Bank Credit and Economic Activity

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The role of banks in regional as well as in national economic fluctuations has been the subject of renewed interest in recent years. With what seems like amazing prescience, Bernanke and Blinder (1988) recently revived the theoretical literature on the role of bank credit typically associated with Brunner and Meltzer (1972). The trickle of empirical papers written before the 1990s that focused on bank credit turned into a torrent during the 1990s.

The primary impetus for this renewed interest was the 1990–91 recession, which seemed contemporaneously to have been distinguished by the large, and perhaps initiating, role played by reduced bank lending. Statements by government policymakers and the outpouring of research on the role of bank credit in macroeconomic fluctuations over the past five years generally indicated that banks' capital shortfalls, whether due to regulatory changes or loan losses, reduced bank lending and were highly correlated with reduced output.

The strong correlation between loans and output is long-standing. Indeed, the U.S. Department of Commerce classifies various measures of the dollar volume of business and consumer credit outstanding as lagging indicators of output, and it classifies various measures of the change in business and consumer credit as leading indicators of output.

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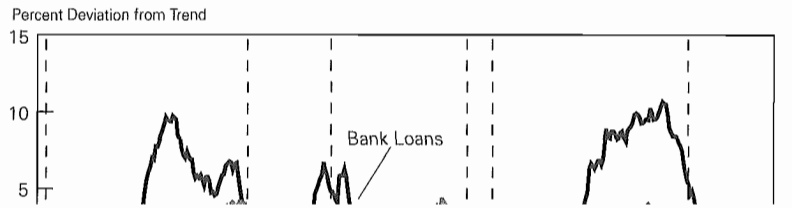
Figure 1

BANK LOANS AND OUTPUT [a]



sors. The extent to which lending fell short of its trend in 1992 and 1993 was atypical, not in its magnitude, but in how long the recovery in lending lagged the recovery of output. Also atypical about the business cycle that began in 1982 was how much lending rose relative to trend during the expansion of the 1980s and how much lending then fell from those lofty heights in the early 1990s.

Rising Interest in the Declining Role of Banks?

One intriguing aspect of the increased attention recently paid to banks is that we might have expected banks to be relatively less important in recent business cycles than ever before. Financial deregulation and innovations in financial instruments and institutions might have been expected to reduce the extent to which banks played a "special" role in supplying either businesses or households with credit. The removal of interest rate ceilings on bank deposits reduced the extent of disintermediation that disrupted flows of credit and economic activity in the past. The deepening of the commercial paper and other nonbank markets for business loans, the widespread use of credit cards by households and small businesses, and the explosive growth of the secondary markets for residential mortgages and other forms of credit presumably expanded greatly the range of relatively close substitutes for commercial bank loans over the past few decades.

Figure 2 plots the ratio of the (dollar) volume of commercial and industrial loans at commercial banks to the sum of those loans and the outstanding (dollar) volume of commercial paper issued by nonfinancial corporations. This ratio has declined steadily over the past two decades, from about 95 percent in 1973 to 80 percent in 1993.[3] This one measure of banks' market share indicates that banks no longer have the near-monopoly in the market for short-term business finance that they once did. Though banks remain the dominant suppliers of short-term business credit, they are no longer effectively the only supplier. Measures of banks' share of credit extended to households (including mortgage credit) would likely show a downward trend as well. Nonetheless, banks still command a large share of the credit extended to the private sector. How much shifts in bank lending per se have contributed to economic fluctuations is the focus of our study.

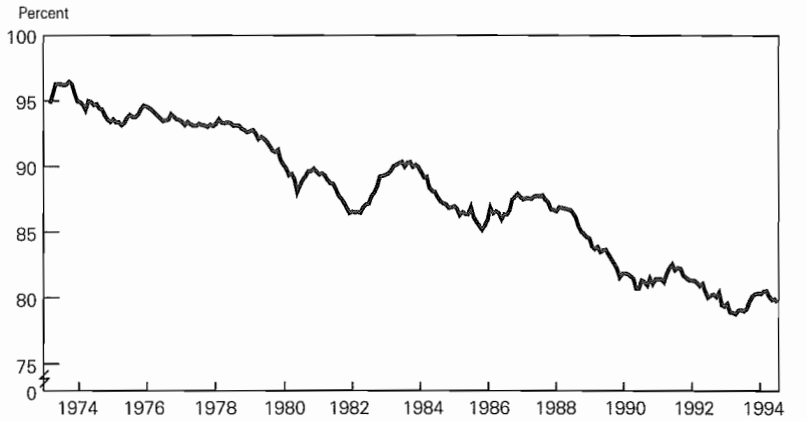
Plan of the Paper

This paper provides estimates of the separate effects on bank lending and on output of shifts in the demand for bank loans and of

[3] See Laderman (1993).

Figure 2

BANKS' SHARE OF SHORT-TERM BUSINESS CREDIT



shifts in the supply of bank loans.[4] It will also provide estimates of some of the proximate determinants of those shocks to bank loan supply over the 1960–94 period.

Evaluation of banks' contributions to fluctuations in aggregate lending and output requires distinguishing changes in bank loans that arise from changes in the supply of bank loans from those that arise from changes in the demand for bank loans. Identifying the separate effects of loan supply and demand has proved to be quite difficult.[5] Hall (1993), Hancock and Wilcox (1993, 1994), Peek and Rosengren (1994, 1995a, 1995b), and studies by many others have argued that shortfalls of bank capital relative to some target level of capital reduced the supply of bank loans.[6] Whether the other factors that they considered reduced the supply of bank loans, the demand for bank loans, or both, they could not say. As a consequence, these studies could not assess the timing or

[4] Throughout, unless explicitly noted otherwise, when we say loans, we refer to *bank* loans.

[5] See Bernanke's comments on Friedman and Kuttner (1993) and on Ramey (1993).

[6] For a dissenting view, see Berger and Udell (1994).

relative importance of bank loan supply shocks in toto to bank lending or to output.[7]

This study uses vector autoregressions (VARs) to assess a number of hypotheses about the interaction of bank lending, monetary policy, and aggregate economic activity. Evidence is presented to support the view that applying the standard Choleski decomposition method to VARs does a creditable job of distinguishing shocks to the supply of bank loans from shocks to the demand for bank loans. Despite the difficulties in measuring both the price and the non-price aspects of loan pricing that serve to ration loan supply, we argue that shocks to the prime interest rate seem to capture empirically the effects of shifts in bank lending behavior that correspond to loan supply disturbances. We then show that these shocks have had important effects on bank lending and on aggregate output.[8]

Unless bank lending is affected by loan supply shocks, output will not be. Thus, the study estimates how much effect shocks to bank loan supply have on the outstanding (dollar) volume, or quantity, of bank loans. It also shows what the estimates imply about the effects of bank loan supply shocks on aggregate output. The estimates are used to calculate the contributions of loan supply shocks to output fluctuations over the past three decades. Though loan supply shocks are not typically the primary determinant of recessions, we show that they played an atypically large role in the 1990–91 recession.

Also estimated is the extent to which the estimated time series of loan supply shocks was correlated with changes in some of the presumed determinants of bank loan supply. For example, it might be expected that loan supply would be reduced by increases in FDIC deposit insurance fees, in reserve requirements, in the amount of capital banks held, in the difference between deposit interest rates ceilings and open market rates, and so on. The estimates indicate that these factors did affect the aggregate supply of bank loans during the 1960–94 period.

We then estimated vector autoregressions (VARs) over subsamples to provide evidence on whether the responses to loan supply shocks changed over time. A priori, less influence of loan supply shocks might be expected in later periods, when more close substitutes for bank loans were available to businesses and to households. The estimates suggest that in recent years the effects of loan supply shocks both on loan volume and on output were smaller than they were historically.

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[7] They could provide estimates of the effects of capital shortfalls on bank lending and on output, but capital considerations presumably were only one of several potential sources of shocks to banks' loan supplies.

[8] Here we do not explicitly address the related issue of whether monetary policy operates through its effects on the supply of bank loans.

The Data

The estimates reported below were based on VARs that used data for aggregate output, inflation, the federal funds rate, the prime interest rate, and bank loans.[9] The data were monthly and covered the period January 1959 (1959:01) through December 1994 (1994:12). Except for interest rates, the data were seasonally adjusted.

In previous empirical investigations of the relation between bank lending and output, and in numerous other investigations that used aggregate data, either quarterly data were used or, if the data frequency was monthly, the index of industrial production typically was used as a proxy for aggregate output. We used monthly data, but avoided problems introduced by the narrowness of industrial production as a measure of aggregate economic activity by using (the logarithm of) the U.S. Department of Commerce's Index of Coincident Indicators (ICI). The ICI is an average of four real series: (1) employees on nonagricultural payrolls, (2) real personal income less transfers, (3) industrial production, and (4) real manufacturing and trade sales. Thus, the ICI subsumes the index of industrial production. Because the ICI is constructed so as to match the aggregate level of economic activity, we refer to the ICI as output.

The measure of inflation, PI, is 100 times the change over the prior 12 months in the log of our measure of the consumer price index (CPI). Starting in January 1983, the U.S. Bureau of Labor Statistics (BLS) changed its calculation of the official measure of the CPI by switching to a rental-equivalence measure of housing costs. This change was intended to reduce biases in the CPI associated with nominal mortgage interest rates. To make the measure of the CPI for the period before 1983 comparable with the later data, we used as the measure of the CPI an unofficial series calculated by the BLS for the period from January 1967 through December 1982, CPIUX1NS. We used the official BLS measure of the CPI from 1959 through 1966. In the period before 1967, nominal mortgage interest rates were low and stable enough that the differences between the series produced by the old and new methodologies would likely have been small.

The monthly nominal federal funds interest rate, denoted by FYFF, is the average of daily rates, each of which was a weighted average of rates on trades at New York federal funds brokers. The prime rate, the nominal interest rate on short-term business loans that banks charged to the lowest-credit-risk customers, was denoted as FYPR. The monthly data for FYPR are averages of daily data.[10]

The data on total loans and leases at commercial banks came from

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[9] We used RATS4.1 to obtain all our estimates.

[10] Data for the federal funds rate and the prime rate came from the Board of Governors of the Federal Reserve System release G.13.

the Board of Governors of the Federal Reserve System. The bank loan data were adjusted by the staff at the Federal Reserve Board for the change in definition that took place in January 1973. We adjusted the data for the data break due to the Federal Reserve's changed method of calculation that took effect in January 1988.[11] Data on bank loans were converted to real terms by dividing them by our measure of the consumer price index. Logged, real bank loans are denoted RBL.

Strategy and Results

Estimates from vector autoregressions (VARs) were used to assess a number of hypotheses about the interaction of bank lending, monetary policy, and aggregate economic activity. Three exogenous variables were included in each of the VARs we estimated: two trend variables and (current and seven lagged values of) the producer price index for crude petroleum.[12] The first trend variable begins in the first period of the sample; the second is zero until January 1974, when it takes on a value of one. It rises by one each month thereafter. The trend terms together are meant to allow for a once-broken linear trend in the log of potential real GDP. Statistical tests of lag length indicated that seven lags of each variable should be included.[13] To allow for lags, the estimation period was shortened to 1960:08 through 1994:12.

