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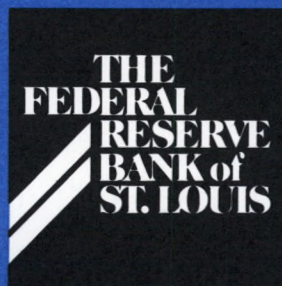
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**Federal Reserve Lending to Banks That
Failed: Implications for the Bank
Insurance Fund**

**Measures of Money and the Quantity
Theory**

**Financial Innovation, Deregulation and
the "Credit View" of Monetary Policy**



In This Issue . . .

3

Federal Reserve Lending to Banks That Failed: Implications for the Bank Insurance Fund

R. Alton Gilbert

During the 1980s, many banks failed, imposing large losses on the Bank Insurance Fund (BIF). The Federal Reserve loaned to many of the banks that ultimately failed, an association that convinced many that Federal Reserve lending practices had increased BIF losses. Based on this concern, Congress imposed limits on Federal Reserve lending to troubled banks in the Federal Deposit Insurance Corporation Improvement Act of 1991.

R. Alton Gilbert investigates whether evidence supports the conclusion that Federal Reserve lending practices increased BIF losses. For example, among banks that failed in 1985–90, BIF losses were larger at banks that borrowed from the Fed in their last year of operation. Other evidence, however, does not support the view that the lending by the Fed caused the higher loss rate among the borrowers. Although borrowers remained open slightly longer than nonborrowers with ratings indicating imminent danger of failure, the behavior of borrowers during their last year is consistent with relatively effective actions of supervisors in limiting the risk they assumed. In addition, declines in large-denomination deposits, which increase the cost to the BIF of resolving bank failure cases through liquidation, declined at about the same rate for both borrowers and nonborrowers in their last year.

19

Measures of Money and the Quantity Theory

James B. Bullard

Many economists believe that the quantity theory of money explains the relationship between money and inflation over long periods of time. In particular, they believe that a permanent increase in the quantity of money will eventually produce an equiproportionate permanent increase in the general level of prices. Similarly, a more rapid, sustained rate of money growth will produce a higher rate of inflation.

James B. Bullard examines, from a nonstructural, low-frequency point of view, the basic proposition that money growth and inflation are closely related in the long run. The article extends the analysis of Robert E. Lucas, Jr., whose work is often cited as an illustration of the validity of the quantity theory. Bullard's results generally support the quantity theoretic proposition that money is long-run neutral.

Financial Innovation, Deregulation and the "Credit View" of Monetary Policy

Daniel L. Thornton

As analysts search for explanations for the protracted recovery from the last recession, a great deal of attention has been focused on the "credit view" of monetary policy, which argues that monetary policy affects the economy through the direct affect of policy actions on the supply of depository institutions' credit. Daniel L. Thornton outlines the credit view and argues that the conditions for it are stringent. He then argues that financial innovation, deregulation and changes in the structure of reserve requirements during the past decade or so should have significantly weakened, if not eliminated, the bank credit channel of monetary policy.

Thornton investigates the direct link between monetary policy actions and bank lending. Consistent with his previous analysis, he finds evidence of a weak and deteriorating relationship between Federal Reserve actions and the supply of bank credit. Thornton's analysis suggests that the removal of reserve requirements on a very large proportion of banks' sources of funds since 1980 has eliminated any direct relationship between the Fed's actions and bank credit. He concludes that there is little reason to suspect that monetary policy works through the bank credit channel, if it ever did, and he considers why interest in the bank lending channel appears to have been rejuvenated at just the time when justification for it has eroded.

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R. Alton Gilbert

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Federal Reserve Lending to Banks That Failed: Implications for the Bank Insurance Fund¹

DEBATE THAT LED TO PASSAGE of the Federal Deposit Insurance Corporation Improvement Act (FDICIA) in 1991 focused on changes in public policy to reduce losses of the deposit insurance funds. One aspect of public policy subject to such scrutiny was lending by the Federal Reserve to troubled banks. A report prepared by congressional staff indicated that over 300 of the banks that failed in 1985-91 were borrowing from the Fed when they failed, and that 90 percent of the banks that borrowed for extended periods of time eventually failed.² Other evidence caused the authors of that congressional staff report to conclude that Fed credit extended the life of borrowers that ultimately failed. Critics of Fed lending practices concluded on the basis of this evidence that lending to troubled banks increased losses to

the Bank Insurance Fund (BIF).³ This concern led to constraints on Federal Reserve lending to troubled banks in FDICIA (see the shaded insert on page 4, "Restrictions on Federal Reserve Lending Under FDICIA").

Restrictions on Federal Reserve lending to troubled banks raise several issues, including the proper role of the discount window and the necessary freedom of action for a central bank in limiting systemic impacts of problems in the operation of a banking system. Failures of banks may have systemic impacts if they cause other banks to fail or cause disruptions in the payment system or financial markets. This article focuses on the more narrow issue of whether Federal Reserve lending to troubled banks in recent years raised the losses of BIF. Critics of

¹The author thanks Kenneth Spong and Walker Todd for helpful information and insights. The views of the author do not necessarily reflect the views of the Federal Reserve Bank of St. Louis or the Federal Reserve System.

²See U.S. House of Representatives (1991c).

³See Garsson (1991), Rehm (1991), Starobin (1991) and Todd (1991, 1992). The FDIC insures the deposits of banks and savings and loan associations but maintains BIF as a separate fund for commercial banks and mutual savings banks. Banks pay insurance premiums into BIF, which then covers any losses when banks fail.

Restrictions on Federal Reserve Lending Under FDICIA

FDICIA restricts Federal Reserve lending to banks that do not meet the minimum capital requirements. For purposes of the various provisions restricting lending, a bank that fails to meet one or more of the minimum capital requirements is classified as undercapitalized. In addition, a bank is classified as undercapitalized if it has a composite CAMEL rating of 5 by its supervisory agency (or an equivalent rating under a comparable rating system), even if it meets the minimum capital requirements. A CAMEL rating of 5 indicates imminent danger of failure. A bank is classified as critically undercapitalized if its tangible equity is less than 2 percent of its total assets.

Under certain circumstances, the Federal Reserve may be liable to the FDIC for losses resulting from loans to undercapitalized or critically undercapitalized banks. If the Federal Reserve lends to a bank for more than five days after it becomes critically undercapitalized, and an FDIC deposit insurance fund incurs a loss greater than would have been incurred in the absence of the loan, the Board of Governors may be liable to the FDIC for part of the additional loss.

FDICIA restricts Federal Reserve lending to an undercapitalized bank to no more than 60 days in any 120-day period, unless the head of the appropriate federal supervisory agency or the chairman of the Board of Governors certifies the bank's viability. A certification of viability is a determination that, in light of the economic conditions and circumstances in the local market, the bank is not critically undercapitalized, is not expected to become critically undercapitalized and is not expected to be placed in conservatorship or receivership. A certification of viability suspends the limit on lending for more than 60 days in any 120-day period. A Reserve Bank may lend to a bank certified as viable for 60 days, beginning on the day of the certification. This 60-day period may be extended for additional 60-day periods on receipt of additional written certifications of viability. If the Federal Reserve extends credit to an undercapitalized bank beyond the limit of 60 days in any 120-day period without a certificate of viability in effect, the Board of Governors may be liable to the FDIC for part of the additional loss incurred by one of its deposit insurance funds as a result.

Fed lending practices have emphasized anecdotal evidence from a few bank failure cases, particularly the failures of the Bank of New England and the Madison National Bank.⁴ This article, in contrast, examines whether the record of Fed lending to many failed banks supports the arguments of the critics.

The evidence in this study indicates that loans from the Fed to many of the failed banks in their last year were concentrated near the time of failure and were allocated to the banks with the greatest liquidity needs. The evidence does not support the argument that Federal Reserve lending to troubled banks increased the losses of the FDIC.

FEDERAL RESERVE POLICY ON LENDING TO TROUBLED BANKS PRIOR TO FDICIA

Prior to passage of FDICIA in 1991, the Federal Reserve had a long-standing policy of not lending to nonviable institutions, except when such lending would facilitate an orderly resolution of institutions. Lending to facilitate orderly resolutions had been undertaken in cooperation with the institutions' supervisors and with the deposit insurance authorities. Under this policy, the Federal Reserve loaned to some troubled banks for extended periods of time. Two of the large banks that received Fed credit for extended

⁴See Schwartz (1992), Todd (1992) and comments by policymakers in Rehm (1991). For hearings on the failures of these banks, see U.S. House of Representatives (1991a, 1991b).

periods of time were the Franklin National Bank, in 1974, and the Continental Illinois National Bank, in 1984.⁵

In response to public criticism that the Federal Reserve had subsidized the Franklin National Bank, the Fed amended its lending regulations to establish a new, higher special discount rate for protracted emergency assistance to particular banks. Figure 1 indicates that such emergency assistance—which has been called extended credit since 1980—at times has been the predominant form of discount window lending. Prior to passage of FDICIA late in 1991, there were no legal constraints on the size or duration of Federal Reserve lending to troubled banks.

THE DEBATE OVER LENDING TO TROUBLED BANKS

The Issues

Public discussion that led to passage of limits in FDICIA on the authority of the Federal Reserve to lend to troubled banks involved two issues. The first issue, philosophical in nature, involved the proper purpose for lending. Walker Todd (1988, 1991, 1992), a major contributor to this debate, has asserted that the proper role for the discount window is to lend for short periods of time to solvent banks that are temporarily illiquid. Todd has described Federal Reserve lending to troubled banks for extended periods of time as the substitution of credit from the Federal Reserve for capital of the banks, which he considered inappropriate use of the discount window.

The second issue involved the implications of Federal Reserve lending practices for BIF losses. This second issue appears to have been more important to Congress than the philosophical issues raised by Todd, because BIF losses may affect the budget of the federal government. For that reason, this article focuses on the second issue in the debate, the implications of Fed lending practices for BIF.

Critics of Fed lending practices cited two reasons why lending to troubled banks may have

increased BIF losses. First, credit from the Federal Reserve may have given the borrowers extra time to assume additional risk. Banks may have increased risk through rapid growth of their assets, in desperate gambles to regain financial strength, or through actions to benefit shareholders, such as paying dividends.

The second argument involved reductions in borrowers' uninsured deposits. Deposits often decline when the public becomes aware of a bank's troubles, but deposits in denominations above the insurance limit of \$100,000 per account tend to fall more rapidly than fully insured deposits. Credit from the Fed may have allowed the borrowers to remain in operation while funding relatively rapid declines in their uninsured deposits. Without credit from the Fed, these banks may have been unable to fund deposit withdrawals some time prior to their failure dates. Chartering agencies might have closed these banks earlier, when their uninsured deposit liabilities were larger, if the Fed had not made its credit available.

Implications of declines in uninsured deposits for the losses to BIF in bank failure cases depend on the methods used by the FDIC to resolve these failures.⁶ The simplest method is liquidation, in which the failed bank is closed and the FDIC pays insured depositors in full. The FDIC over time pays the uninsured depositors a fraction of their deposits, which depends on the value of the failed bank's assets. If the value of the assets is less than the value of the liabilities, the FDIC and the uninsured depositors share as losses the gap between the value of assets and liabilities. A decline in uninsured deposits raises the cost to BIF if a case is resolved through liquidation, since a decline in uninsured deposits forces the FDIC to absorb more of the shortfall of the value of assets below liabilities.

