 1960s. Some have interpreted this as a symptom of a general loss in monetary control by central banks. It may be that the "noise" stems from the rapid growth in off-balance sheet liquidity, reducing the correlation between *M1* and total liquidity. We know of no evidence that monetary authorities have looked at unused commitments when formulating policy or that they have targeted total liquidity or even considered it as a relevant factor. Our analysis suggests that such an experiment should be considered.

IV. Conclusions and Summary

The debates over monetary policy and monetary targeting have been largely restricted to forms of liquidity appearing on the balance sheets of financial institutions. Much of the debate has been over which liabilities of these institutions should be properly counted as "money," and hence which are thought to represent the appropriate target for monetary policy.

Interestingly, little attention has been paid to the monetary importance of contingent liabilities of these institutions in the form of off-balance sheet

16. See Simpson and Porter (1980) and Judd and Scadding (1982).

credit facilities. These facilities provide a medium of exchange capacity and represent a liquidity substitute for on-balance sheet "money."

We have presented empirical evidence consistent with this view. Unused commitments appear to be a significant argument in money demand functions. Firms and individuals appear to jointly determine their demand for on-balance sheet and off-balance sheet liquidity, where one may be substituted for the other.

This has a number of important implications for interest rate determination and monetary policy. To the extent that interest rate adjustment ultimately clears a "liquidity" market, the substitutability of on- and off-balance sheet aggregates weakens the relationship between money, interest rates, and other variables of concern to policymakers.

If this view is correct, monetary authorities should be targeting, or at least watching, *total* liquidity, including unused off-balance sheet credit facilities. Short-term discretionary control of this aggregate may prove quite difficult, however, given the tendency of off-balance sheet liquidity to countervail changes in "money," including those generated by monetary "surprises" or unanticipated shocks in monetary policy.

Finally, it may be desirable to address the issue of regulation of off-balance sheet liquidity. Similar debates for on-balance sheet money and bank liabilities often involve trade-offs between macro and micro considerations. The former include arguments for regulation to improve monetary control and prevent macroeconomic instability. Micro considerations might dictate opposition to more regulation in order to achieve efficiency in banking operations and credit allocation. Off-balance sheet liquidity or contingent liabilities for financial institutions have been much less regulated than on-balance sheet activities. Any changes in this state must be weighed in light of the same sorts of micro and macro considerations.

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