Similarities to and Differences from Earlier Findings

Because using the monthly ICI as a proxy for aggregate output is surprisingly *un*common, we began by estimating VARs similar to those based on quarterly data reported by Friedman and Kuttner (1993). We find the common use of the monthly index of industrial production in lieu of the ICI especially surprising because the index of industrial production is one component of the ICI and the other components of the ICI provide information about economic activity in the non-industrial part of the economy, which is probably larger than the industrial part. We were also interested in the effects of moving to higher-frequency data. Friedman and Kuttner used real GDP as a proxy for output

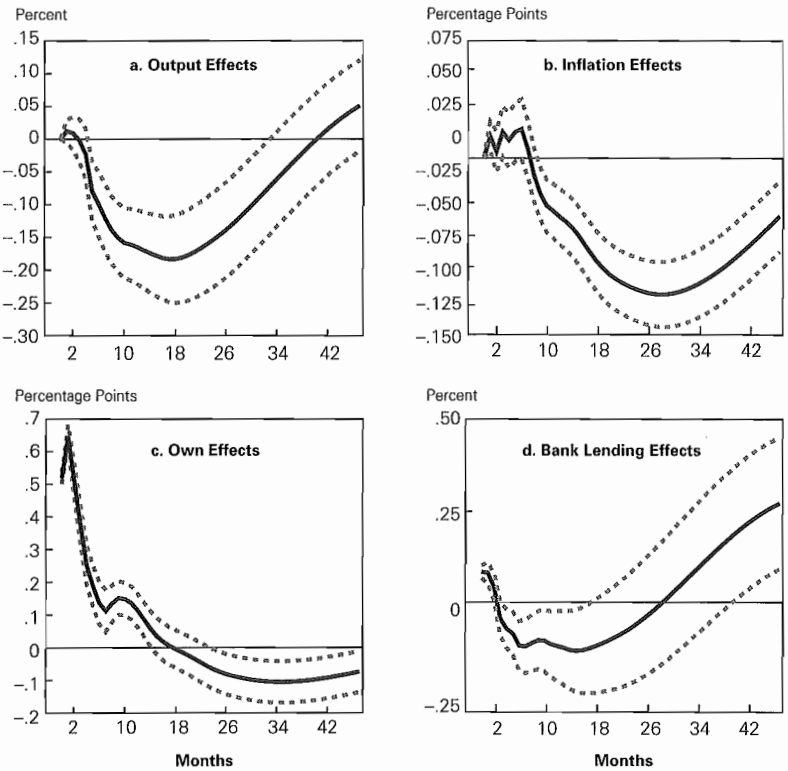
[11] To do so, we multiplied the data for the period before January 1988 by 0.9955.

[12] The PPI was deflated by our measure of consumer prices to make it a relative price and then was logged.

[13] Based on DeJong, Nankervis, Savin, and Whiteman's (1992) test for the null of trend stationarity, we could reject the null only for the real loan series (test statistic of 0.26 compared to a 5 percent critical value of 0.24). Using the first difference of RBL in place of the level had no substantive effects on our results. The residuals from the VAR passed standard tests for stationarity and showed no signs of serial correlation. Based on a likelihood ratio test, the null of six lags versus the alternative of seven lags could be rejected easily; seven lags could not be rejected against the alternative of eight lags. We used seven lags throughout.

Figure 3

Responses to a Funds Rate Shock



Note: Dashed lines indicate one-standard-error bands.

and the change in the implicit deflator for GDP as their measure of inflation, neither of which is available at a monthly frequency. Their sample period was 1960:QII through 1992:QIV, which is quite similar to ours. They reported impulse-response functions from four-variable VARs that included, in order, real GDP, inflation, and the federal funds rate, as well as one additional variable from among a set of various financial market variables. Each of their VARs included four lags of each endogenous variable.

Figure 3 shows our estimates of the responses of output, inflation, the funds rate itself, and (the quantity of real) bank loans to a one-

standard-deviation shock to the federal funds rate; also shown for the impulse-response functions are the one-standard-error bands, which were obtained by Monte Carlo integration.[14] The VAR specified the endogenous variables in the following order: ICI, PI, FYFF, and RBL.[15] This specification was chosen because of its similarity to the Friedman and Kuttner specification.

Panel (a) of Figure 3 shows that, in response to a positive shock to the funds rate, output first briefly rose by a small and statistically insignificant amount. It then declined rather sharply, troughed about 20 months after the funds rate shock, and rebounded to its pre-shock level about three and one-half years after the shock. Thus, we found a pattern based on monthly data with ICI used as a proxy for output that was broadly consistent with estimates based on quarterly data with real GDP used as a measure of output.[16] Panel (a) shows that output troughed at about a 0.17 percent decline relative to baseline, whereas Friedman and Kuttner reported a maximum decline of about three times that amount, which seems consistent since they used quarterly rather than monthly data. Bernanke and Mihov (1995), using a monthly GDP series, found a somewhat larger effect for a funds rate increase.[17] As expected, the response of inflation, plotted in Panel (b), trailed and was generally smaller than the response of output to a funds rate shock.[18]

After a short, sharp, significant increase in response to an upward shock to the funds rate, bank lending moved below baseline and stayed there for about two years, as shown in panel (d).[19] We attribute the rise in lending that immediately followed a monetary contraction to the increased credit needs of firms that find cash flows declining in the face of reduced aggregate demand.[20]

The estimates in Figure 3 also differ in noteworthy ways from those obtained by Friedman and Kuttner. For example, we found that output both declined and rebounded more rapidly; this difference could result solely from their use of quarterly average rather than monthly data. In contrast to the results in panel (d), Friedman and Kuttner estimated that

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[14] Standard error bands were generated based on 1,000 draws.

[15] We omitted FYPR from the VARs used to generate Figure 3.

[16] Bernanke and Mihov (1995) find a similar response using a monthly GDP measure.

[17] Note that over the 1960–94 period the variance of detrended (log) quarterly real GDP was smaller (3.85 percent) than that of the detrended (log) monthly index of coincident indicators (4.34 percent).

[18] Panel (b) of Figure 3 shows the "price puzzle," that inflation initially rises in response to a funds rate shock. Though it has been argued that including a commodity price variable in a VAR tends to eliminate the puzzle, our specifying the real price of petroleum as exogenous did not eliminate it. The positive responses of output and inflation were small enough that the one-standard-error bands always contained the baseline.

[19] This is similar to the pattern reported by Bernanke and Blinder (1992).

[20] For example, Wilcox (1992) reports that while commercial and industrial loans initially rise in response to a funds rate shock, consumer and real estate loans decline.

a funds rate shock *raised* bank lending above baseline for three years; this is difficult to reconcile with our a priori belief that an increase in the funds rate represented a tightening of monetary policy.[21] To the extent funds rate shocks approximated shifts in monetary policy, the estimates delivered by our specification seemed more plausible.

In principle, the demand for bank loans may have shifted importantly, for example, because of substantial changes in the supply of nonbank finance. A priori, we did not expect loan demand shocks to be important determinants of changes in the volume of bank loans or of changes in output. In that regard, we concurred with Bernanke and Blinder's (1988) view that, in contrast to shocks to loan supply, it might be "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." The evidence presented below supports that view.

To help judge whether shocks to the real quantity of bank loans were important, Figure 4 shows the estimated responses to them. Panel (a) shows that output rose briefly but by only a very small amount in response to a positive shock to loan volume. The ensuing responses of output to the loan quantity shock were always small and insignificant. This contrasts with the Friedman and Kuttner finding that, in response to a loan volume shock, output rose continually over a three-year period. Inflation also responded by small and insignificant amounts to loan quantity shocks. The funds rates' response being noticeably above baseline during the first year following the positive shock to bank loans, shown in panel (c), presumably reflected a countercyclical reaction on the part of the Federal Reserve.

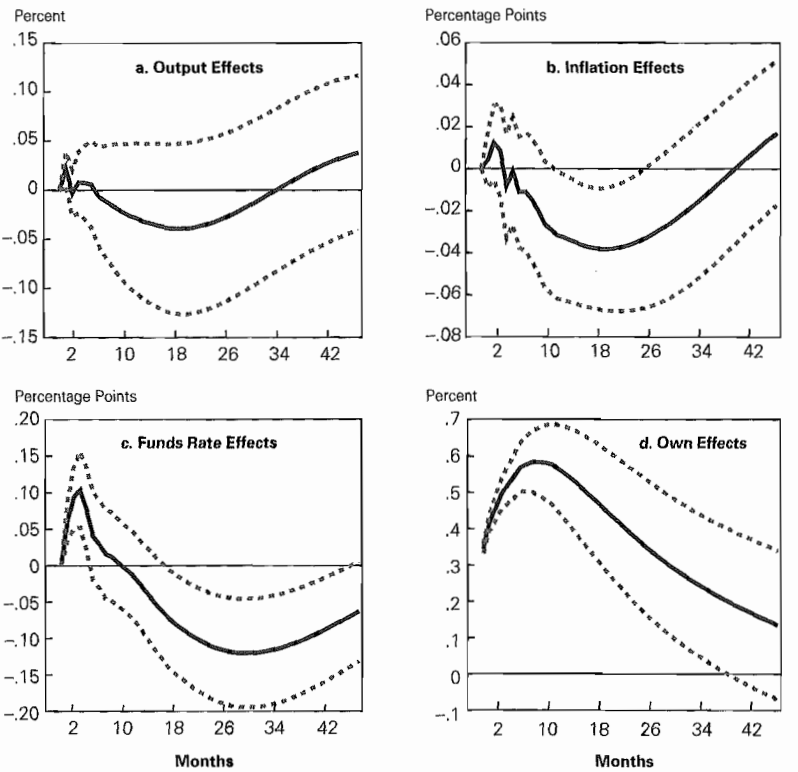
Figure 5 shows impulse-response functions obtained when we substituted the prime interest rate for the volume of bank loans in the four-variable VAR. A prime rate shock was estimated to lower output and inflation initially. As in Figure 3, the inflation response trailed that of output. These responses are consistent with a prime rate shock being identified as a loan supply shock. But they contrast with the Friedman and Kuttner finding that shocks to the bank loan interest rate, which they measured as a spread over the commercial paper rate, led to a rise in output.

Figure 5 also shows that a positive prime rate shock was followed by a decline in the federal funds rate, again presumably reflecting a countercyclical policy response of monetary policy by the Fed. Since output reversed its decline and eventually rose temporarily above the baseline path, the policy response appeared to overcompensate for the prime rate shock. Though the typical response of the funds rate can

[21] This judgment is perhaps more accurately term our "posterior" belief, since it has been influenced by the evidence presented in a number of earlier studies.

Figure 4

RESPONSES TO A BANK LOAN QUANTITY SHOCK



Note: Dashed lines indicate one-standard-error bands.