In cases resolved through transfer of insured deposits, banks bid for the deposit accounts of a failed bank in denominations below the insurance limit. The winning bidder assumes the insured deposit accounts of the failed bank, and the FDIC makes a cash payment to the winning bidder equal to the deposits, minus the premi-

⁵For a view on the history of Federal Reserve discount window lending, see Schwartz (1992). Thrift institutions have had access to credit from the discount window since 1980, under provisions of the Monetary Control Act. This paper focuses on lending to commercial banks. For convenience, all depository institutions are called banks.

⁶See the appendix to Gilbert (1992) for an analysis of the distribution of losses between the FDIC and uninsured depositors under alternative methods of resolving bank failure cases.

um paid by the winning bidder.⁷ The cost of a resolution arranged as a transfer of insured deposits tends to be lower than what the cost would have been under liquidation by the amount of the premium, net of administrative costs of arranging the resolution. The FDIC shares with the uninsured depositors any losses from resolving the failed bank. Declines in uninsured deposits have the same implications for BIF losses under liquidation and transfer of insured deposits.

During the years covered by this study, 1985-90, the FDIC resolved most bank failure cases through a third method called purchase and assumption (P&A). In a case resolved through P&A, the bank with the winning bid assumes all of the deposit liabilities of the failed bank and purchases some of its assets. The cash payment from the FDIC to the winning bidder equals all deposit liabilities (insured and uninsured), minus the value of assets purchased by the winning bidder, minus the premium. The FDIC does not share any of the losses with uninsured depositors in cases resolved through P&A, since the winning bidder assumes all of the deposit liabilities. Even in cases resolved through P&A, however, declines in uninsured deposits may increase BIF losses. In some cases, resolution costs might have been lower if the failed banks had been closed prior to the declines in uninsured deposits and resolved through liquidation or transfer of insured deposits.

The Evidence

The staff of the House Banking Committee issued a report in 1991 that summarized patterns in Federal Reserve lending to insured depository institutions from January 1, 1985, through May 10, 1991. The report concluded:

1. Ninety percent of all institutions that received extended credit during this period subsequently failed.
2. The Federal Reserve routinely extended credit to institutions with CAMEL ratings of 5 by

their supervisory agencies (the rating that indicates imminent danger of failure).⁸

3. Borrowers that failed remained open for 10-12 months on average after being rated CAMEL 5 by their supervisory agencies. The report implies that the banks would not have stayed open that long after being rated CAMEL 5 without Federal Reserve credit.
4. Borrowings increased dramatically as the condition of institutions deteriorated.
5. The Federal Reserve took the highest quality assets as collateral when banks borrowed, in amounts substantially in excess of the loan amounts.
6. Of the 530 failed institutions that borrowed from the Federal Reserve in the three-year period prior to their failure, 320 were borrowing at the time of their failure, with \$8.3 billion in discount window credit outstanding.

This paper investigates the implications of these conclusions for BIF losses.

BORROWINGS BY A SAMPLE OF FAILED BANKS

This section presents information on Federal Reserve lending to a sample of banks that failed from 1985-90. The number of bank failures per year was relatively large during that period. Including these years yields a large sample of failed banks. The sample ends in 1990 to avoid failures in periods in which Federal Reserve lending to troubled banks was influenced by the provisions in FDICIA. Since the content of FDICIA was discussed and debated throughout most of 1991, the sample ends with the failures in 1990. Note in Figure 1 that extended credit borrowings were relatively low throughout 1991 and have been zero or relatively small since late 1991, when FDICIA was enacted.

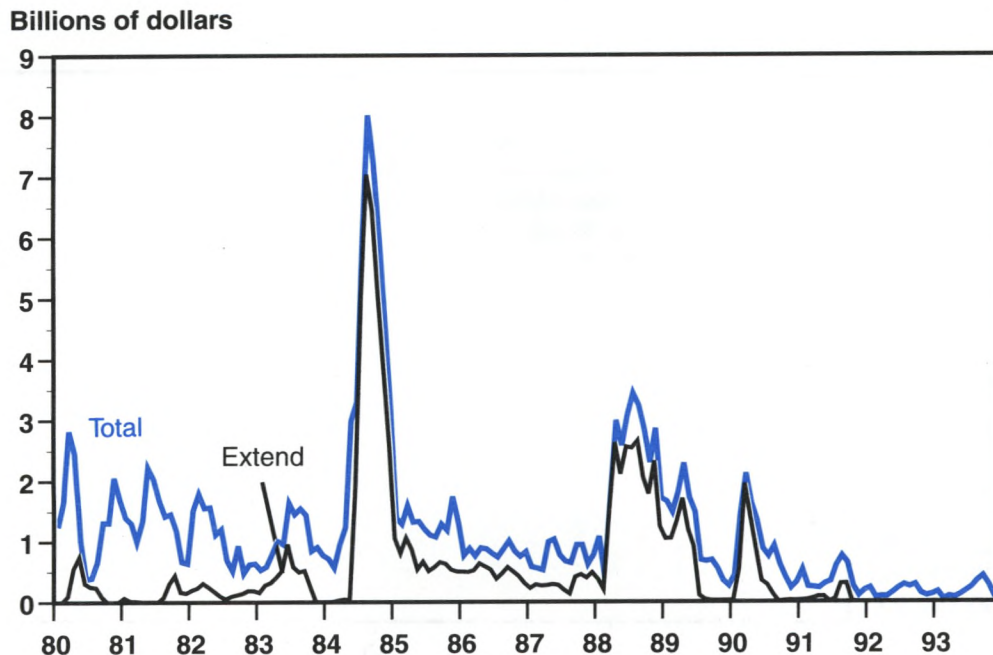
The sample is restricted to failed banks that reported their deposits to the Federal Reserve

⁷Winning bidders in cases resolved through transfer of insured deposits often purchase some of the assets of the failed banks.

⁸When government supervisors examine a bank, they give it ratings from 1 (the best) to 5 (the worst) on five aspects of its operations: Capital adequacy, Asset quality, Management, Earnings and Liquidity (CAMEL, for short). In addition, supervisors assign a composite CAMEL rating from 1 to 5, based on the ratings for these five components. Banks with composite ratings of 4 or 5 are classified as

problem banks and subjected to relatively close supervision. Banks rated composite CAMEL 5 are in such poor condition that their supervisors consider them to be in imminent danger of failing.

Figure 1
Total and Extended Credit Borrowings



each week in their last year, because the analysis involves deposit data in their last year. This restriction affects the size distribution of the banks in the sample. Relatively small banks report their deposit liabilities and vault cash for one week in a quarter, and their required reserves are set at the same level for a quarter based on their reports. The maximum asset size of the quarterly reporters was changed over the years 1985-90.

Restricting the sample to those that reported deposit data to the Fed in each of their last 52 weeks reduces a potential sample of 870 failed banks to 318. Figure 2 presents the size distribution of the banks in the sample, based on their total assets as of failure date. Restricting the sample to banks that reported their deposits weekly for their last 52 weeks eliminates the very small banks. None of the banks in the sample had total assets below \$10 million, and only 19 of the 318 banks had total assets below \$20 million as of their failure date.

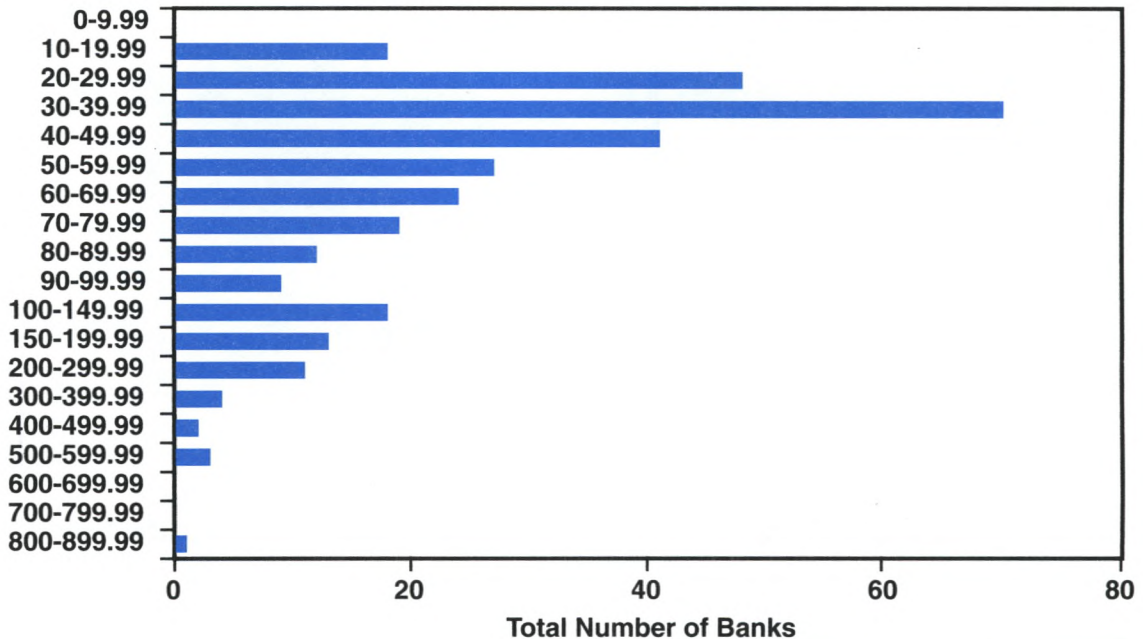
Results derived from this sample of 318 banks may not apply for smaller banks. In several ways, however, the observations on borrowings

in the report of the House Banking Committee are similar to the patterns of borrowings by banks in this study. Also, among the 870 banks in the broader sample, ratios of BIF loss to total assets are not related systematically to asset size, and the distributions of banks by resolution methods are similar for the larger and smaller samples of banks.

Table 1 presents the distribution of the 318 banks in the sample by year of failure and borrowings in their last 52 weeks. Failures of the banks occurred fairly uniformly over the 1985-90 period. About 58 percent of these banks borrowed in at least one of their last 52 weeks. Borrowings tended to be concentrated in the weeks just prior to failure. Of the 185 banks that borrowed in their last 52 weeks, 154 (83.2 percent) borrowed in at least one of their last 13 weeks. For the 318 banks as a group, about 54 percent of the total dollar amount of borrowings in their last 52 weeks occurred in their last 13 weeks. This observation confirms the conclusion in the report by the staff of the House Banking Committee that borrowings increased as the condition of the banks deteriorated.

Figure 2
Distribution of Banks in the Sample by Total Assets as of Failure Date

Total Assets as of Failure Date
 (in Millions of Dollars)



Conclusions of the staff report of the House Banking Committee leave the impression that many failed banks borrowed for long periods prior to their failure. For instance, the observation that borrowers remained in operation 10 to 12 months on average as CAMEL-5 rated banks leaves the impression that credit from the discount window was essential for keeping the borrowers in operation during their last 10 to 12 months. This study indicates, in contrast, that only a small minority of the banks borrowed for at least half of their last year. Only 28 of the 318 banks (8.8 percent) borrowed in at least 26 of their last 52 weeks.⁹ The discount window may have become less accommodating to troubled banks in 1989-90; only four of the 94 banks that failed in those years borrowed in half or more of their last 52 weeks.

The sample of failed banks is distributed very unevenly across Federal Reserve Districts, with

88 percent of the banks located in Districts 6, 10, 11 and 12 (Table 2). These Districts also account for most of the banks that borrowed in their last 52 weeks. The banks that borrowed in half or more of their last 52 weeks were concentrated in Districts 10 (Kansas City) and 11 (Dallas), which may reflect differences in Reserve Bank lending practices. While the 12 districts follow the same general policies on lending, the staff of the district Reserve Banks have some freedom to follow different lending practices.