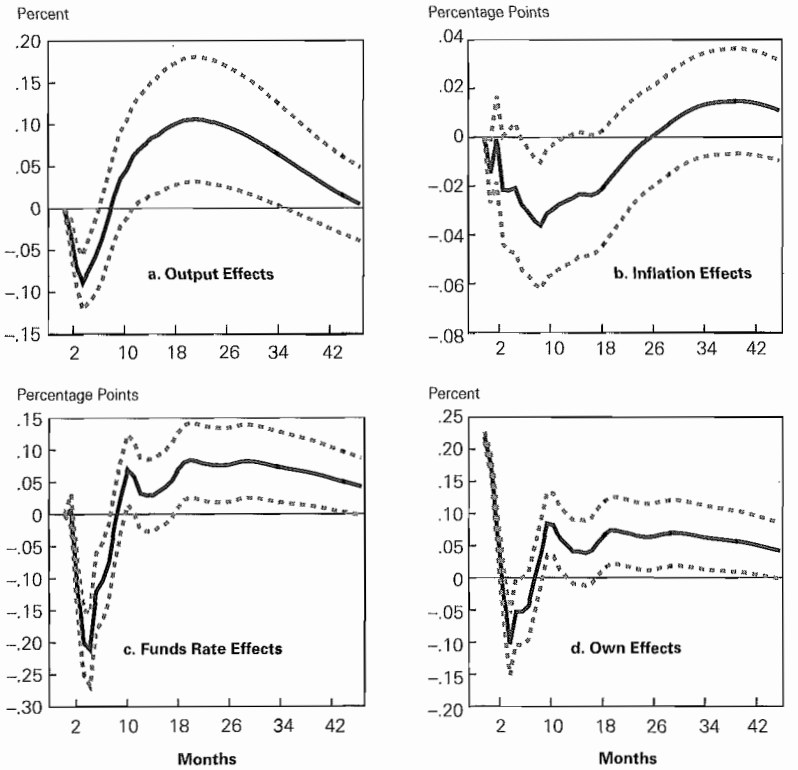
hardly be blamed for being "too late," it might be judged to be "too much."

Identifying Loan Supply and Loan Demand

Above, we have demonstrated that the responses reported in Figures 4 and 5, and our interpretation of shocks to loan quantity and to the prime rate as loan demand and supply shocks, respectively, are robust to having included only one of the two variables from the bank loan market at a time. Next we report estimates of a VAR that included

Figure 5

RESPONSES TO A PRIME RATE SHOCK



Note: Dashed lines indicate one-standard-error bands.

both the prime rate and the real quantity of bank loans. The effects on output, inflation, the funds rate, the prime rate and bank lending of shocks to the two loan market variables are shown in Figures 6 and 7. In calculating these impulse-response functions, we ordered the variables as: ICI, PI, FYFF, FYPR and RBL, respectively. Reversing the ordering of the two loan market variables had little effect on the estimated impulse-response functions.

If the prime rate and the real quantity of bank loans are jointly determined in the market for bank loans, the recursive structure imposed by a Choleski decomposition would fail to separately identify

supply and demand disturbances. To check this possibility, we also experimented with the specification of a "structural VAR" in which the prime rate and loan quantity were assumed to be simultaneously determined, with both responding contemporaneously to both loan supply and demand shocks. These shocks were then identified through a priori restrictions on the contemporaneous relations among the basic disturbances. Specifically, maintaining the recursive structure for output, inflation, and the funds rate that was used in the basic VAR formulation, we allowed the residuals in the equations for FYPR and RBL to be linear combinations of underlying loan supply and demand disturbances. We identified these equations by excluding the funds rate from the loan demand equation and contemporaneous output and inflation from the loan supply equation. In addition, we included the credit-policy dummies developed by Romer and Romer (1993) as instrumental variables when we estimated the loan demand equation.

The estimated loan supply shock series obtained via the structural VAR was highly correlated with the prime rate shock series obtained via the Choleski decomposition. Similarly, the loan demand shock series was highly correlated with the loan quantity shock series obtained via the Choleski decomposition. Thus, the estimates of the shocks to loan supply and to loan demand appeared robust to the alternative structural VAR identification scheme. In addition, the correlation between the structural loan supply shocks and the loan quantity shocks from the astructural Choleski decomposition was small, and the correlation between the structural loan demand shocks and the prime rate shock from the astructural Choleski decomposition was small.[22] These small correlations suggest that the Choleski decomposition separated supply from demand about as effectively as the structural VAR did. Consequently, we report results below only for the Choleski decomposition.

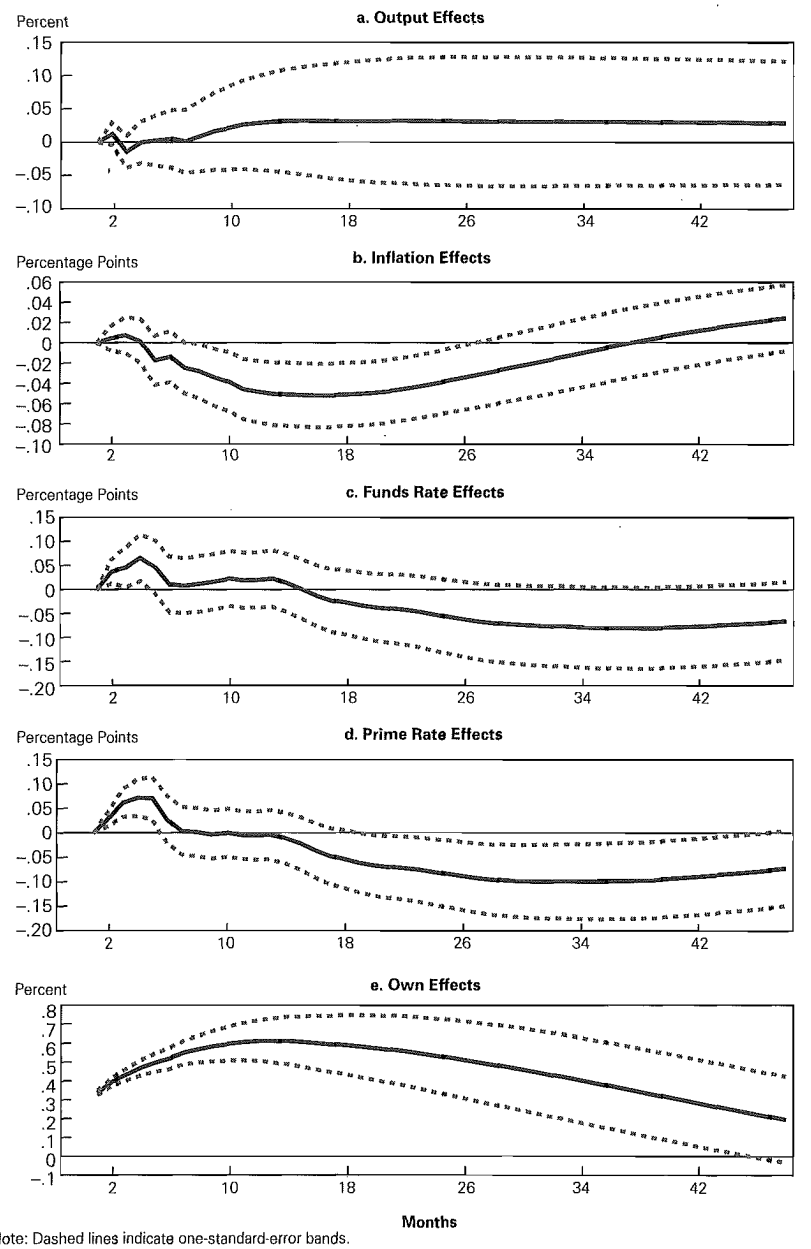
What Were the Effects of Shocks to Loan Supply and Loan Demand?

Figures 6 and 7 plot the responses of the five endogenous variables to the loan quantity and prime rate shocks identified via the Choleski decomposition. In Figure 6, panel (e) shows that loan quantity remained above baseline for several years following an upward shock to itself. Similarly, output tended to rise above baseline within six months of a positive shock to loan demand and stayed above baseline for at least

[22] Letting (s d) denote the estimated structural shocks and (pr l) denote the shocks from the Choleski decomposition, correlation(s, pr) = 0.972, correlation(d, l) = 0.937, correlation(s, l) = −0.171, correlation(d, pr) = 0.149.

Figure 6

Responses to a Bank Loan Quantity Shock



Note: Dashed lines indicate one-standard-error bands.

four years following the shock.[23] Shocks to loan demand also generated temporarily higher funds rates, as the Fed apparently responded countercyclically to the higher output and inflation rates. The prime rate traced out a response path similar to that of the funds rate, presumably both because the increased demand for bank loans allowed banks to increase the spread they charged between the prime interest rate and bank funding costs and because the higher funds rate raised banks' funding costs. Each of these responses was consistent with loan quantity shocks effectively measuring shocks to loan demand. Inflation staying below baseline, however, did not support this interpretation.[24]

In contrast, the responses in Figure 7 to a prime rate shock were consistent with responses to a loan supply shock. The response of the quantity of bank loans supported the idea of an upward shock to the prime rate being interpreted as a reduction in the supply of bank loans. Panel (e) shows that loan quantity began to decline almost immediately following the rise in the prime rate, fell to a level significantly below baseline, and remained below baseline for about one and one-half years.

Output also fell in response to an increase in the prime rate, just as would be expected if the shock to the prime rate could be associated with a change in the supply of "special" bank loans. About one year after the shock, output reverted to baseline and for the subsequent two years was above baseline. In fact, in the second and third years following the shock to the prime rate, each of the responses, including that of the prime rate itself, was reversed. One possible explanation for this positive effect is that the initial increase in the prime rate led to a more-than-offsetting decline in the funds rate, as shown in Panel (c). To the extent the Federal Reserve "overreacted" in lowering the funds rate, it might eventually have raised the funds rate to a level higher than baseline when bank loans, output, and inflation each moved above their baseline levels. Also consistent with a positive shock to the prime rate being associated with a reduction in the supply of bank loans was the decline in the inflation rate. This decline tended to trail that of output, as would be expected.

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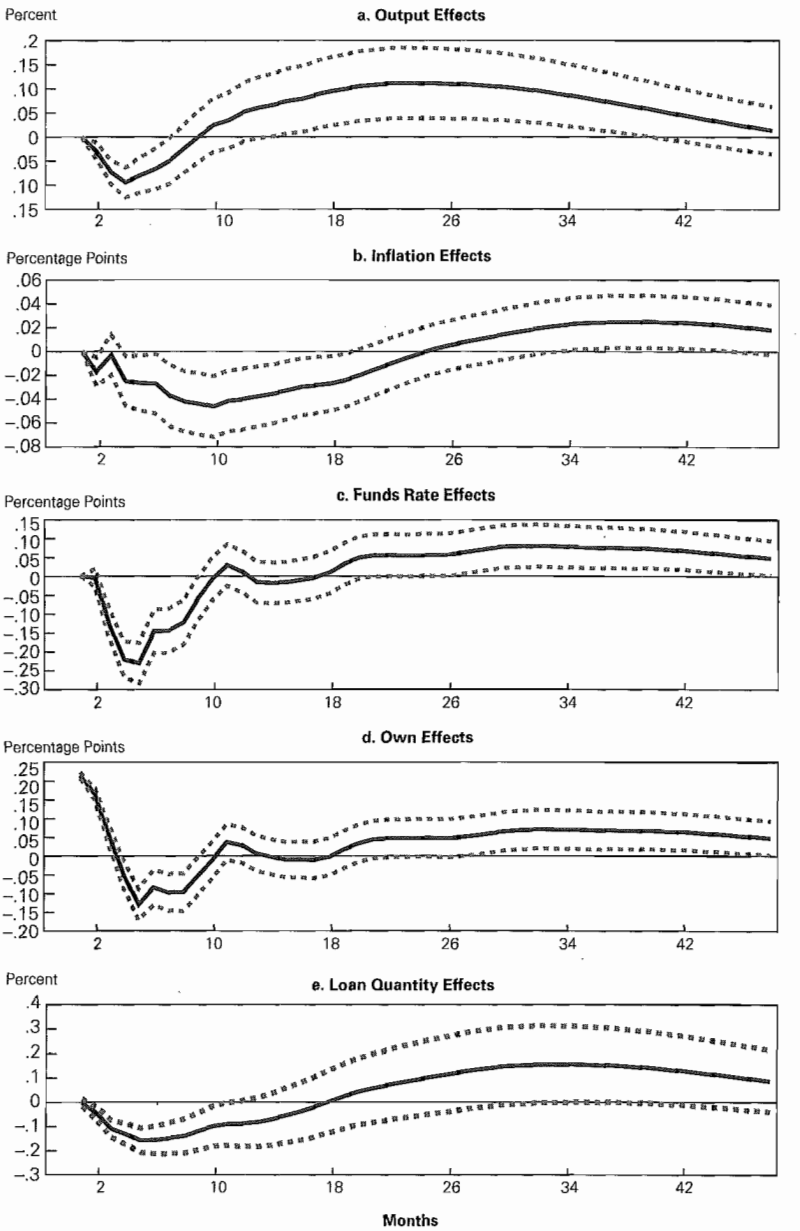
[23] Bernanke and Blinder (1988) argued that shocks to loan demand might be relatively small. That is different from arguing that the responses will be small. Shocks to bank loan demand might be larger than shocks to the demand for total (bank plus nonbank) credit.

[24] Because of the bank's balance sheet identity, our use of a bank asset variable, real loans, could actually be capturing the effects of disturbances to bank liabilities and therefore the money stock. However, if our loan demand shock is actually a money demand shock that, given the funds rate, leads to an expansion of reserves and the money supply, we would expect the prime rate to decline as banks attempt to expand lending. The estimated impulse-response functions show the prime rate rising in response to a shock to the real quantity of bank loans, which is more consistent with our interpretation.

Figure 7

RESPONSES TO A PRIME RATE SHOCK



Note: Dashed lines indicate one-standard-error bands.

How Important Were Loan Shocks to Output and to Bank Lending?

Table 1 reports the shares of the variance of the forecast error at various horizons for output (panel a) and for bank loan quantity (panel b) attributable to shocks to the bank loan market variables in the five-variable VAR. The fraction of output forecast error variance attributed to orthogonalized shocks to the prime rate was much larger than that attributed to bank loan shocks, although neither explains much of the forecast error variance of output.[25] Taken together, loan supply and demand accounted for less than 2 percent of the variance of output at a 12-month horizon and about 5 percent at a 36-month horizon. Reversing the order of the two loan market variables (so that FYPR entered before RBL) had virtually no impact on the variance decompositions. Note also that the shares of forecast error variance of lending associated with output (about 20 percent at a horizon of two years) were considerably larger than the shares of forecast error variance of output associated with the bank loan variables (less than 4 percent at a horizon of two years).

Although in principle one might expect that the residuals from the real loan quantity and prime rate equations in the VAR would be determined simultaneously by the interaction of loan demand and loan supply factors, they were nearly independent disturbances. The similarity between the results from the four-variable systems reported in Figures 3 and 4, each of which excluded one of the loan market variables, and the five-variable system (which included both bank loan market variables) suggests that prime rate shocks and real loan quantity shocks were essentially orthogonal. That view was buttressed by the low (0.14) correlation between the unorthogonalized residuals and by the variance decompositions being hardly affected by the ordering of FYPR and RBL.

Panel (b) shows that shocks to the prime rate accounted for about 5 percent of the forecast error variance of bank lending at a six-month horizon, but typically less than half that amount at longer horizons. Thus, loan supply shocks had effects on loan volume that were also quite small. Forecast errors in loans themselves of course accounted for most of the variance. Somewhat surprising was the infinitesimal share of forecast error variance attributable to the funds rate, especially in light of the funds rate's contribution to the forecast error variance of output, shown in panel (a). One reason that the funds rate may have smaller shares here than in previous studies is that Table 1 is based, not on industrial production as a measure of aggregate output, but on the index of coincident indicators. Industrial production is likely to be more

[25] Very similar shares emerged when the bank loan volume and prime rate variables are included separately.

Table 1
Variance Decompositions for Output and Bank Lending

a. Which Shocks Drove Output?

Horizon (months)	Share of Output Forecast Error Variance Attributable to:				
	ICI	PI	FYFF	FYPR	RBL
3	96.9	1.4	.1	1.5	.1
6	91.7	5.5	.3	2.4	.0
12	82.3	12.8	3.3	1.4	.1
18	71.6	19.2	6.9	2.0	.3
24	63.1	23.6	9.8	3.1	.3
36	55.6	27.2	12.2	4.6	.5
48	56.1	26.6	11.9	4.7	.6

b. Which Shocks Drove Bank Lending?

Horizon (months)	Share of Bank Loan Quantity Forecast Error Variance Attributable to:				
	ICI	PI	FYFF	FYPR	RBL
3	6.3	8.9	2.2	2.6	80.0
6	9.6	11.6	1.6	5.1	72.2
12	15.8	18.6	1.3	3.2	61.1
18	19.1	27.4	1.5	1.7	50.1
24	19.4	34.2	1.7	1.3	43.4
36	17.1	41.3	1.5	1.8	38.4
48	15.8	42.3	1.7	2.2	38.0

heavily weighted toward output such as durable goods, demand for which might be more interest-sensitive than the broader measure of output for which ICI served as a proxy.

When Was the Loan Market Shocked?

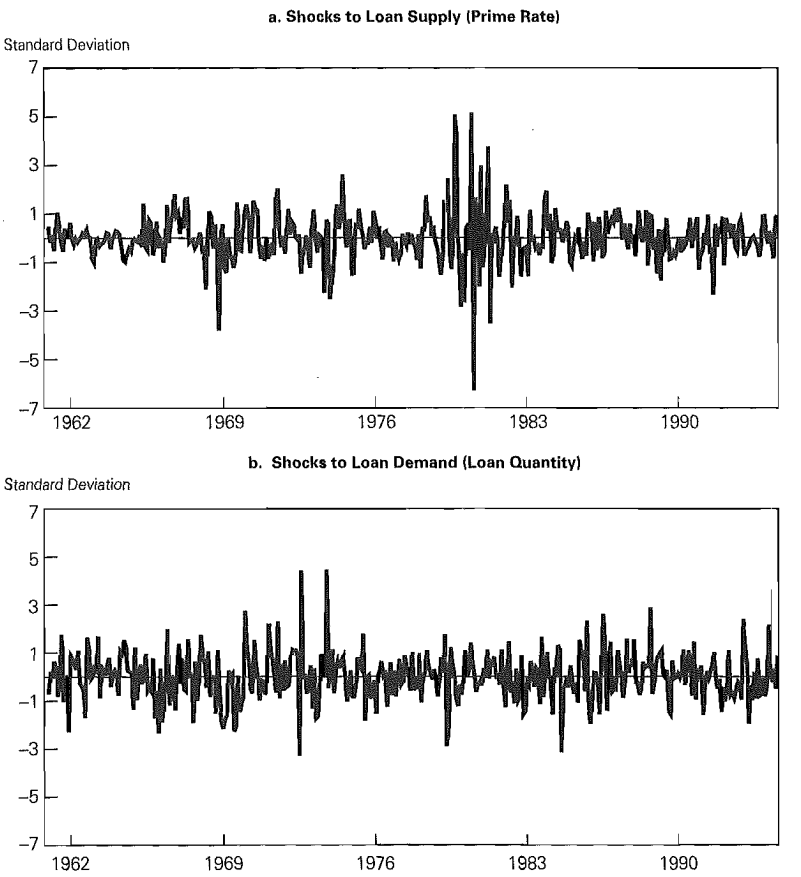
Figure 8 plots the time series of orthogonalized loan market shocks implied by the five-variable VAR. The top panel plots shocks to loan supply (that is, to the prime rate) and the bottom panel plots shocks to loan demand (that is, to loan quantity). Because loan supply shocks pertained to the prime interest rate and loan demand shocks pertained to the quantity of loans outstanding, we scaled each series by its own estimated standard deviation to make them more comparable.

Loan supply shocks were estimated to have been unusually large during 1980 and 1981. Indeed, the single largest negative shock was recorded in early 1980, the time when the Federal Reserve imposed credit controls.[26] The estimates indicated that loan supply shocks were

[26] See Romer and Romer (1993).

Figure 8

Estimated Shocks to Bank Loan Supply and Bank Loan Demand



predominantly positive from 1985 through 1988 and predominantly negative in 1989 and 1990, which conforms to popular accounts of banks' lending practices during these periods. It is notable that the estimated loan supply shocks have not been particularly large since the late 1980s.

The largest loan demand shocks occurred during 1973 and 1974, and the shocks tended to be positive during 1988 and 1989. Loan demand showed no particular pattern during the 1990s.

How Much Did Loan Supply Shocks Affect Bank Lending?

Changes in the real volume of bank loans outstanding can be expressed as the sum of the contributions of the endogenous variables. Figures 9A and 9B plot the historical decomposition of the effects on loan quantity of shocks to output, to the funds rate, and to the prime rate.[27] Figure 9A plots data for the entire period, while Figure 9B plots data for the 1985–94 period. The vertical lines indicate the dates of business cycle peaks.

Panel a of Figure 9A shows that shocks to output contributed much more than the funds rate or the prime rate contributed to variations in bank loan quantity. Changes in monetary policy, identified here with fed funds rate shocks, also had appreciable effects on bank lending, as shown in panel b. Panel c shows that changes in bank loan supply as proxied by shocks to the prime rate generally were the least important contributors to bank loan quantity.

Figure 9B shows that the relative contributions of output, the funds rate, and the prime rate typical of the longer term were also in evidence over the most recent decade. Even during the most recent recession, output (panel a) contributed considerably more to the decline in loans than did reduced supplies of bank loans, as measured by the prime rate (panel c). Over the past decade, the contributions of monetary policy apparently were a mirror image of those of output. Tightened monetary policy restrained bank lending beginning in 1988, two years before the onset of the recession in July 1990, while an eased policy contributed ever more positively to bank lending by 1991.[28]

During 1989 and 1990, bank lending was greater than it would have been otherwise because of prior increases in the supply of bank loans. By early 1991, however, the contribution of loan supply to lending was declining and, through 1992 and 1993, the contribution of loan supply was negative. Figure 9B then suggests that monetary policy reduced the growth rate of lending before the recession began (which may have led to a recession even without the subsequent reduction in loan supply) and that, once the recession was under way, shocks to loan supply aggravated the decline in lending. By the end of 1994, the contractionary effects of loan supply on lending appeared to have been spent.

How Much Did Loan Supply Shocks Affect Output?