Banks in the sample also differ substantially by the amount of their borrowings relative to the size of their total deposits. For most of the banks that borrowed from the Fed in their last year, average borrowings were small relative to their average total deposits. Over their last 52 weeks, for instance, 85 percent of the failed banks either didn't borrow from the Fed or their borrowings were less than 1 percent of

⁹The extreme cases in this sample involved two banks in the Kansas City District that borrowed almost continuously for about two years and then failed.

Table 1

Distribution of Sample Banks by Borrowings from the Federal Reserve in Their Last Year

Year of failure	Number of banks	Borrowed in their last 52 weeks (percent)	Borrowed in their last 13 weeks	Borrowed in at least 26 of their last 52 weeks
1985	50	26 (52.0)	24	4
1986	60	36 (60.0)	28	8
1987	60	43 (71.7)	39	6
1988	54	30 (55.6)	26	6
1989	44	26 (59.1)	18	2
1990	50	24 (48.0)	19	2
TOTAL	318	185 (58.2)	154	28

Table 2

Distribution of Sample Banks by Federal Reserve District

Federal Reserve District	Number of banks	Borrowed in their last 52 weeks	Borrowed in their last 13 weeks	Borrowed in at least 26 of their last 52 weeks
1	4	2	1	0
2	7	3	1	0
3	0	0	0	0
4	3	2	1	0
5	0	0	0	0
6	36	22	19	2
7	14	6	4	2
8	2	1	1	0
9	7	2	2	0
10	66	46	37	10
11	148	85	75	12
12	31	16	13	2
TOTAL	318	185	154	28

their average total deposits (Table 3). In contrast, borrowings were large relative to total deposits at a few of the banks. Borrowings of three banks exceeded 10 percent of their total deposits over their last 52 weeks. Ratios of borrowings to total deposits tended to be higher over the last 13 weeks than over longer periods prior to failure dates, since borrowings tended to rise and deposits decline as banks approached their failure dates. For instance, borrowings of 15 banks exceeded 10 percent of their total deposits over their last 13 weeks.

IMPLICATIONS OF BORROWINGS FOR THE BANK INSURANCE FUND

Direct Comparisons of BIF Loss Ratios

Analysis of the effects of Federal Reserve lending to troubled banks on the losses of BIF begins with comparisons in Table 4 of BIF losses associated with the failed banks that borrowed from the Federal Reserve and those that did not

Table 3

Distribution of Sample Banks by the Size of Their Borrowings Relative to Their Average Total Deposits

Range of ratios of borrowing to total deposits	Sum of borrowings divided by the sum of total deposits over the following periods ending on failure dates:					
	Last 13 weeks		Last 26 weeks		Last 52 weeks	
	No. of banks	Cumulative percent	No. of banks	Cumulative percent	No. of banks	Cumulative percent
Zero	164	51.57%	149	46.86%	133	41.82%
$0.000 < x \leq 0.001$	28	60.38	54	63.84	65	62.26
$0.001 < x \leq 0.005$	29	69.50	29	72.96	52	78.62
$0.005 < x \leq 0.010$	23	76.73	23	80.19	21	85.22
$0.010 < x \leq 0.020$	20	83.02	22	87.11	23	92.45
$0.020 < x \leq 0.050$	25	90.88	24	94.65	15	97.17
$0.050 < x \leq 0.100$	14	95.28	10	97.80	6	99.06
$0.100 < x \leq 0.200$	11	98.74	5	99.37	2	99.69
$0.200 < x$	4	100.00	2	100.00	1	100.00

borrow in their last year. The mean BIF loss ratios in Table 4 for banks that did and did not borrow from the Fed in their last year are not adjusted for differences among the banks, other than borrowings, that might explain differences in BIF loss ratios, such as the condition of banks prior to borrowing or regional effects.

Mean BIF loss ratios are about 5 percentage points higher among the failed banks that borrowed from the Federal Reserve in their last year, and differences in the mean loss ratios are highly significant. The high *t*-statistics for differences in mean BIF loss ratios indicate that there is only a very small chance that the BIF loss ratios of the borrowers and nonborrowers were drawn from the same distribution.

The association between borrowings and BIF loss ratios in Table 4 does not necessarily indicate that Fed lending practices *caused* higher BIF losses. Perhaps the banks that borrowed from the Fed in their last year would have had higher BIF loss ratios than the other banks if the Fed had not loaned to them. Two observations raise doubts about the argument that loans by the Fed caused the higher BIF loss ratios among the borrowers. First, borrowings of most banks were concentrated near the time of their failure dates, long after they had assumed the risk that led to their failure. Second, if Federal Reserve lending caused the higher BIF loss

ratios among the borrowers, we would expect the banks that borrowed the most relative to their deposit size to have the highest BIF loss ratios. This is not the case. Figures 3 and 4 present information on the association between BIF loss ratios and ratios of borrowings to deposits among the banks that borrowed in their last year. Measuring borrowings over the last 13 weeks (Figure 3) and the last 52 weeks (Figure 4), there does not appear to be a positive association between BIF loss ratios and borrowings ratios.

The remainder of this section attempts to determine whether Fed lending practices caused the higher BIF loss ratios among the borrowers by investigating whether evidence supports the assumptions that underlie such a direction of causality.

Did Federal Reserve Credit Help Keep Problem Banks Open?

Credit from the Fed may have allowed the borrowers to remain open longer as troubled banks than the nonborrowers. Supported by Fed credit, the borrowers may have assumed additional risk just prior to their failure, resulting in larger losses to BIF when they failed. The report by the staff of the House Banking Com-

Table 4

Association Between BIF Loss Ratio and Borrowings by Failed Banks in Their Last Year

Group of banks based on borrowings from the Federal Reserve	Number of banks	Mean BIF loss ratio* (standard deviation in parentheses under mean)	t-statistic for difference in means
Borrowings in last 13 weeks:			
Yes	154	0.3067 (0.1181)	4.01
No	164	0.2514 (0.1253)	
Borrowings in last 26 weeks:			
Yes	169	0.3079 (0.1228)	4.73
No	149	0.2445 (0.1186)	
Borrowings in last 52 weeks:			
Yes	185	0.3007 (0.1253)	4.02
No	133	0.2468 (0.1175)	

*The BIF loss ratio is the ratio of the loss to BIF from a bank failure divided by total assets of the failed bank as of its failure date.

mittee emphasized such a link between borrowings and BIF losses. One of the key conclusions was that the failed banks which borrowed from the Federal Reserve in their last three years remained open on average about 10 to 12 months after supervisors rated them as CAMEL 5. The report implies that these banks would have been closed earlier if the Federal Reserve had not provided credit.

There are two problems with such an inference. First, the report does not indicate when in their last three years these banks borrowed from the Federal Reserve. Suppose a bank borrowed for one day three years prior to its failure and was rated CAMEL 5 one year prior to failure. This case would be included among the observations supporting the inference that Federal Reserve credit helped some CAMEL 5 banks stay open for relatively long periods.

A second problem is a lack of comparison to the length of time that nonborrowers were rated CAMEL 5 prior to their failure dates. Table 5 provides such a comparison. The sample of 318

failed banks is divided into two groups: those that borrowed from the Federal Reserve in their last 13 weeks and those that did not. Borrowings are observed over the last 13 weeks because any banks kept open only through access to Federal Reserve credit would be borrowing from the Fed near the time of their failure. Table 5 presents the distributions of these banks by the length of time they were rated CAMEL 4 or 5, and rated CAMEL 5, prior to their failure. Banks rated CAMEL 4 or 5 are classified as problem banks. It is relevant to know whether Federal Reserve credit helped banks rated CAMEL 4 or 5 remain in operation for relatively long periods prior to their failure, in addition to analysis that focuses exclusively on CAMEL 5-rated banks.

The distributions of banks by the number of months they were rated CAMEL 4 or 5 prior to their failure are almost identical for the borrowers and nonborrowers. The median number of months between the time the banks were rated problem banks and their failure was 20.5 months

Figure 3

Relationship Between Borrowings Ratios and BIF Loss Ratios Among Banks that Borrowed: Last 13 Weeks

Average Total Borrowings Divided by Average Total Deposits

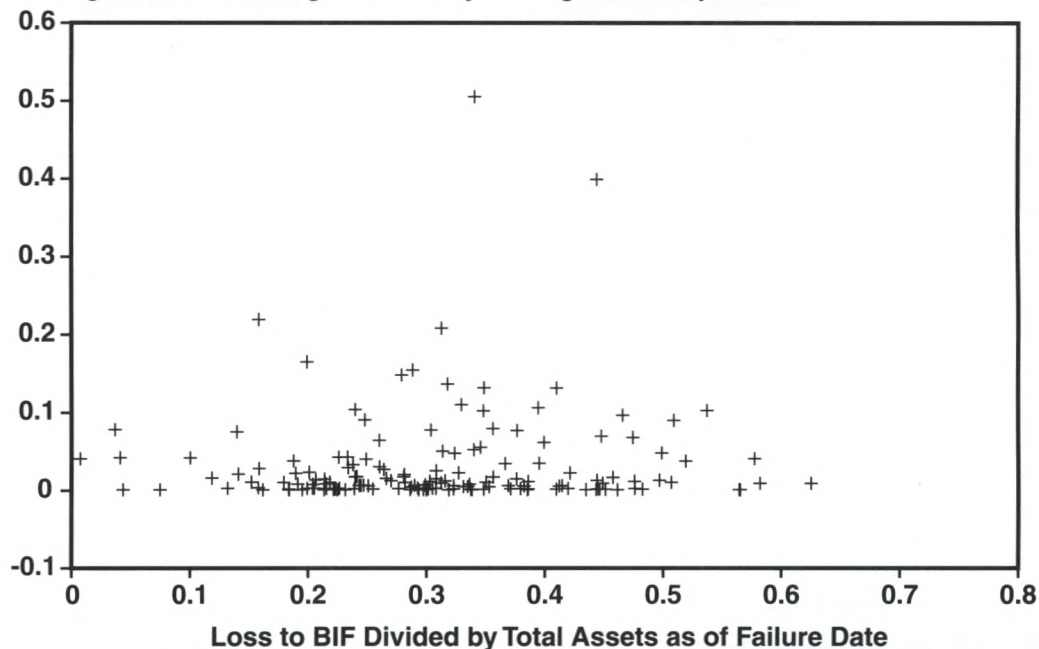


Figure 4

Relationship Between Borrowings Ratios and BIF Loss Ratios Among Banks that Borrowed: Last 52 Weeks

Average Total Borrowings Divided by Average Total Deposits

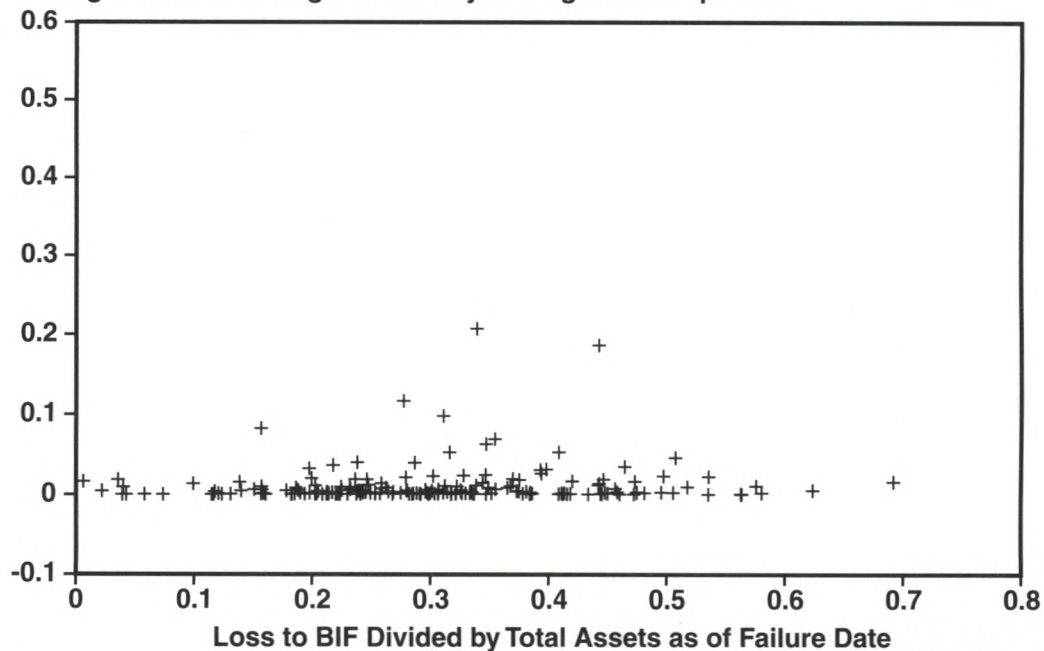


Table 5

Cumulative Distributions of Banks by the Length of Time They Were Problem Banks Prior to Failure