Figure 10 plots the contributions of shocks to bank loan supply and demand to movements in output. Panel a plots the sum of the contri-

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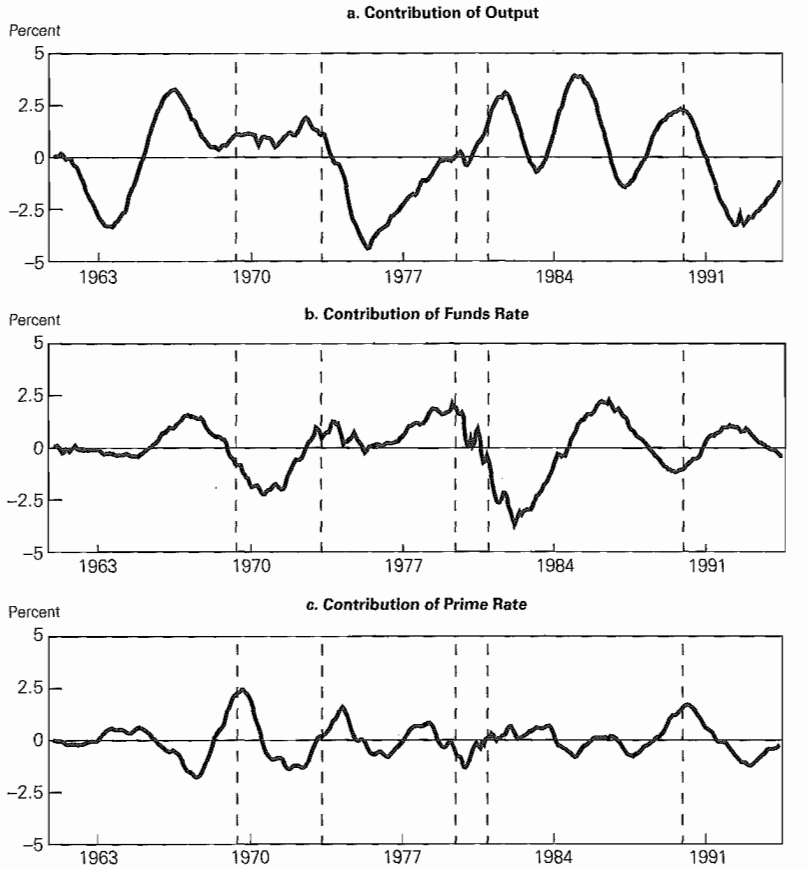
[27] Figure 9 does not plot the historical contributions of inflation shocks or of shocks to loan demand (quantity) itself.

[28] The contribution of the funds rate is similar to that of the money supply reported by Walsh (1993).

Figure 9A

Contributions of Output, the Funds Rate, and the Prime Rate to Changes in the Volume of Real Bank Loans, 1961 to 1994

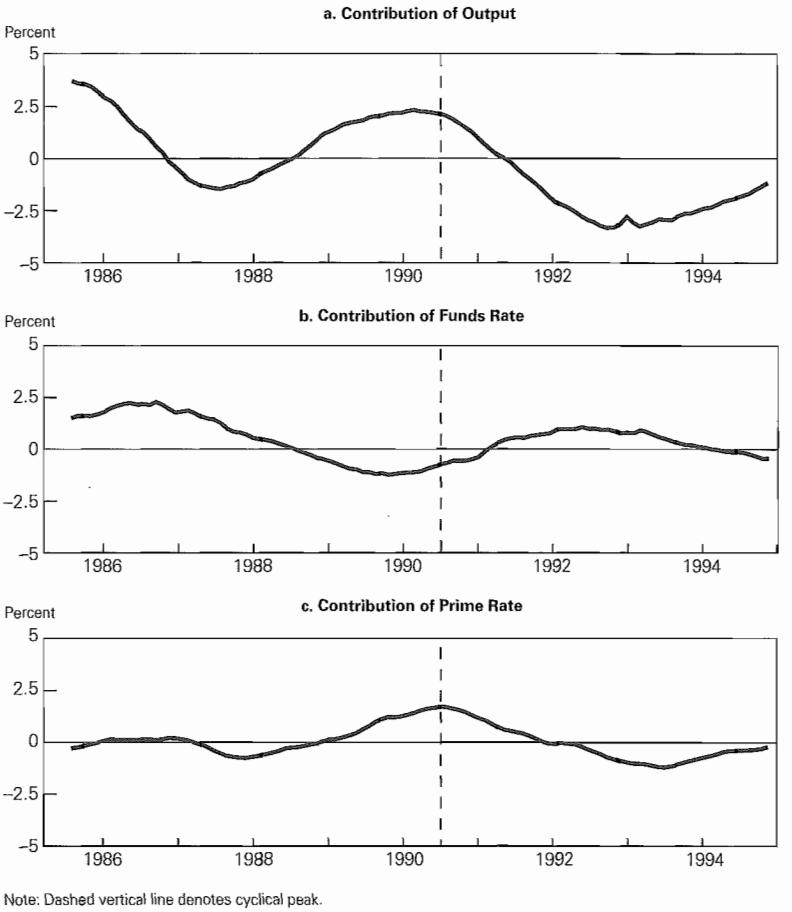


Note: Dashed vertical lines denote cyclical peaks.

butions of the two loan market variables to variation in output for the entire sample period; panel b plots the separate contributions of loan supply and loan demand shocks to output. As already shown by the variance decompositions, loan market disturbances generally were not the dominant force in output movements over the 1960–94 sample

Figure 9B

Contributions of Output, the Funds Rate, and the Prime Rate to Changes in the Volume of Real Bank Loans, 1986 to 1994

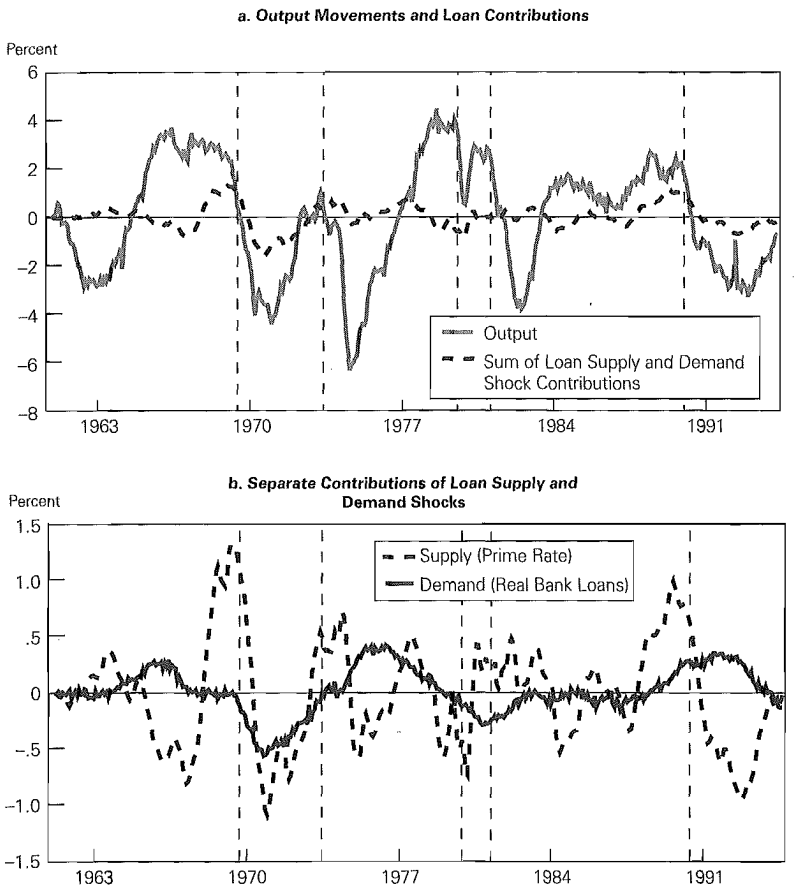


Note: Dashed vertical line denotes cyclical peak.

period. Together they contributed noticeably to the 1970 recession and the ensuing recovery and to the late 1980s boom and the ensuing shortfall of output that started in 1990. In that regard, the focus on bank lending during the 1990–91 recession seems warranted. More attention during the late 1980s to the role of bank lending in the boom of 1988–89 would have been equally warranted.

Figure 10

Contributions of Loan Supply and Loan Demand Shocks to Movements in Output



Note: Dashed vertical lines denote cyclical peaks.

Panel b suggests that output typically was affected more by changes in loan supply than by changes in loan demand. But the relative contributions of supply and demand vary a great deal from episode to episode. For example, in the mid 1960s, positive shocks to loan demand contributed to output being well above its deterministic level, while the effect of loan supply was to hold back output. In contrast, in the early 1970s, both supply and demand restrained output. In the late 1980s,

loan demand contributed relatively little to output, while the eased loan supply provided considerable propulsion to output. And, finally, during the first half of the 1990s, the contractionary contributions of loan supply more than offset expansionary effects coming from loan demand. By the end of 1994, neither loan supply nor loan demand was pushing output away from its trend level.

What Shocked Bank Loan Supply?

We specified the VARs so that we could estimate the values of shocks to bank loan supply and the effects of those shocks. Though the estimated shocks to the prime rate shown in Figure 8 are not forecastable on the basis of the variables used in the VARs, they may be explicable with other variables that affect bank loan supply. For two reasons, we want to know whether the estimated shocks to the prime rate were correlated over the 1960–94 period with identifiable factors that would be expected to affect bank loan supply. First, finding appreciable correlations between the estimated prime rate shock series and factors expected to affect loan supply supports our judgment that prime rate shocks can be interpreted as loan supply shocks. Because our empirical specification includes only bank loan variables and not measures of total credit, the loan market shocks we identify could simply be proxying for disturbances to total credit supply and demand. Evidence that the loan supply shocks we identify are related to bank-specific factors would give some evidence that it is *bank* lending disturbances that are producing the effects on output that we estimate, and that these effects are not just reflecting disturbances to total credit supply. Second, because the magnitudes of some of the factors can be determined by policymakers, knowing which factors affected loan supply, and by how much, helps predict the effects of policies that affect banks.

Among the reasons that banks may reduce the supply of bank loans are changes in regulations that raise bank costs. Table 2 presents the results of regressing the estimated loan supply shock series (plotted in Figure 8) on various measures of regulatory variables. We used a number of the variables that Laderman (1993) suggested as candidates to explain the competitiveness of banks in the face of nonbank competition for short-term business loans: banks' capital ratio, reserve requirements, the spread between open-market interest rates and the regulatory ceiling on savings account deposit rates, and deposit insurance premiums. We also included dummy variables to allow for the imposition and removal of credit controls in 1980.

Data limitations restricted the estimation period to quarterly data

from the fourth quarter of 1961 through the second quarter of 1990.[29] In columns 1, 2, and 3, the dependent variable is the (quarterly average of the) estimated loan supply shock series (ELSQ). The dependent variable in column 4 is the estimated loan demand shock series (ELDQ), whose monthly values are also plotted in Figure 8. The dependent variable in the fifth column is the first-difference of WILLING, D(WILLING), the net percentage of banks indicating more "willingness" to make consumer installment loans.[30]

As approximations to the shocks to the explanatory variables that might account for shocks to loan supply, we used differences of the Laderman (1993) data. To allow for the extra costs imposed on banks by higher capital ratios and to allow for the seasonality of reported bank capital, we included D4A4, the four-quarter difference in the aggregate capital ratio of banks. To allow for changes in the implicit tax on banks associated with zero-interest-bearing required reserves, we included DRRR, the first difference of the ratio of required reserves not adjusted for changes in reserve requirements to required reserves adjusted for changes in reserve requirements.[31] We included D80Q1 and D80Q2, dummy variables that take the value zero for each quarter except 1980:I and 1980:II respectively, when they each take the value one, to allow for the imposition and removal of credit controls on banks.

To allow for the increased costs associated with higher deposit insurance fees, we included a measure of the change, PREMLED1, in the ratio of net aggregate deposit insurance premiums to total insured deposits, led one quarter. We specified this variable to be led one quarter, because banks typically were given notice of upcoming changes in deposit insurance fees. Because preliminary regressions indicated that the first difference of PREMLED1, D(PREMLED1), was more highly correlated with ELSQ than was PREMLED1, we included D(PREMLED1) in the regressions reported in Table 2.

We also included the change in the difference between the levels of the 3-month Treasury bill rate and the regulatory ceiling on savings account deposit rates, SPREAD, to allow for the reduction in bank loan supply attributable to disintermediation associated with open-market rates rising above deposit rate ceilings. We set SPREAD equal to zero in quarters when the difference between the Treasury bill rate and the

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[29] Because the Laderman data were available at a quarterly frequency, we took quarterly averages of the estimated loan supply and demand series. Her data began in 1961 and ended in 1990.

[30] The series comes from the Board of Governors of the Federal Reserve System's Senior Loan Officer Opinion Survey of Bank Lending Practices. Because data for WILLING begin in 1966:III, the estimation periods for regressions reported in Table 2 that included it begin in 1966:IV. We divided WILLING by 1,000.

[31] This variable did not come from Laderman (1993), who used a measure of required reserves adjusted for the level of nominal interest rates.

Table 2
Determinants of Shocks to Loan Supply
Estimation Period: 1961:IV to 1990:II Ordinary Least Squares

	Dependent Variable				
Explanatory Variables	ELSQ (1)	ELSQ (2)	ELSQ (3)	ELDQ (4)	D(WILLING) (5)
Constant	.006	.007	.008	−.002	.000
	(.51)	(.53)	(.57)	(−.09)	(.22)
D4A4	8.60	9.28	8.24	−9.78	.537
	(1.41)	(1.52)	(1.18)	(−.86)	(.56)
DRRR	.509	.605	.572	−.261	−.186
	(1.62)	(1.87)	(1.47)	(−.41)	(−3.73)
D80Q1	.300	.306	.303	−.029	−.000
	(2.39)	(2.44)	(2.21)	(−.13)	(−.14)
D80Q2	−.254	−.193	−.206	−.291	−.043
	(−1.98)	(−1.39)	(−1.33)	(−1.15)	(−2.04)
D(PREMLED1)	983	860	840	−51	−125
	(2.31)	(1.96)	(1.72)	(−.06)	(−1.89)
D(SPREAD)	—	.013	.012	−.004	−.004
		(1.13)	(.91)	(−.20)	(−2.40)
D(WILLING)	—	—	−.228	−.740	—
			(−.29)	(−.59)	
R^2	.135	.145	.148	.029	.235
S.E.E.	.125	.125	.136	.222	.019
F	3.410	3.062	2.167	.369	4.497
Prob(F)	.007	.008	.045	.918	.001

ceiling rate was negative. Because preliminary regressions again indicated that the first difference of SPREAD, D(SPREAD), was more highly correlated with ELSQ than was SPREAD, we included D(SPREAD) in the regressions reported in Table 2.[32]

Column 1 of Table 2 shows that bank loan supply shocks were indeed larger when banks' capital ratios increased, when required reserves increased, when credit controls were imposed in 1980 (and were smaller when those credit controls were removed), and when deposit insurance fees were increased. Of these, the last three were statistically significant. Column 2 adds D(SPREAD) to the variables included in Column 1. Though D(SPREAD) was not statistically signif-

[32] In preliminary regressions, we included both the levels and first-differences of the changes of each of the right-hand-side variables, in order to assess which specifications were more closely associated with shocks to loan supply.

icant, a more tightly binding interest rate ceiling was associated with reduced supply of bank loans. In columns 1, 2 and 3 of Table 2, the impact of removing the 1980 credit controls was estimated to be roughly the same as having imposed them. In each of the first three columns, the F-statistic for the regression indicates a significant relation overall, as indicated by the probabilities of obtaining F-statistics that large being less than 5 percent.

To the extent that D(WILLING) can be interpreted as a predetermined measure of the extent to which banks are willing to extend credit to households, we expect it to negatively affect loan supply. (An alternative interpretation is given below and discussed in connection with the results in Column 5.) Column 3 shows that increases in D(WILLING) only insignificantly reduced bank loan supply. In results not shown in Table 2, we found that including the dummy variable for credit actions developed by Romer and Romer (1993) did not add significantly to the explanation of loan supply shocks, regardless of whether the 1980 credit control variables were included.

Columns 1 and 2 suggest that the variables we posited would reduce bank loan supply are significantly related to shocks to the prime rate, which we interpret as shocks to bank loan supply. To cross-check these results, we also regressed shocks to real bank loans, which we interpret as shocks to bank loan *demand*, on the same explanatory variables used in Column 3. Column 4 reports the results of testing the null hypothesis that none of the determinants of supply affected bank loan demand. Indeed, not one of the variables was significantly correlated with our measure of demand. Nor was the F-statistic of 0.369 anywhere near its 0.05 critical value.

Column 5 treats D(WILLING) as a dependent variable. One interpretation of willingness to lend is that it is itself a measure of bank loan supply. As would be expected on that interpretation, willingness to lend to households declines significantly with increases in reserve ratios and with disintermediation due to higher values for D(SPREAD). Weaker support emerged from the negative but insignificant effect of higher deposit insurance fees on banks' willingness to lend to households.

Taken together, the columns of Table 2 suggest that positive shocks to the prime rate are correlated with identifiable changes in regulations and conditions that would be expected to reduce bank loan supply. At the same time, those changes are not correlated with shocks to the demand for loans. These results give additional support to our earlier interpretation of the shocks from the Choleski decomposition of the VAR residuals. And finally, banks' self-reported willingness to lend is correlated with the measures of changes in regulations and conditions that would be expected to affect bank loan supply.

Are Banks Now Less Important?

Because several substitutes for bank loans to businesses and consumers have developed over time, we expected that shocks to bank loan supply of a given size should have ever-larger effects on bank lending and ever-smaller effects on output over time. Borrowers may now have greater access to nonbank lenders (such as finance companies and the market for commercial paper). They may also be less subject to credit rationing by banks because of pre-arranged loan commitments and credit card lines. Thus, a reduction in the supply of bank loans might now lead borrowers to move more readily to nonbank sources of credit and to sidestep credit rationing. As a consequence, a reduction in bank loan supply might now have less effect on total (bank plus nonbank) borrowing and thus on output than it had in the past.

Panel a of Figure 11 plots the impacts on bank loans and panel b the impacts on output of a 50-basis-point prime rate shock. The solid line in each panel represents the responses calculated from data for the more recent half (1978 to 1994) of the sample. The grey line represents the responses calculated from the data for the first half (1960 to 1977) of the sample. In general, and in contrast to our hypothesis, the response of bank loans to loan supply shocks was somewhat larger in the earlier period.

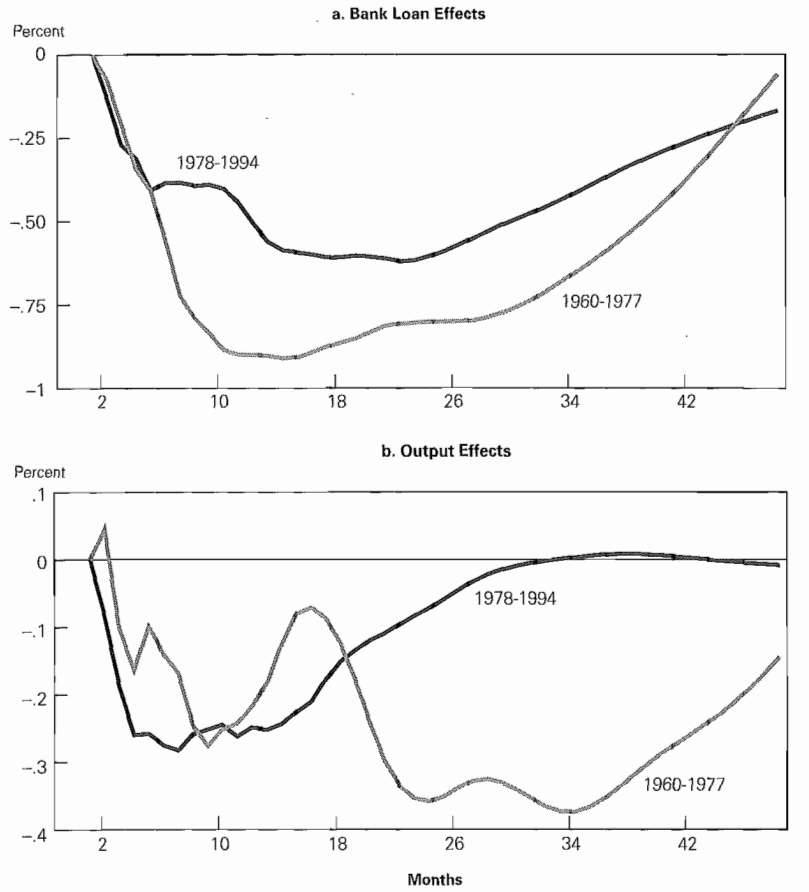
Output on average was less affected by loan supply shocks in the more recent period than in the earlier period. The initial responses of output were actually larger in the more recent period; the change was noticeable but probably not statistically significant. The major difference in the response of output shows up in the second, third, and fourth years following a loan supply shock. In contrast to the lingering and sizable effects on output estimated for the period before the mid 1970s, in the more recent period, the effects on output of loan supply shocks are near zero in the third and fourth years. Thus, the changes in the responses of loans and output are only partially consistent with the financial deepening view of credit markets. At the same time, evidence for the early 1990s reminds us that bank loan supply shocks can still be important. Borrowers may have greater access to credit substitutes, but shocks to bank loan supply still act like sand in the gears of credit and output markets.

Conclusions

We have argued that a simple VAR framework that includes the prime rate and real bank lending appears to provide estimates of the separate effects on bank lending and on output of shifts in the demand for bank loans and of shifts in the supply of bank loans. The estimates suggest that shocks to banks' loan supply were sometimes important

Figure 11

Effects of a Loan Supply Shock[a]



[a] A 50-basis-point prime rate shock.

determinants of the volume of bank loans outstanding and of aggregate output. They were particularly important over the most recent business cycle. In that sense, banks mattered.

We provided estimates of some of the proximate determinants of shocks to bank loan supply. Loan supply was reduced by increases in FDIC deposit insurance fees, increases in reserve requirements,

increases in bank capital, and the imposition of credit controls in 1980. By their effects on bank loan supply, these factors may have considerable impact on output.

Although loan supply shocks typically were not the primary determinant of recessions, we show that they played a larger role during the 1990–91 recession than they had in two decades. At the same time, the response of output to loan supply shocks may have been tempered in recent years by the development of substitutes for bank loans. In that regard, banks may be less important than they were in the past.