No. of months rated CAMEL 4 or 5: less than	Borrowed from the Federal Reserve in their last 13 weeks:			
	Yes		No	
	No. of banks	Percent	No. of banks	Percent
1	5	3.2%	6	3.7%
2	11	7.1	10	6.1
5	15	9.7	13	7.9
10	27	17.5	27	16.5
15	47	30.5	52	31.7
20	72	46.8	77	47.0
25	96	62.3	105	64.0
30	111	72.1	120	73.2
36	130	84.4	135	82.3
36 or more	154	100.0	164	100.0
Median no. of months rated CAMEL 4 or 5	20.5		20	
No. of months rated CAMEL 5: less than				
1	15	9.7%	22	13.4%
2	30	19.5	40	24.4
5	46	29.9	63	38.4
10	77	50.0	102	62.2
15	111	72.1	130	79.3
20	135	87.7	146	89.0
25	148	96.1	153	93.3
30	152	98.7	158	96.3
36	153	99.4	162	98.8
36 or more	154	100.0	164	100.0
Median no. of months rated CAMEL 5	9.5		7	

for the borrowers and 20 months for the non-borrowers.¹⁰

The banks that borrowed in their last 13 weeks tended to be rated CAMEL 5 somewhat longer than the nonborrowers. The median period the banks were rated CAMEL 5 prior to failure was 9.5 months for borrowers, compared to seven months for the nonborrowers.

Access to credit from the discount window, however, does not appear to have been the only

factor determining how long the borrowers and nonborrowers rated CAMEL 5 remained in operation. If access to Fed credit had been the only factor, all of the borrowers would have been rated CAMEL 5 for relatively long periods prior to their failure, and all of the nonborrowers rated CAMEL 5 for relatively short periods. This was not the case. Periods that both borrowers and nonborrowers were rated CAMEL 5 ranged from less than one month to three years or more. About 20 percent of the borrowers were closed within two months of the time

¹⁰The median is used, instead of the mean, because the few failed banks that remained open for long periods as problem banks could distort comparisons of means. For instance, among the 154 borrowers, three banks were rated CAMEL 4 or 5 for over 60 months prior to failure; among the 164 nonborrowers, four banks were rated CAMEL 4 or 5 for over 60 months.

when their supervisors rated them CAMEL 5, whereas many of the nonborrowers remained in operation rated CAMEL 5 for much longer periods.

Suppose Table 5 is interpreted as indicating that access to credit from the Federal Reserve allowed borrowers to remain in operation slightly longer as CAMEL 5-rated banks. What would this imply for losses to BIF? The idea that troubled banks should be closed promptly to keep them from taking actions that expose BIF to larger losses is based on the assumption that supervisors have been ineffective in preventing troubled banks from taking such actions. This author, however, has found evidence that supervisors have been effective in constraining the behavior of most of the troubled banks under their jurisdiction.

Some of the evidence reveals the behavior of banks while their capital ratios were below required levels or while supervisors rated them as problem banks. Supervisors attempt to limit asset growth, dividends and loans to officers and directors of the banks (the insiders) of undercapitalized and problem banks. Gilbert (1991) reported that large majorities of the banks that operated in 1985-89 for four or more consecutive quarters with capital ratios below the minimum capital requirement in effect at the time reduced their assets, refrained from paying dividends and had lower insider loans while undercapitalized. Gilbert (1992) found that the banks undercapitalized the longest prior to failure had the fastest declines in their total assets in their last year, and the group of banks undercapitalized the longest prior to their failure had the smallest percentage paying dividends in their last year. Gilbert (1993) found that banks reduced the growth rates of their assets and reduced their dividends when supervisors downgraded them to problem status.

Another study tests directly the association between the length of time prior to their failure that banks operated with capital ratios below the minimum required level and the losses to the deposit insurance fund resulting from their failures. Gilbert (1992) found no association between losses to the deposit insurance fund and the length of time banks were undercapitalized prior to their failure. Thus, if Federal Reserve lending practices allowed some CAMEL 5-rated banks to remain in operation slightly longer than others, it is not clear that those lending practices had any effect on BIF losses.

Behavior of the Banks That Borrowed

Conclusions about the behavior of most troubled banks may not apply to those that borrowed from the Fed near the time of their failure. Since these banks were privileged to have access to credit from the discount window near the time of their failure, they may have had other privileges not available to all troubled banks.

The articles cited above indicate that troubled banks subject to relatively close supervision tended to reduce their assets and refrain from paying dividends. Table 6 examines the deposit growth and dividends of borrowers and nonborrowers that were rated CAMEL 4 or 5 one year prior to their failure. Of these 238 banks, 96 did not borrow from the Fed in their last year, and the remaining 142 banks borrowed at least once in their last year. The 142 borrowers are divided into several groups, based on their average borrowings over their last year as a percentage of average total deposits over their last year. For each of the groups in Table 6, based on their borrowings ratios, the mean of the percentage change in total deposits in their last year was negative. The borrowers tended to have more rapid declines in total deposits in their last year than the nonborrowers, and those that borrowed more relative to the size of their total deposits tended to have faster rates of decline in total deposits than the banks with lower borrowings ratios. These observations are consistent with the view that the banks that borrowed most relative to their deposits had the greatest liquidity needs.

About 15.5 percent of the banks rated CAMEL 4 or 5 in their last year paid dividends in their last year, and this percentage was about the same for the borrowers and nonborrowers. Dividends as a percentage of total assets, however, were smaller among the borrowers that paid dividends in their last year (mean of 0.29 percent) than among the nonborrowers that paid dividends in their last year (mean of 0.45 percent). Based on deposit growth and dividends, supervision of the problem banks that borrowed in their last year appears to have been at least as strict as the supervision of problem banks that did not borrow from the Fed.

Table 6

Deposit Growth and Dividends of Banks Rated CAMEL 4 or 5 Over Their Last Year

Range of ratios of borrowings to total deposits over the last 52 weeks	No. of banks	Mean of percentage change in total deposits over last 52 weeks	No. of banks that paid dividends in their last year	Of banks that paid dividends, mean of dividends as percentage of average total assets over the last year
Zero	96	-12.1%	15	0.45%
$0 < x \leq 0.001$	53	-13.1	5	0.12
$0.001 < x \leq 0.005$	35	-17.2	8	0.41
$0.005 < x \leq 0.010$	16	-20.2	3	0.22
$0.010 < x \leq 0.020$	17	-19.5	3	0.27
$0.020 < x \leq 0.050$	13	-27.3	0	N/A
$0.050 < x \leq 0.100$	5	-29.9	3	0.35
$0.100 < x \leq 0.200$	2	-19.2	0	N/A
$0.200 < x$	1	-58.3	0	N/A
TOTAL	238		37	

Did Borrowers Have Larger Declines in Uninsured Deposits?

One of the arguments that Fed lending practices raised BIF losses rests on the assumption that uninsured deposits declined more rapidly at borrowing banks than at nonborrowing banks. Table 7 indicates that for the banks that borrowed in their last year, the mean of the percentage change in large denomination time deposits over their last 52 weeks (negative 34.3 percent) was significantly different from the mean percentage change in other deposits (negative 9.6 percent). Large denomination time deposits of the banks that borrowed from the Fed in their last 26 weeks also declined more rapidly on average than their other deposits over their last 26 weeks (negative 26.2 percent compared to negative 8.6 percent).

This pattern of more rapid declines in large denomination time deposits than in other deposits at borrowing banks, however, is almost

identical to the record for the banks that did not borrow from the Federal Reserve in their last year.¹² Credit from the Federal Reserve does not appear to have facilitated more rapid declines in large denomination time deposits at the banks that borrowed from the Fed. These observations fail to support one of the arguments linking access to credit from the discount window and BIF losses: that declines in uninsured deposits near the time of failure were more rapid for borrowers than nonborrowers.

Federal Reserve Lending to Troubled Banks May Have Limited BIF Losses by Promoting Orderly Resolutions

Resolution of a failed bank through methods other than liquidation takes some time for the FDIC to arrange. The FDIC has to prepare a package of assets and liabilities for bidders to

¹¹Instructions for reporting deposits call for classifying brokered deposits in denominations of \$100,000 or less as small denomination time deposits.

¹²The *t*-statistics for differences between the mean growth rates of large denomination deposits at the borrowers and

nonborrowers, measured over their last 26 weeks and over their last 52 weeks, are less than 0.2.

Table 7

Deposit Growth of Failed Banks in the Last Year: Borrowers and Non-borrowers

	Banks that borrowed from the Fed in their last 52 weeks	Banks that <i>did not</i> borrow from the Fed in their last 52 weeks
Mean percentage change in total deposits in their last:		
26 weeks		
(t-statistic for difference in growth rates for borrowers and nonborrowers)	- 13.0 % (-2.38)	- 10.3 %
52 weeks		
(t-statistic for difference in growth rates for borrowers and nonborrowers)	- 17.3 (-2.79)	- 11.7
Mean percentage change in large time deposits in the last 26 weeks	- 26.2	- 25.6
Mean percentage change in deposits other than large time deposits in the last 26 weeks	- 8.6	- 7.0
t-statistics for difference in means of growth rates of large time deposits and other deposits	- 9.01	- 5.63
Mean percentage change in large time deposits in the last 52 weeks	- 34.3	- 33.5
Mean percentage change in deposits other than large time deposits in the last 52 weeks	- 9.6	- 6.0
t-statistics for difference in means of growth rates of large time deposits and other deposits	- 6.83	- 5.51

examine, allow them time to assess its value, and arrange for transfer of the assets and liabilities to the winning bidder. Resolutions arranged as P&A tend to be less expensive to the FDIC than other types of resolutions.¹³ Lending by the Federal Reserve may have allowed some banks to remain open while the FDIC worked to minimize resolution costs.

One form of evidence that Federal Reserve lending facilitated orderly resolutions would be a lower percentage of liquidations among the banks that borrowed from the Federal Reserve

near the time of their failure. Table 8 indicates that the percentages of banks resolved by each of the three methods were about the same for the banks that borrowed in their last 13 weeks and those that did not.¹⁴ These observations do not support the argument that Federal Reserve lending near the time of failure facilitated resolutions through methods other than liquidation.

Liquidations of failed banks might have been more common without Federal Reserve credit to troubled banks, since borrowers had more rapid declines in their total deposits in their last

¹³See Gilbert (1992).

¹⁴Results are similar to those in Table 8 if the division between the two groups of banks is based on borrowings in the 26 weeks ending in failure.