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Discussion

Stephen G. Cecchetti*

The central question at the heart of Walsh and Wilcox's paper is: *Does monetary policy affect output through bank assets or bank liabilities?* Using aggregate data and a vector autoregression (VAR), they attempt to estimate the quantitative importance of different channels of monetary transmission. More specifically, they try to identify the impact of bank loan demand shocks and bank loan supply shocks on output, and to measure the relative size of their effects. The results suggest that neither loan demand shocks nor loan supply shocks have much impact on output.

My comments can be divided into three parts. First is a brief review of the literature on the monetary transmission mechanism. Next, I describe several pitfalls inherent in using aggregate data to try to distinguish the channels of monetary transmission. Finally, I discuss the methods and results of Walsh and Wilcox's paper, beginning with a description of how they identify loan supply from loan demand, and ending with my interpretation of their results.

Theories of the Monetary Transmission Mechanism

What are the views of monetary transmission, and why do we care to distinguish them? The answer to the second part of the question is straightforward. If bank assets (that is, loans) are important in the transmission mechanism, then monetary policy will have important distributional consequences that may entail efficiency losses. When credit market imperfections and 'bank loan supply' effects are quantita-

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tively meaningful, then policy's impact depends on the characteristics of borrowers that are unrelated to the inherent creditworthiness of their investment projects. As a result, an entrepreneur may be deemed unworthy of credit simply because of a currently low net worth, for example, regardless of the social return to the project being proposed.

As I describe in a recent survey,[1] the two views of the monetary transmission mechanism can be labeled the Money View and the Lending View.[2] In the Money View, reductions in the quantity of outside money raise real rates of return. This, in turn, reduces investment, as fewer profitable projects are available at higher required rates of return—this is a movement along a fixed marginal efficiency of investment schedule.

The Lending View has two parts, commonly labeled 'broad' and 'narrow.' The broad lending view is based on the existence of credit market imperfections.[3] The basic idea is that information asymmetries and moral hazard problems, as well as bankruptcy laws, imply that the state of a firm's balance sheet has implications for its ability to obtain external finance. As a result, monetary policy-induced increases in interest rates (which are both real and nominal) can cause a deterioration in the firm's net worth, both by reducing expected future sales and by increasing the real value of nominally denominated debt. With lower net worth, the firm is less creditworthy, as it has an increased incentive to misrepresent the riskiness of potential projects. As a result, potential lenders will increase the risk premium they require when making loans. The asymmetry of information makes internal finance of new investment projects cheaper than external finance.

The narrow lending view is associated with bank loans. The argument has two clear parts. First, some borrowers cannot finance new projects except through loans. And second, policy changes have a direct effect on loan supply, since bank loans and outside money (that is controlled by the monetary policy authority) are complements. It is important to emphasize that banks need not be explicitly involved, as this could be a result of the complementarity of 'small business loans' and outside money in investors' portfolios. The most important impact of a policy innovation is cross-sectional, as it affects the quantity of loans to loan-dependent borrowers.

Walsh and Wilcox's goal is to measure the relative importance of loan supply and loan demand effects on output. They are not trying to

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[1] See Cecchetti (1995).

[2] In his comments on an earlier paper, R. Glenn Hubbard labels the first of these by the more accurate term, the *user-cost-of-capital* view.

[3] Bernanke, Gertler, and Gilchrist (1994) have labeled this the 'financial accelerator.'

distinguish the money view from the broad lending channel. Rather, they are studying the size of the narrow lending channel.

Pitfalls in Testing with Aggregate Data

The work in this paper focuses solely on aggregate data, utilizing total real bank loans economy-wide. But a number of well-known pitfalls are associated with use of such data in this context. I will discuss three.

First, can aggregate timing relationships tell us anything about the transmission mechanism? The fact is that credit lags output—it is countercyclical. But since individuals must continue to service credit even after income falls, credit falls after income, regardless of whether it is the fundamental source of fluctuations.[4]

Second, can forecasting power, or correlations, tell us anything? What if credit measures contain information about output fluctuations beyond what is already accounted for in monetary aggregates? Monetary aggregates are a measure of bank liabilities, while credit aggregates are measures of bank assets. Since these are calculated slightly differently, they will not be identical. But it is these technical measurement differences that are likely to account for the differences in forecasting ability, not anything about the transmission mechanism.[5]

Walsh and Wilcox examine a VAR with real activity, inflation, the federal funds rate, and real bank loans. My interpretation of this is that their bank loans measure provides information about fluctuations in 'money' that is not included in the federal funds rate.

Finally, can we learn anything from interest rate data? Walsh and Wilcox employ the prime rate as their measure of the *price* of bank loans. The theory tells us that what we need is a measure of the change in the marginal cost of bank funds to a constant-quality borrower. But during recessions, banks drop lower-quality borrowers rather than raising interest rates. This suggests that we really cannot observe the interest rate we would like to see, as it is the rate on loans that are not made. It is *not* the prime rate. We would be happy with observations on the secondary market for small business loans, but these are also hard to come by.

To put the same point slightly differently, movements in the prime rate do not give us a very good indication of the change in the *composition* of bank loan portfolios. Are they making more loans under commitment? Is higher-quality collateral being required? Beyond this is the problem that the prime rate is an administered price, whose

[4] See Kiyotaki and Moore (1995) and Bernanke, Gertler, and Gilchrist (1994).

[5] This argument is due to Bernanke (1993).

meaning has changed dramatically over the 30-year sample period Walsh and Wilcox study.[6]

Identification Issues

The heart of Walsh and Wilcox's paper is the section on identifying loan supply and loan demand. This is what allows them to conclude that:

> [S]hocks to banks' loan supply were sometimes important determinants of the volume of bank loans outstanding and of aggregate output in general. They were particularly important over the most recent business cycle. In that sense, banks mattered.

How can we evaluate this? Overall, I believe that, even if taken at face value, their results provide very little support for such a statement. Their measured impact of loan demand and loan supply innovations on output is rarely different from zero at standard levels of statistical significance. (Keep in mind that they plot *one*-standard-deviation bands on their impulse-response figures.)

But more importantly, a careful examination of Walsh and Wilcox's methods suggests that we should not accept their interpretation of their results. I will provide a summary of what they do.

Their main conclusions are based on estimation of a simple VAR, which I will write as

$$\begin{bmatrix} y_t \\ \pi_t \\ r^{ff}_t \\ r^{p}_t \\ q^{l}_t \end{bmatrix} = A(L) \begin{bmatrix} \epsilon_{yt} \\ \epsilon_{pt} \\ \epsilon_{mt} \\ \epsilon_{st} \\ \epsilon_{dt} \end{bmatrix}, \tag{1}$$

where $A(L)$ is a matrix of lag polynomials in the lag operator L, y is activity, π is inflation, r^{ff} is the federal funds rate, r^{p} is the prime lending rate, q^{l} is the real quantity of bank loans, ϵ_y is the output 'shock,' ϵ_p is the inflation 'shock,' ϵ_m is the monetary 'shock', ϵ_s is the loan supply 'shock,' and ϵ_d is the loan demand 'shock.' The error process is assumed to be independently and identically distributed, with covariance matrix equal to the identity matrix.[7]

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[6] In addition, as Mester and Saunders (1990) emphasize, the prime rate behaves asymmetrically, rising more quickly than it falls.

[7] It is worth making a small technical disgression here. It is standard in this literature to use the log of the price level. See Christiano, Eichenbaum, and Evans (1994) for a review. In addition, Walsh and Wilcox use overlapping observations of the 12-month

Standard methods involve estimating the reduced form of (1), and then identifying the structural errors by calculating *A(0)*. Walsh and Wilcox assume that *A(0)* is lower triangular. This imposes a very clear structure on the supply and demand curves. While it is rarely done in this context, I find it instructive to actually write the equations down. Ignoring output and inflation, as well as lags of all variables, the supply and demand curves are

$$r_t^p = \beta r_t^{ff} + \epsilon_{st} \qquad \textit{Supply} \tag{2}$$

$$q_t^l = \alpha_1 r_t^{ff} + \alpha_2 r_p^t + \epsilon_{dt} \quad \textit{Demand} \tag{3}$$

Identification is achieved by assuming that the contemporaneous quantity of bank loans does not appear in the supply equation. This means that (after removing the impact of the federal funds rate) contemporaneous loan supply is flat at the current prime interest rate! Changes in the quantity of real loans outstanding are ascribed to loan demand shocks. My sense is that this cannot be right. The cost of funds to loan suppliers, that is, banks, must rise with quantity even in the very short run.

Beyond the issue of identifying loan supply shocks from loan demand shocks, an even more fundamental question is raised by the Walsh and Wilcox VAR methodology. Can a VAR structured in this way actually address the question of interest? I take the issue to be whether *monetary policy* is transmitted to the real economy through bank assets or bank liabilities. Implicitly, this question takes policy as the fundamental disturbance to the economy, and examines its effects. Walsh and Wilcox examine the relative importance of ϵ_{st} and ϵ_{dt} on output. These are *not* monetary policy shocks. If ϵ_{mt} is the policy shock, then ϵ_{st} and ϵ_{dt} are shocks to the financial system that are constructed to be *uncorrelated* with policy disturbances, and so do not address the central issue.

Given this, how do I interpret their conclusions—principally the results in their Table 1? What they show is that shocks to bank loan supply—*that by construction are unrelated to monetary policy*—have virtually no impact on output. Furthermore, shocks to bank loan demand have a small (but probably statistically insignificant) impact on the real economy. On the other hand, monetary policy shocks explain a bit over 12 percent of the variance in output after three years. But the bulk of the variation in output is explained by 'own' shocks, ϵ_y, which may be aggregate supply disturbances, and by shocks to prices, ϵ_p, which might be aggregate demand disturbances that are uncorrelated with the rest of

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inflation rate and do not correct for the induced serial correlation structure in their error process—it is an MA(11). This affects the standard error bands on the impulse responses.

the shocks. This rings true, as it is not too dissimilar from results reported by Galí, in his estimation of a structural VAR.

Conclusion

Let me close with the following points. It is my strongly held opinion that financial innovation will lead us to the virtual elimination of banks as depository institutions in the not too distant future. As a result, to know if the impact of monetary policy is weakening, we must understand whether something about banks is particularly important in the monetary transmission mechanism. But to do this, we have to separate the cross-sectional effects due to credit market imperfections from those that are the result of banks per se. The work of Walsh and Wilcox does not help us with this.

On the other hand, Kashyap, Lamont, and Stein (1994) suggest one possible way of distinguishing. If one can find a recessionary period that was *not* preceded by a monetary contraction, and show that interest rates rose but that bank dependence was irrelevant to individual firms' experiences, this would mean that banks are responsible for the distributional effects induced by monetary shocks. I know of no such evidence.

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Discussion

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With commendable timing, academic economists rediscovered bank lending just before the start of the 1990–91 recession. Bernanke (1983) claimed that the shifts in loan supply made a major contribution to the Great Depression of the early 1930s. Bernanke and Blinder (1988) developed a small model interrelating loans, deposits, and output. I refer to this work and the many papers that followed as "the lending view."