Table 8

Distribution of Banks by Borrowings Near the Time of Their Failure and by Resolution Method

Resolution method	Borrowed from the Federal Reserve in their last 13 weeks:			
	Yes		No	
	Number	Percent	Number	Percent
Purchase and assumption	122	79.2%	129	78.7%
Transfer of insured deposits	23	14.9	24	14.6
Liquidation	9	5.8	11	6.7
TOTAL	154	100.0	164	100.0

year than nonborrowers (Table 7). Without credit from the Federal Reserve, rapid deposit declines might have forced the FDIC to liquidate more banks. This argument, however, does not provide a strong defense for Federal Reserve lending to troubled banks, since the FDIC has authority to use its resources to keep troubled banks open until it can determine the least costly method of resolution. Options available to the FDIC include lending to troubled banks, injecting capital through open bank assistance, and operating failed banks as bridge banks while they search for buyers, as in the case of the Bank of New England.

CONCLUSIONS

About 60 percent of the sample of banks that failed in 1985-90 borrowed from the Federal Reserve in their last 52 weeks. In addition, losses of the Bank Insurance Fund were larger among the banks that borrowed from the Federal Reserve in their last year. The combination of these observations could be interpreted as evidence that the Federal Reserve engaged in a major operation of sustaining the life of troubled banks that eventually failed, and that the Federal Reserve increased BIF losses substantially by lending to many banks near the time of their failure.

This evidence, however, does not necessarily prove that Fed lending practices caused the higher BIF loss ratios of the borrowers. Perhaps the Fed made loans to banks which would have had relatively high BIF loss ratios with or without

Fed loans. This article investigates whether evidence supports the arguments that Fed lending caused larger BIF losses.

One argument is that Fed credit extended the life of the borrowers, giving troubled banks with little to lose additional time to assume risk. Borrowers were rated CAMEL 5 by government supervisors (in imminent danger of failing) slightly longer prior to their failure than the nonborrowers. Additional evidence, however, indicates that the borrowers tended to have faster declines in total deposits and tended to pay smaller dividends than the nonborrowers in their last year. These observations on deposit growth and dividends are consistent with the view that the banks which borrowed from the Fed in their last year were under strict supervision appropriate for troubled banks.

The evidence does not support the argument that borrowers had relatively rapid declines in their uninsured deposits near the time of their failure, which would have raised the cost of resolution through methods other than purchase and assumption. Large denomination time deposits declined at about the same rates on average for borrowers and nonborrowers over their last 26-to-52 weeks.

It is possible to make an argument that, in many cases, Federal Reserve lending to failed banks helped limit BIF losses. In most cases, borrowings were concentrated in a few weeks just prior to failure. These loans may have allowed the banks to remain in operation, funding deposit withdrawals, while the FDIC worked to arrange resolutions less costly to BIF than

liquidations. Evidence on resolution methods in the bank failure cases, however, does not support this interpretation. Percentages of failed bank cases resolved through purchase and assumption, transfer of insured deposits to other banks and liquidation were about the same for borrowers and other failed banks.

Overall, the evidence does not support the argument that Federal Reserve lending to failed banks affected the costs of bank failures to BIF.

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Measures of Money and the Quantity Theory

MANY ECONOMISTS BELIEVE THAT, over long periods of time, the quantity theory of money explains the relationship between money and inflation. In particular, many believe (generally speaking) that a permanent increase in the quantity of money will eventually produce an equiproportionate permanent increase in the general level of prices. Similarly, a constant rate of money growth will produce a constant rate of inflation. This belief is often summed up in the phrase "money is long-run neutral."

Unfortunately, it has been difficult for economists to investigate such claims satisfactorily. Part of the difficulty lies in defining what is meant by measurement at low frequencies, horizons long enough so that other economic adjustments have taken place. An additional problem has been one of designing investigations that do not rely critically on other details (sometimes called "structure") about how the economy works, details on which there is notoriously little consensus among economists.

In this paper, the basic proposition that money growth and inflation are closely related in the long run is examined from a nonstructural, low-

frequency point of view. The nonstructural aspect of the analysis is attained by using a technique that does not require a host of encumbering theoretical or econometric assumptions. The low-frequency aspect is achieved by using a certain filter that extracts a long-run signal from time series data. The filter was introduced to this literature by Lucas (1980). The purpose of the paper is to extend the analysis of Lucas, whose work is often cited as an illustration of the validity of the quantity theory, along two dimensions. The first is simply an extension of the quarterly data set up to the present.¹ The second is to check the robustness of the results across different measures of money, an issue not addressed in the original paper nor in subsequent comments on the paper by other authors.²

Authors commenting on Lucas (1980) tended to raise questions concerning the relationship of the graphically based, nonstochastic methodology to statistical techniques. Whiteman (1984) and McCallum (1984) in particular both suggested there were limits to the inferences that could be drawn using Lucas' empirical analysis. Recent developments in econometric theory due

¹Lucas (1980) used quarterly data on M1, the consumer price index and real GNP from 1953 to 1975.

²Lucas (1980, p. 1006) notes, "this question of which monetary aggregate one would theoretically expect to move in proportion to prices is much more open than has tradi-

tionally been recognized. In [this paper]...money means M1, but the arbitrariness of this measurement choice should be emphasized at the outset..." (italics in original).

to Fisher and Seater (1993) have suggested a framework that can be used to answer the questions raised by these authors, and also to put Lucas' original work into statistical perspective. This paper provides a summary of the Fisher and Seater framework as it pertains to the neutrality issues investigated here.

The data for the study consists of quarterly observations from the United States from 1960 through 1992. This data set includes, broadly speaking, a period of increasing inflation up to about 1980 and a period of disinflation thereafter. Thus, the data provide a useful natural experiment in that policymakers have evidently followed both relatively high and relatively low inflation policies during this era. This is useful because the methods used here would be uninformative if there were insufficient variation in policy. Two measures of inflation and 19 measures of money are used, the latter to check robustness of the results across different definitions of money. The measures of money used range from the very narrow to the very broad and include Divisia versions of some aggregates.

The results indicate, very broadly speaking, that quantity theory illustrations pan out in the sense that, by any combination of measures, higher money growth rates are associated with higher inflation rates at something like a one-for-one rate. When the measure of money is broad, such as M2, M3 or L, the illustrations can be striking, although when other measures of money are used, the results are weaker. In particular, the results of Lucas (1980), which were obtained using M1 as the measure of money, are less satisfactory when data from the 1980s are included.

A VERSION OF THE QUANTITY THEORY

The equation of exchange is defined as $MV \equiv PT$, where M is the quantity of money, P is the price level, T is a measure of the volume

of transactions and V is the transaction velocity of money, which is simply defined in terms of the other three variables. The transaction measure typically used is real output Y , so that $MV \equiv PY$. An assumption on the behavior of velocity is required in order to convert this tautology into a theory. The version of the quantity theory employed in this paper postulates that the growth rate of V is constant in the equation of exchange, and that output movements are uncorrelated with changes in the quantity of money. The constant velocity growth rate will be denoted by $\alpha > -1$; if $\alpha = 0$, the level of velocity is constant. Since the analysis is from a long-run perspective, these assumptions can be viewed as applying only over long horizons. Therefore, while it is true that velocity fluctuates over short time horizons, the nature of the analysis undertaken here makes a constant growth velocity assumption more attractive.³

The theory's key proposition for the purposes of this paper can be found by now taking logarithms of both sides of the equation and differentiating with respect to time. This manipulation, combined with the velocity assumption, implies that

$$(1) \frac{1}{P} \frac{dP}{dt} = \alpha + \frac{1}{M} \frac{dM}{dt} - \frac{1}{Y} \frac{dY}{dt},$$

that is, the inflation rate is equal to the constant velocity growth rate plus the money growth rate less the growth rate of output. For convenience, denote $(1/x) (dx/dt)$ by Δx_t so that

$$(2) \Delta P_t = \alpha + \Delta M_t - \Delta Y_t.$$

In the long run, then, according to this theory, a plot of inflation against money growth less output growth should produce data points that lie along a 45-degree line with intercept α . It is well known that such a proposition does not hold when the data are measured over short frequencies such as a quarter, but many economists believe that it does hold when the

³More complicated velocity assumptions are possible. One might suppose, for instance, that the trend in velocity sometimes changes or that it follows a quadratic. Generally, more creative velocity assumptions bring one closer to the tautological equation of exchange, and therefore may be of limited use. Still, it should be stressed that for any measure of P , M and Y there is a velocity assumption, sufficiently complicated, that will lead to a perfect illustration of the quantity theory by the methods used in this paper. The velocity assumption used here maintains comparability to Lucas (1980).

variables are viewed from a long-run perspective. To get at this notion, a filter is introduced in the next section which extracts a long-run signal from time series data.

LOW-FREQUENCY DATA ANALYSIS

A Two-Sided Filter

Lucas (1980) suggested the following filter for this problem:

$$(3) \ x_t(\beta) = \frac{(1 - \beta)}{(1 + \beta)} \sum_{k=-\infty}^{\infty} \beta^{|k|} x_{t+k},$$

where x_t is the variable of interest, and β is a parameter restricted to be between 0 and 1. As β approaches zero, no filtering occurs, while as β approaches unity, the filtered $x_t(\beta)$ approach the sample mean of the original series. Higher values of β , but short of unity, imply greater smoothing of the time series. Lucas' original idea was to choose a value of β short of unity which would allow the filter to extract a long-run signal from the time series data, and then to compare filtered data on money and inflation to see if the long-run movements are along a 45-degree line, as suggested by the quantity theory. Lucas found that the value $\beta = .95$ worked well, and this value is employed throughout most of this paper.⁴ Of course, a value of $\beta = .95$ is close to 1, and, hence, the filtered data will be quite smooth relative to the unfiltered time series.⁵

The filter is two-sided and extends beyond the sample in both directions. A technique due to Cooley, Rosenberg and Wall (1977) can be used to assign beliefs via a diffuse prior on points outside the sample; the moving average can then be calculated as if the entire doubly in-

finite record existed. Lucas (1980) reports that filtered series using this technique are virtually identical to the filtered series calculated using zero values for points outside the sample, with the exception of the data points quite near the beginning and quite near the end of the sample data. Lucas discarded the first two years and last two years of the filtered data so as not to allow the zero values to have undue influence on the results. In this paper the same procedure is followed.⁶

The two-sided nature of the filter can be interpreted as incorporating within the data analysis the behavior of agents whose actions today depend on their expectations of the future. This point can be illustrated by envisioning a model economy with many individual agents. Suppose that such an economy is characterized by a growth rate of the money stock and an associated inflation rate which is equal to the money growth rate. The growth rate of the money stock generally has an invariant distribution with a fixed mean and constant variance; on occasion, however, the mean of the distribution changes according to decisions made by the policy authorities. Since agents need to know the inflation rate in order to make decisions, "structural" policy changes of this type play a role in influencing their behavior. Suppose finally that the agents have to learn the new inflation rate following a policy change. The learning implies a well-defined transitory dynamics following a policy change, and these transitory dynamics would tend to blur the period-by-period relationship between money growth and inflation in the model. The essential problem for the econometrician observing such an economy is to disentangle the actual long-run relationship from the surrounding noise introduced by the transitory learning dynamics. The filter used to analyze the data from this economy, then,

⁴To see the effects of other values of β , see the general equilibrium example in the next subsection.

⁵For a detailed discussion of the filter, see Lucas (1980).

⁶The filter in the text employs the factor $(1 - \beta)/(1 + \beta)$. This factor is the inverse of the sum of the doubly infinite set of weights

$$\sum_{k=-\infty}^{\infty} \beta^{|k|},$$

and it serves to preserve the mean of the doubly infinite data set. Since we have assumed zeros for the points outside the actual sample, one might be tempted to preserve the mean of the actual finite sample with the factor

$$\left[\sum_{k=1-t}^{T-t} \beta^{|k|} \right]^{-1},$$

where T is the sample size and t is the point in the sample for which computation is being done. The results in this paper are qualitatively unchanged if an alternative filter of this type is employed. This confirms Lucas' (1980) claim that the results are not very sensitive to the way in which the points outside the sample are treated.

should be one that reliably distinguishes between "signal" induced by the structural policy changes that occur and the transitory noise. The filter employed here does extract signal from noise based on the variance of the noise term, and indeed this is the principle reason Lucas (1980, 1987) chose to use the filter. This motivation for the filter is illustrated in more detail in a general equilibrium example in the next section.

Before turning to the example, it is perhaps worth emphasizing that in an economy with a constant mean money growth rate and a constant mean inflation rate over the whole sample, an examination of the data such as the one carried out in this paper will yield no information. One cannot discern the effects of changes in money growth rates on inflation if there have been neither changes in money growth rates nor changes in inflation rates, by which I mean shifts in the entire distribution of these rates. In this sense, the structural policy changes are crucial to the successful verification of the quantity theoretic relationship; if no structural changes occur, the filtered data will simply be tightly clustered about the mean. Fortunately, the United States since 1960 has been characterized both by a period of accelerating inflation and a period of disinflation. It would appear, then, that the historical record contains enough variation in policy to be informative according to the methods employed here.

An Example in General Equilibrium

Some of these ideas can be made more concrete by illustrating the principles in a simple dynamic general equilibrium model with structural policy shifts. The model economy endures forever and consists of overlapping generations of identical two-period lived agents. The agents maximize utility $U = \ln c_t(t) + \ln c_t(t+1)$, where $c_t(t)$ is consumption, subscripts denoting birthdates and parentheses denoting real time. Each agent receives an endowment of the consumption good in each period of life, which we denote by $\{w_t(t), w_t(t+1)\}$. The endowments are the same for all agents regardless of birthdate. Agents can hold unbacked paper currency provided by the government; the government endures forever and provides currency at gross

rate θ . Currency holdings have a gross rate of return $P(t)/P(t+1)$, where $P(t)$ is the price of the consumption good at time t . The nominal amount of currency in circulation at time t is denoted by $H(t)$. The population size is constant, and the identical agents of each generation will be represented by a single agent.

If we solve the problem of the individual agent, we can write the equations describing equilibrium in this economy as

$$(4) H(t)/P(t) = [w_t(t) - w_t(t+1)\gamma(t)] / 2$$

$$(5) H(t) = \theta H(t-1)$$

$$(6) F[P(t+1)] \equiv \gamma(t)P(t),$$

where $\gamma(t)$ is the expected gross inflation rate at time t and $F[P(t+1)]$ is the time t forecast of the price at time $t+1$. The model can be closed with an assumption about how agents form expectations of the future price level. The learning assumption employed here is that agents use a first-order autoregression on prices using information available through time $t-1$:

$$(7) \gamma(t) = \left[\sum_{s=1}^{t-1} P(s-1)^2 \right]^{-1} \left[\sum_{s=1}^{t-1} P(s-1) P(s) \right].$$

These assumptions determine a dynamic system in $\gamma(t)$. For cases where $w_t(t) > w_t(t+1)$ and the pace of currency creation is relatively slow, this model has a locally stable steady state in which the gross rate of inflation is equal to the gross rate of currency creation.⁷ Local stability means that if the model is initialized at the steady state and then subjected to a small, one-time unanticipated change in the policy parameter θ , the dynamic path will eventually converge back to the steady state at $\gamma = \theta$. Thus, in the long run, the quantity theory holds in this model in the sense that the rate of inflation is equal to the rate of currency creation in the steady state.

If the policy parameter changed often enough, the transitory learning dynamics might cause money growth and inflation to appear to be unrelated period-to-period even though the quantity theory holds in the long run in this model. To consider a situation like this, view the agents as sophisticated enough to look forward via the first-order autoregression to make their savings decision, but not so sophisticated that they attempt to anticipate the next move of the policy

⁷See Bullard (1994).

authorities. In particular, ascribe to agents the belief that today's value of the policy parameter will persist into the next period (which is the only period that matters from the perspective of the young agents). Given this assumption, suppose that the actual law of motion for the money growth rate is given by

$$(8) \theta(t) = \theta(t-1) + \varepsilon(t) \text{ if } \theta(t-1) \in [\theta_l, \theta_u],$$

$$\theta(t) \sim U[\theta_l, \theta_u] \text{ otherwise,}$$

where $\varepsilon(t)$ is a mean zero noise term with variance σ_ε^2 , θ_l and θ_u represent lower and upper bounds, respectively, on the money growth rate, and $U[\cdot]$ represents a uniform distribution. If the variance of $\varepsilon(t)$ is chosen to be small relative to $\theta_u - \theta_l$, the policy parameter changes slowly within the bounds but can move sharply on occasions when the bounds are violated.

Because the system is locally stable near the monetary steady state, if policy was constant in the sense that $\sigma_\varepsilon^2 = 0$ and $\theta(0) \in [\theta_l, \theta_u]$, the system would converge to the steady state from an initial condition $\gamma(0)$ in the neighborhood of $\theta(0)$ and remain there for all time. Data plotted from such an experiment, with money growth on the horizontal axis and inflation on the vertical axis, would have virtually all of the observations on a 45-degree line at a single point. To obtain an illustration of the quantity theory—a movement along the 45-degree line—a policy change is required. If there were a single, unanticipated policy change at time τ such that $\theta(0) \neq \theta(\tau) \in [\theta_l, \theta_u]$, the system would first converge to the steady state at $\theta(0)$ and then, after some transitory dynamics following the policy change, converge to the steady state at $\theta(\tau)$.

The law of motion for the gross rate of money growth used here represents a more complicated situation, where policy changes occur every period, with most changes being small and some changes being large. By construction, the model obeys the quantity theoretic proposition that the rate of money creation is reflected in the rate of inflation in the long run. But because the policy parameter is constantly changing, the short-run (period-by-period) data might not provide evidence of such a relation-

ship. By simulating the model and using Lucas' filter, evidence of the long-run relationship can be recovered.

This principle can be shown through a simulation of the model with endowments for all agents set as $\{w_t(t), w_t(t+1)\} = \{2, 1\}$. The distribution of ε_t was set as triangular with mean zero and bounds $-.1$ and $.1$; this implies a variance of $.00167$.⁸ The system was initialized at the monetary steady state with $\gamma(0) = \theta(0) = 1.2$, and the upper and lower bounds on the money growth rate were set as $\theta_l = 1.1$ and $\theta_u = 1.3$, that is, between 10 percent and 30 percent per period. The simulation was run for 500 periods. The results are reported in Figures 1 through 4. Consistent with the earlier discussion of the distortion in the points near the beginning and end of the sample, the first and last 20 observations were omitted, leaving 460 in the charts. Figure 1 reports the raw, unfiltered data. There appears to be little or no evidence of a relationship between money growth and inflation, even though such a relationship exists by construction in this model. Figures 2, 3 and 4 show the same plot based on the filtered data, with the filtering parameter β set to $.5$, $.8$ and $.95$, respectively. In Figure 4, the filtered data lie virtually exactly on the 45-degree line and, thus, the long-run relationship between money growth and inflation that exists in the model is recovered using Lucas' (1980) procedure.

SOME ECONOMETRIC ISSUES

Empirical testing of the money growth-inflation relationship has been successfully undertaken by Vogel (1974), Dwyer and Hafer (1988), Duck (1993) and others using cross-country data. The general conclusion of these studies is that countries which experience high rates of inflation also have high rates of money growth, where inflation rates and money growth rates are typically averaged over many years. Unfortunately, as mentioned in the introduction, similar tests on time series data for a single country have been difficult to carry out.⁹ One element of the problem has been obtaining a suitable approach to defining the "long run" and detecting long-run relationships; an approach to this problem is the one used in this paper.

⁸The triangular distribution can be found by setting $\varepsilon_t = x_1 - x_2$, where $x_1, x_2 \sim U[0, 1]$.

⁹This fact motivated Lucas (1980).