The Lending View

The lending view became an active research area just before the Federal Reserve and the Bush Administration argued publicly that reduced willingness of banks to lend contributed to the 1990–91 recession and the slow recovery. One metaphor of the time was that a 50-mile-an-hour head wind was blowing against the expansion. The (intended) presumption was that the Federal Reserve was doing its prudent utmost to foster expansion but was stymied by the refusal of banks to lend aggressively. I argued at the time that this view was wrong (Meltzer 1991).

The lending view consists of two principal propositions. First, spending by some group of borrowers depends on bank loans. Second, monetary policy shifts the supply of bank loans relative to other types of credit.

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The first proposition is not in doubt if "depends" means only that bank loans are a main source of external finance for many small and medium-sized firms. Alternative lenders exist for these firms, however, including finance companies, trade credit, credit card debt, venture capitalists, families, and others. At issue is how much substitution occurs among types of credit. This issue is usually neglected, and the current paper is not an exception. Studies of bank lending and borrowing cannot by themselves establish that borrowers could not or did not obtain credit or that they were forced to contract.

The second proposition is more doubtful. The principal problem for the lending view is to show that autonomous shifts in banks' offers to lend contribute significantly to cyclical changes in total lending and output. The alternative view is that bank lending responds to demand. Critics of the lending view point out that banks can borrow Eurodollars, issue certificates of deposit, sell securities, and in other ways finance lending if it is profitable. And, if the banks face an excess demand for loans, why do other intermediaries fail to satisfy the excess demand?

The Walsh-Wilcox Analysis

The paper by Carl E. Walsh and James A. Wilcox is a serious effort to analyze part of the second proposition. The authors try to separate shocks to supply and shocks to demand, using the prime rate to measure supply effects and the real value of loans to measure customers' demand. The general idea is to treat borrowers as price takers and banks as price setters. Banks set the prime rate and allow borrowers to decide how much to borrow. Borrowing and lending decisions are part of a five-equation monthly model interrelating the real amount of bank lending, and the prime lending rate, with measures of output, inflation, and monetary policy. The monthly output measure appears to be an improvement on previous work.

The authors deserve credit for making a serious effort to show that the demand and supply shocks they estimate are not spurious; they obtain similar measures using alternative procedures. They can be faulted for treating all loans as homogeneous and made at the prime rate. This is not entirely consistent with the lending view. On that view, small borrowers are subject to non-price rationing.

Walsh and Wilcox summarize their findings as showing: (1) supply shocks have had "important" effects on bank lending (p. 87); (2) the principal supply shocks in the recent past were changes in banks' capital

ratios, required reserves, and deposit insurance fees (p. 109);[1] and (although the conclusion blurs this finding) (3) output was on average *less* affected by loan supply shocks in the recent cycle than in past periods (p. 112).

Problems with the Analysis

Despite the authors' careful work, I am skeptical about their findings, for two main reasons. First, their model is misspecified in a way that is important for the identification of demand and supply shocks. Unless we are reasonably certain that we have identified demand and supply shocks accurately, we cannot conclude reliably about relative effects of shifts in demand and supply. Second, the model is incomplete. The authors barely mention other intermediaries and sources of credit. Even if we correctly identify supply effects, we cannot conclude that loan supply affects output if we do not control for two types of substitution. Borrowers can substitute other forms of lending for bank lending, and bankers can substitute for reserves by borrowing in the Eurodollar, CD, and other markets.

Let me state what is and is not at issue. First, it is not surprising that the amount of bank lending changes with the costs of bank lending. Increases in reserve requirements, deposit insurance premiums, and other costs reduce the size of banks relative to competitors. Borrowers shift to lower-cost suppliers. At issue is how quickly the adjustment occurs, whether there is full substitution, and whether part of the adjustment occurs by banks acquiring liabilities that are not subject to the new rules. Large CDs have not been subject to reserve requirements since 1970, debentures are not subject to deposit insurance, and so on. Second, I have no quarrel with the lending view when it claims that intermediation matters. The issue is whether intermediaries can prevent Federal Reserve policy from affecting output and prices or change the size of those effects in the way described by the lending view. If banks were less likely to lend in 1991 because of new capital requirements or deposit insurance fees, why did the Federal Reserve not add more to the supply of reserves to encourage more expansion?

Walsh and Wilcox write their model with five variables: the federal funds rate, the prime loan rate, output, inflation, and the real value of total commercial bank loans and leases. Bank lending is independent of the stock of bank reserves or the monetary base, and the federal funds rate contains all information about Federal Reserve policy. In practice,

[1] Only the last two are statistically significant. Walsh and Wilcox also report effects of the 1980 credit controls. I omit the 1980 credit controls as raising separate issues. It is notable that the Basle capital requirements do not have a significant effect.

the Federal Reserve shifts the federal funds rate and allows bank reserves to adjust. Hence, at any preset federal funds rate, banks can obtain (or reduce) reserves and expand (or contract) bank loans if the return to lending is positive (negative). In other words, the federal funds rate alone does not tell us whether bank reserves are rising or falling. An essential part of the monetary mechanism is missing. The missing pieces are important when the economy changes direction or speed, particularly if the Federal Reserve is slow to change the funds rate. Some measure of aggregate reserves or base money should be part of the model to test for an independent or non-monetary lending channel.

A peculiar feature of the work on the lending view that I have seen is that nonbank financial assets are nowhere to be found. Banks hold both loans and securities, such as Treasury bills and government bonds. Omitting government securities is a second misspecification.

To show why, let me describe where the misspecification enters. Suppose a shock to bank lending has occurred, such as is discussed in the Walsh–Wilcox paper and in the lending view generally. Banks in the aggregate now lend less per dollar of reserves than in the past. Since they lend less, two outcomes are possible, given the supply of reserves or base money and the stock of government securities. Banks either hold excess reserves or buy more securities. Since bank reserves have zero interest return, banks minimize excess reserves. Hence, a decision to reduce loans is a decision to buy more securities. Banks bid for securities in an open market, so their decisions change the yield on securities relative to other yields. Other intermediaries such as thrift institutions, mortgage lenders, finance companies, and the like, faced with the resulting change in relative yields, acquire an alternative asset. They supply the loans, mortgages, or leases that the banks forgo. The net effect is a change in the banks' supply of loans without a corresponding change in total credit extended. The only alternative is that banks hold idle excess reserves. There is no evidence that this occurred in the 1990s. If it had occurred, the solution would have been simple. The Federal Reserve could have supplied more base money by lowering the funds rate, as they soon did.

Let me summarize. Bank lending is not informative about whether or not output would have expanded more in the 1991–92 period. The authors are right to separate loan demand and supply, but their analysis cannot answer the question: Did restrictions on bank lending reduce output in 1991 and in 1992? No evidence in the movement of excess reserves shows that banks refused to lend or reduced lending. Even if they did, the banks' actions tell us nothing about the total supply of credit offered to business and households.

Two main reasons that bank lending fell during the early 1990s were that the economy was in recession and bank reserves rose very slowly. Bank reserves are the raw material for aggregate bank loans and money.

In the two years ending with the fourth quarter of 1990, total bank reserves rose at a 0.6 percent annual rate; total reserves increased by less than $1 billion during the two years as a whole. In the next two years, total reserves rose at an 11.7 percent compound annual rate, and the addition to reserves was $18.6 billion. The funds rate was reduced from 8 percent in the fall of 1990 to 4¼ percent in the fall of 1991. Talk about a credit crunch and 50-mile-an-hour head winds ended. In my view, the lending problem was in part a monetary problem and in part a problem of anticipations set off by lower inflation and falling asset prices in many markets—especially real estate markets. Whether judged by interest rates or reserve growth, monetary policy was very restrictive (as the Shadow Open Market Committee argued at the time).

Before leaving this part of my discussion, let me narrow some of the differences with Walsh and Wilcox. My claim is that the effect of bank lending on output, given the growth of money and government debt, is close to zero, so I set it at zero. The authors find that 6 to 18 months after a lending shock, bank lending explains about 2 percent of the unexplained variance of output.

We can further narrow the differences. Walsh and Wilcox use monthly data from 1959 through 1994. From the mid 1960s to the end of the 1970s, Regulation Q ceilings were binding at times. Until 1970, the ceiling rates applied to all CDs, even the largest. The ceilings worked to reverse the relation between growth of money and bank credit (loans and securities). When the ceiling was binding, wealth owners reduced time deposits and bought securities directly. Bank credit, including loans, declined relative to money, currency, and demand deposits. Some of these effects are hidden in the Walsh–Wilcox estimates because they do not isolate the effects of Regulation Q and the credit crunches it fostered. I believe that if they separated the effects of Regulation Q, their estimate would be less biased, smaller, and closer to mine at zero.

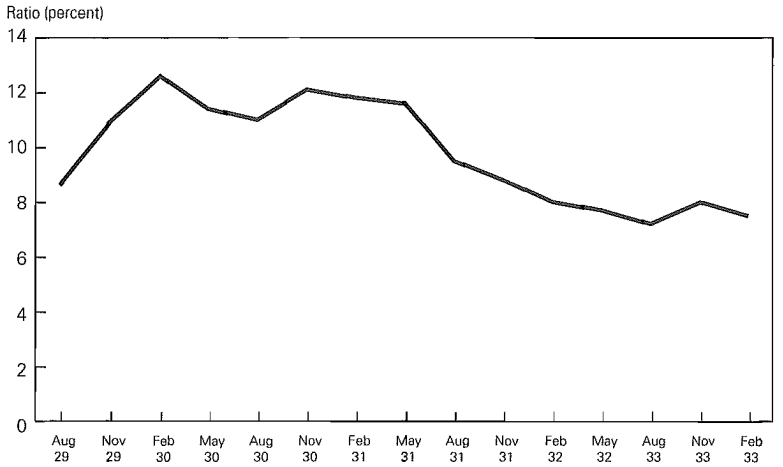
A Final Test

A main piece of evidence in favor of the lending view comes from the Great Depression. Bank failures, corporate failures, and increased risk make a plausible case for the lending view in this period. If declines in bank lending have an independent effect, the Great Depression is the period when that effect should be most obvious.

Remember that, according to the lending view, the effect occurs because small firms are much more dependent on banks. Small firms are forced to curtail activity because they cannot borrow. Plausible as this story seems, it is not supported by the data. During the Great Depression, open market borrowing in the form of commercial paper and bankers' acceptances declined relative to commercial bank loans (in 101 cities). Figure 1 shows the ratio of open market borrowing to bank loans.

Figure 1

RATIO OF OPEN MARKET CREDIT TO BANK LOANS
AUGUST 1929 - FEBRUARY 1933



Then as now, larger, more secure firms were the main borrowers on the open market. The fall in open market borrowing relative to bank borrowing is counter to the lending view.

None of this denies that intermediation is important. My conclusion is that restrictive Federal Reserve policy explains the decline in both money and bank lending during the Great Depression and in the most recent recession. Credit crunches had an independent effect on lending under regulation Q rules, but this is well-known and not part of the lending view.

POSTSCRIPT

Shortly after completing this comment, I received two new studies of bank lending and the lending view. Morris and Sellon (1995, p. 73) write: "[C]oncern that structural changes in the banking system may affect the transmission mechanism does not appear to be warranted." Sharpe (1995, pp. 32–33) concludes that there is little evidence supporting claims that the decline in lending in the 1990–91 period was the result of capital standards. These studies add to the growing skepticism about the main tenets of the lending view.

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