Figure 1
A Theoretical Example

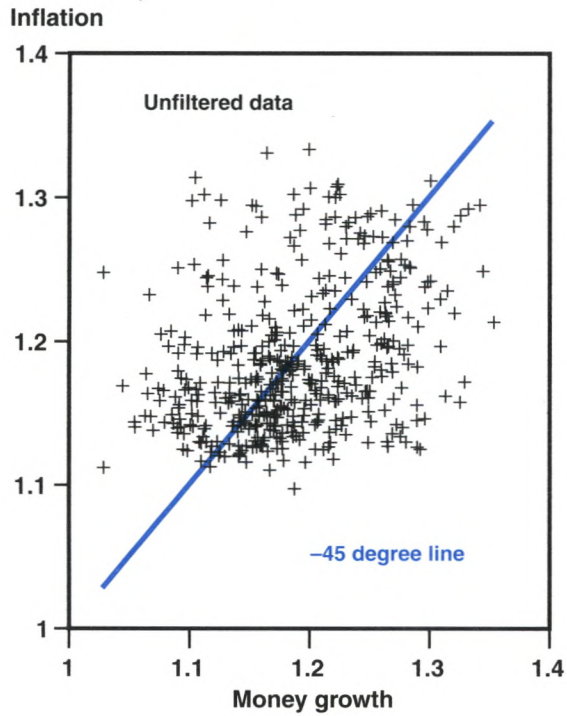


Figure 2
A Theoretical Example

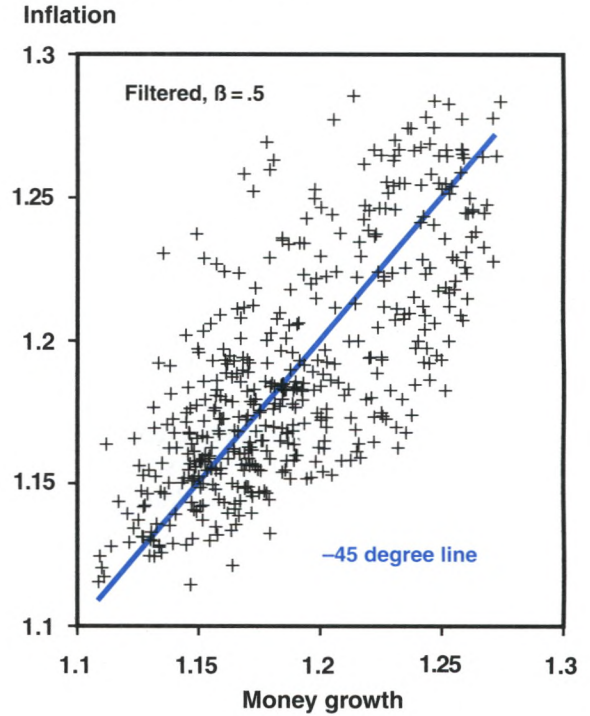


Figure 3
A Theoretical Example

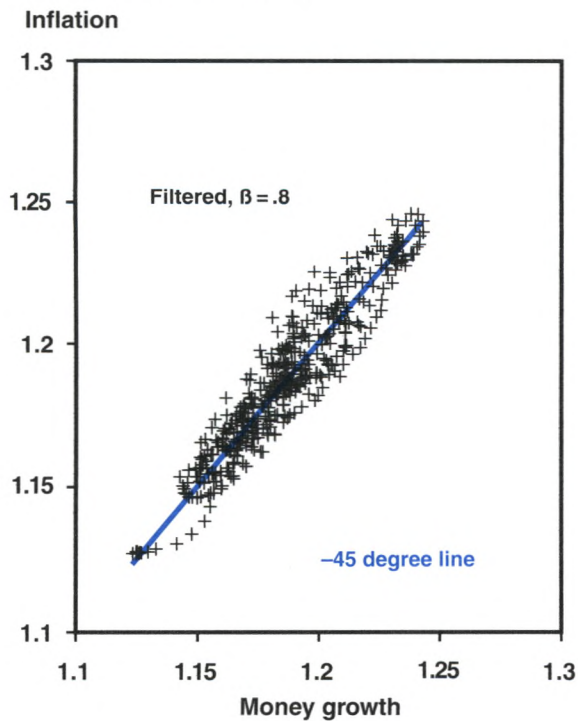
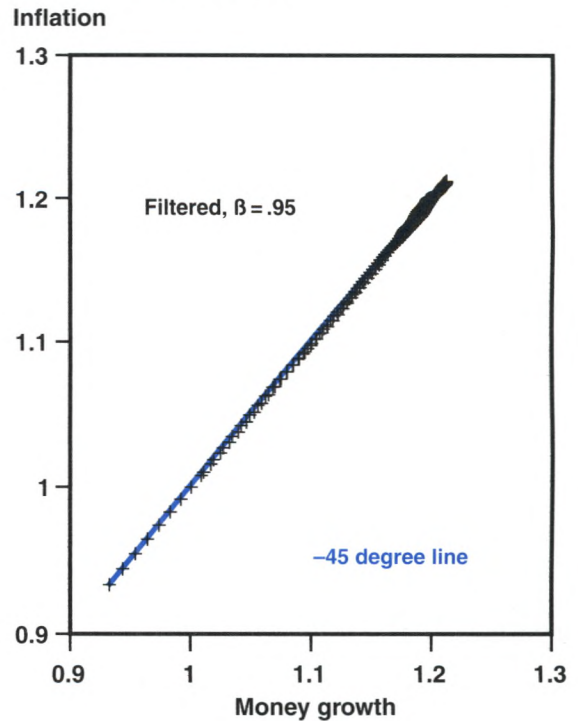


Figure 4
A Theoretical Example



One time series technique for testing neutrality has been developed recently by Fisher and Seater (1993).¹⁰ These authors show how non-structural tests of neutrality propositions depend importantly on the order integration of the variables being tested. The Fisher and Seater (1993) methodology can be used to provide a statistically based rationalization for the technique used by Lucas (1980, 1987) and in this paper, and also to clarify some questions raised by authors commenting on Lucas (1980).

Fisher and Seater examine tests of neutrality and superneutrality in a nonstructural two variable system. The first variable can be thought of as m , the natural logarithm of the nominal money stock, and the second variable can be thought of as p , the natural logarithm of the aggregate price level. Let $\langle \chi \rangle$ denote the order of integration of χ , so that if χ is integrated of order one, then $\langle \chi \rangle = 1$. Let the lag operator be denoted by L , and let $\Delta \equiv (1-L)$. It follows that the growth rate of a variable can be denoted by $\Delta\chi$, and that $\langle \Delta\chi \rangle = \langle \chi \rangle - 1$. Fisher and Seater study a two-equation system given by

$$(9) a(L)\Delta^{(m)}m_t = b(L)\Delta^{(p)}p_t + u_t$$

$$(10) d(L)\Delta^{(p)}p_t = c(L)\Delta^{(m)}m_t + w_t,$$

where $a_0 = d_0 = 1$, and the vector $[u_t, w_t]'$ is independently and identically distributed with mean zero and covariance Σ . Constants and trends are suppressed, and variables stationary about a deterministic trend are treated as integrated of order zero. Fisher and Seater work with this model in some generality, considering cases of superneutrality as well as neutrality, and also considering cases where the variable opposite m could be either of real or nominal magnitude. To focus the discussion here, we will concentrate on the case in which the two variables are m and p and the only question is one of neutrality.¹¹

Fisher and Seater define neutrality in terms of a long-run derivative of p with respect to a permanent change in m . Their definition is that if

$$(11) \lim_{k \rightarrow \infty} \frac{\partial m_{t+k}}{\partial u_t} \neq 0,$$

then

$$(12) LRD_{p,m} \equiv \lim_{k \rightarrow \infty} \frac{\partial p_{t+k} / \partial u_t}{\partial m_{t+k} / \partial u_t}.$$

In the case where

$$(13) \lim_{k \rightarrow \infty} \frac{\partial m_{t+k}}{\partial u_t} = 0,$$

Fisher and Seater simply leave the long-run derivative undefined. In this case, there is no permanent movement in m and a neutrality proposition cannot be tested. Otherwise, Fisher and Seater interpret the long-run derivative as representing the ultimate long-run effect of a disturbance u on p relative to the effect of the disturbance on m itself. Fisher and Seater (1993, p. 404) show that

$$(14) \lim_{k \rightarrow \infty} \partial m_{t+k} / \partial u_t = \theta(1),$$

where $\theta(L) \equiv (1-L)^{1-(m)}\alpha(L)$

and that

$$(15) \lim_{k \rightarrow \infty} \partial p_{t+k} / \partial u_t = \Gamma(1),$$

where $\Gamma(L) \equiv (1-L)^{1-(p)}\gamma(L)$.

They thus conclude that the value of the long-run derivative, when it is defined, depends on $\langle m \rangle - \langle p \rangle$ through the formula

$$(16) LRD_{p,m} = \frac{(1-L)^{(m)-(p)}\gamma(L)}{\alpha(1)} \Big|_{L=1}.$$

Fisher and Seater then define long-run monetary neutrality as $LRD_{p,m} = 1$. They categorize the possibilities into several cases. In the first case, $\langle m \rangle < 1$ and the long-run derivative is not defined. Long-run neutrality cannot be addressed because there are no permanent changes in the money stock. In the second case, $\langle m \rangle \geq \langle p \rangle + 1 \geq 1$ and long-run neutrality fails immediately because (in the simplest case) there are permanent shocks to the money supply but no permanent shocks to the price level. A third case has $\langle m \rangle = \langle p \rangle \geq 1$, and here $LRD_{p,m} = 1$ if neutrality holds. Therefore, tests of long-run neutrality can be devised since both m and p possess permanent changes. Fisher and Seater also argue that tests can be devised in a fourth case where $\langle m \rangle = \langle p \rangle - 1 \geq 1$.

¹⁰For applications of the techniques Fisher and Seater (1993) describe, see King and Watson (1992) and Bullard and Keating (1993). Most of the material in the remainder of this section can be found in greater detail and generality in Fisher and Seater (1993).

¹¹In Lucas (1980), the relationship between money growth and interest rates is also examined. The question of super-neutrality would be important in this context, but this issue is not dealt with in this paper.

Lucas' (1980) graphical technique can be viewed as equivalent to estimating a regression coefficient, and if money is assumed to be long-run exogenous, this coefficient can be identified with the long-run derivative. In particular, Fisher and Seater argue that if $\langle m \rangle = \langle p \rangle = 1$, one can interpret the slope coefficient in a regression of filtered Δp on filtered Δm as an estimate of $LRD_{p,m}$.¹² In this paper, tests of integration are not pursued, but there is ample evidence that $\langle m \rangle \geq 1$, and that $\langle p \rangle \geq 1$.¹³ Since such tests have low power, economists cannot say with precision what the order of integration of these variables is, but it seems reasonable to proceed for the purposes of the present paper on the assertion that one of the above conditions holds. Later in the paper, values of the regression coefficients of filtered Δp on filtered Δm are reported as estimates of $LRD_{p,m}$.

As mentioned in the introduction, two papers offering critiques of Lucas (1980) can be understood relatively easily in terms of the Fisher and Seater (1993) paradigm. McCallum's (1984) "second example" suggested that $LRD_{p,m}$ was not necessarily equal to unity even when long-run neutrality held. But in the example, $\langle m \rangle = 0$ so that the long-run derivative is not defined. Both Lucas (1980) and Fisher and Seater (1993) emphasized that permanent shocks to money were necessary to test neutrality propositions.

Whiteman (1984) critiqued Lucas (1980) from the point of view of a structural model that could display a Mundell-Tobin effect. In such a model, a permanent increase in the rate of money growth would permanently lower the real interest rate. Because of this, nominal interest rates would not rise one-for-one with increases in money growth, and superneutrality would be violated. This is an important consideration for Lucas' second set of scatterplots which are not replicated in this paper. The Mundell-Tobin effect does not bear on long-run

neutrality, however, and Whiteman confirmed this by showing that when $\langle m \rangle = \langle p \rangle \geq 1$, the long-run derivative would equal unity in his model regardless of the Mundell-Tobin effect. Whiteman's critique of Lucas (1980), although valid, does not impinge on the first part of Lucas' analysis or on the analysis here, both of which focus on long-run neutrality.

RESULTS

In this section, the filter is applied to all three series as described above, giving the maintained relationship as $\Delta P_t(\beta) = \alpha + \Delta M_t(\beta) - \Delta Y_t(\beta)$. If the filtered inflation data is plotted against the difference between filtered money growth and filtered output growth, the form of the quantity theory used here predicts that the data will lie on a 45-degree line with intercept α .¹⁴ The output measure employed is real gross domestic product.¹⁵ Two inflation measures are used: the consumer price index and the gross domestic product deflator. Along with 19 measures of money, this yields 38 illustrations of the quantity theory. The measures of money range from the very narrow to the very broad. These series are all available over the entire sample period of 1960-92. These years keep all measures on equal footing: although some measures could be taken further into the past, any comparisons among monetary aggregates would then be blurred.¹⁶

The results can be summarized in a number of ways. Lucas' (1980) method simply involves a graphical interpretation in which the data is plotted and examined to see if it appears to lie plausibly on a 45-degree line. A few selected plots of this type are shown in Figures 5 through 8. One of the main results of this paper is that, broadly speaking, these plots provide illustrations of the quantity theory in that higher inflation is associated with higher money growth regardless of the particular measure of money used.¹⁷ In this sense, the results are

¹²Fisher and Seater (1993) also argue that the LRD interpretation holds if $\langle m \rangle = \langle p \rangle = 2$ and Δm and Δp are co-integrated.

¹³See, for instance, King and Watson (1992).

¹⁴Plots of this type differ somewhat from those found in Lucas (1980, 1987) in that the real output growth rate is also filtered; in the previous work, the output growth rate was set equal to the average output growth rate over the sample period.

¹⁵Replacing actual output with potential output produces qualitatively unchanged results. Here, actual output is used to maintain comparability with Lucas (1980, 1987).

¹⁶The measures of money used are adjusted reserves, total reserves, nonborrowed reserves, currency, adjusted monetary base (St. Louis), adjusted monetary base (Board of Governors), Divisia M1A, M1A, Divisia M1, M1, Divisia M2, M2, non-M1 components of M2, Divisia M3, M3, the non-M2 components of M3, Divisia L, L, and the non-M3 components of L. Barnett, Fisher and Serletis (1992) provide a survey of the construction and use of Divisia aggregates, a topic beyond the scope of this paper.

¹⁷Plots using the CPI as the measure of inflation are qualitatively similar.

Figure 5
Monetary Base (Board Series)
with GDP Deflator

Filtered inflation

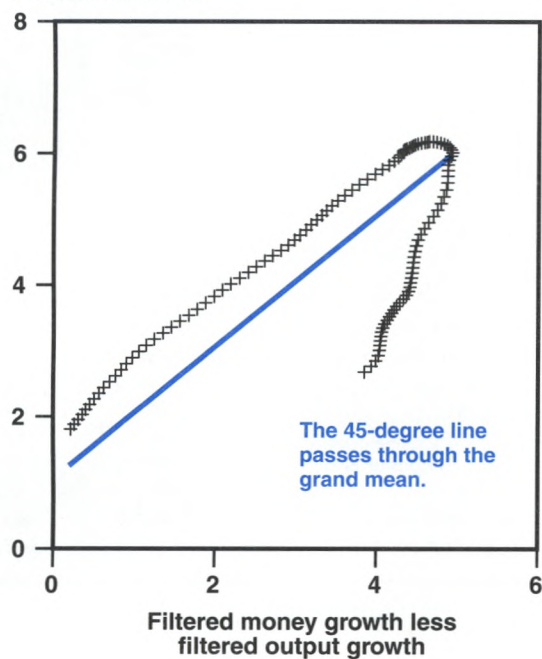


Figure 6
M1 with GDP Deflator

Filtered inflation

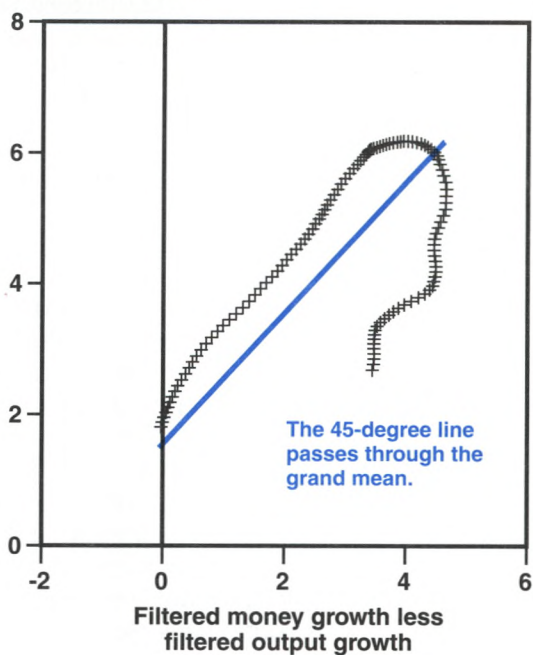


Figure 7
M2 with GDP Deflator

Filtered inflation

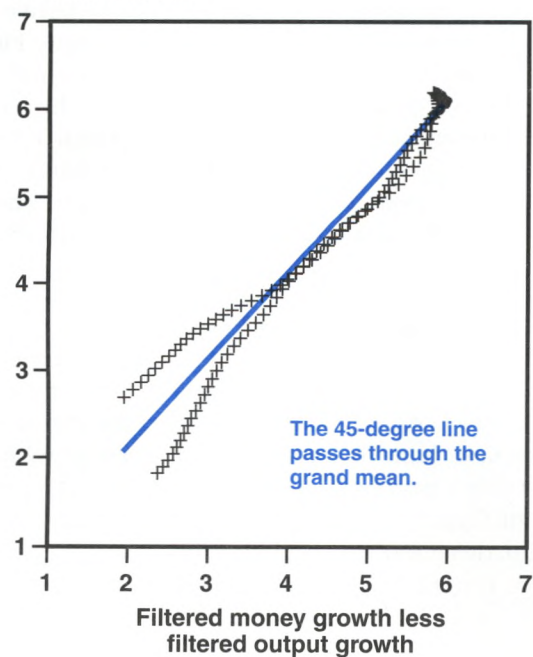
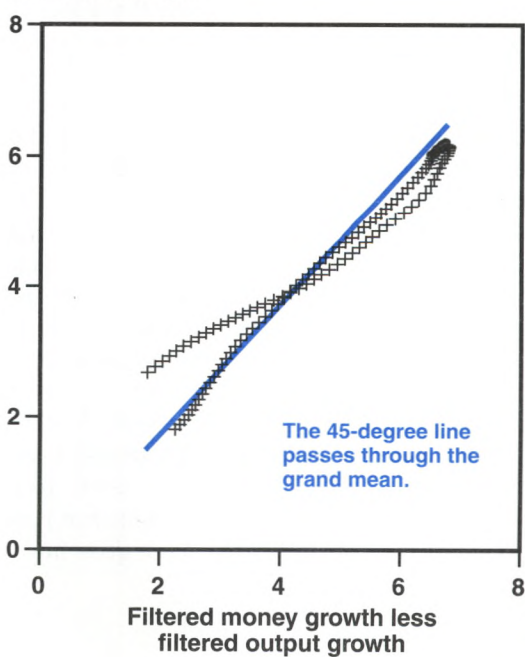


Figure 8
L with GDP Deflator

Filtered inflation



consistent with those provided by Lucas even when the data from the last 17 years are included, years that are known for being rocky from the point of view of reliable empirical relationships involving monetary aggregates. The results are particularly striking if the measure of money is broad, such as M2 (Figure 7), M3 or L (Figure 8). Narrower measures, such as the monetary base (Figure 5) or M1 (Figure 6), tend not to provide as convincing an illustration.¹⁸

The results can be summarized more quantitatively by computing the mean-square error (MSE) from the 45-degree line that passes through the grand mean of the filtered data. This amounts to measuring the distance of the filtered data from a fitted regression line where the slope is forced to unity. Table 1 summarizes the results using all measures of money and inflation based on an MSE criterion. In the table, the results are presented in order from the lowest MSE to the highest when the measure of inflation is the deflator, but the results are also presented for the case where the CPI is the inflation measure. The MSE is the lowest when the measure of money is broad, with aggregates like M2, M3 and L and their Divisia counterparts provide the best performance.

The data in Figures 5 through 8 can be viewed as representing the coherence between long-run movements in inflation and long-run movements in money growth. That is, when the pace of monetary expansion is increasing, the quantity theory suggests that the rate of inflation should be increasing as well, again, in the special long-run sense used in this paper. Thus, regardless of the relationship to a 45-degree line that passes through the mean of the data, one would like to know if the data is moving in the "right direction"—along a line with slope one—most of the time. It may be, for instance, that the relationship between some measure of money and inflation is subjected to an occasional shift during the sample period. The filtered data in such a case might normally plot along a 45-degree line except for brief interludes corresponding to the occasional shifts. Thus, it may be useful to consider a coherence measure that does not require the data to stay on the same 45-degree line at all times in order to do well.

Table 1
Mean-Square Error Criterion

Measure	MSE	
	Deflator	CPI
M2	10.1	24.9
Divisia L	19.8	37.5
L	19.8	22.8
Divisia M3	27.3	53.9
Divisia M2	27.6	50.0
M3	36.1	52.7
Currency	90.2	68.8
Adjusted monetary base STL	96.0	81.4
Non-M1 components of M2	97.2	136.4
M1A	105.5	130.7
Divisia M1A	112.3	130.8
Adjusted monetary base BOG	119.2	98.6
Adjusted reserves	126.9	131.9
Divisia M1	135.8	117.5
M1	162.9	141.7
Non-M3 components of L	255.9	194.4
Total reserves	383.3	362.0
Nonborrowed reserves	462.7	437.8
Non-M2 components of M3	4233.3	4475.9

One way to measure coherence of this type is to proceed as follows. First, construct a line between each pair of adjacent filtered data points. Second, measure the angles in radians between the constructed lines and a 45-degree line. Finally, square each radian measure and sum across all data points to obtain a measure of coherence. This coherence measure has a maximum value which occurs when each constructed line is exactly perpendicular to the 45-degree line. The results according to a coherence criterion are presented in Table 2, and rankings are again computed using the deflator as the measure of inflation. The broad simple-sum measures M2, M3 and L again do well, but currency, base measures and the non-M1 components of M2 also fare well. The results concerning the monetary base (and to some extent currency, which is a large portion of the base) can be inferred from Figure 5. The base certainly moves in the right direction much of the time, as the coherence criterion requires, even though the plotted

¹⁸In the charts, the grand mean is the mean of all the plotted pairs of filtered money and filtered inflation.

Table 2
Coherence Criterion

Measure	Squared radians	
	Deflator	CPI
L	12.3	8.1
Currency	20.5	15.5
M3	23.2	17.5
Non-M1 components of M2	24.7	36.9
Adjusted monetary base BOG	26.0	20.5
M2	26.6	23.7
Adjusted monetary base STL	27.5	22.2
Divisia M3	30.1	44.6
Non-M3 components of L	30.4	25.5
Divisia M2	31.5	44.1
Divisia L	32.5	46.0
Divisia M1	35.1	29.4
M1	37.4	31.6
Adjusted reserves	63.2	57.7
M1A	75.5	82.3
Divisia M1A	76.8	82.4
Total reserves	80.6	75.5
Nonborrowed reserves	88.6	87.6
Non-M2 components of M3	90.9	92.8

Table 3
Long-Run Derivative

Measure	LRD	
	Deflator	CPI
M2	0.99	1.08
Divisia M1A	1.08	1.27
Adjusted reserves	0.83	1.02
L	0.80	0.88
M3	0.78	0.84
Divisia M3	1.24	1.32
Divisia L	1.25	1.37
Adjusted monetary base STL	0.75	0.90
Divisia M2	1.28	1.39
Currency	0.71	0.85
Non-M1 components of M2	0.68	0.70
Adjusted monetary base BOG	0.66	0.80
Divisia M1	0.64	0.78
M1A	1.38	1.58
M1	0.57	0.71
Non-M3 components of L	0.45	0.54
Total reserves	0.22	0.32
Nonborrowed reserves	0.16	0.25
Non-M2 components of M3	0.01	-0.01

data is rarely on the 45-degree line that passes through the grand mean.

Finally, the results can be summarized according to the estimate of the long-run derivative as defined by Fisher and Seater (1993), that is, by the slope of an ordinary least-squares line fitted to the filtered data. This time, both the slope and intercept are estimated, instead of forcing the slope to unity as in the MSE criterion. The main concern is whether the estimated slope is close to 1. As a simple metric, the squared difference between the estimated slope and unity is used as the measure of how close the estimated long-run derivative is to 1. In Table 3, the results are shown ranked according to this metric when the measure of inflation is the deflator. The table shows the estimated slope coefficient, instead of the squared difference between this coefficient and 1. Again, the broad aggregates and their Divisia counterparts tend to rank in the top half. In this case, Divisia M1A and adjusted reserves also perform well.

SUMMARY

The results presented in this paper are generally supportive of a quantity theoretic proposition that has been difficult for economists to investigate satisfactorily using time series data from a single country. The proposition is that money is long-run neutral. By using a certain filter suggested by Lucas (1980), a long-run signal can be extracted from time series data, and filtered data on money growth and inflation can be examined to see if it conforms to quantity theoretic predictions. When broad measures of money are used, such as M2, M3 and L, striking illustrations of the quantity theory are obtained. These results can be verified using either Lucas' original graphical procedure or by using alternative goodness-of-fit criteria. The results have some statistical basis in the sense that they can be described within the framework for testing neutrality and superneutrality propositions recently worked out by Fisher and Seater (1993).

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Financial Innovation, Deregulation and the "Credit View" of Monetary Policy

IT IS GENERALLY ACKNOWLEDGED that monetary policy affects real economic activity in the short run and inflation or the price level in the long run, but much less of a consensus exists on exactly how monetary policy affects output and prices. The possibility that monetary policy affects the economy through credit channels has received considerable attention lately.

Two distinct credit channels for monetary policy have been described.¹ Both of these channels are based on lending problems associated with asymmetric information and control.² The cost of acquiring information and controlling borrower's behavior drives a wedge between the cost of internal and external finance. For

some borrowers the premium for external finance is so large that it is impractical for them to obtain funds in impersonal financial markets. Depository financial intermediaries (hereafter, banks), reduce the wedge by specializing in acquiring information about and assessing the risk characteristics of such borrowers.³

One broad credit channel has been called the "excess sensitivity hypothesis" by Gertler and Gilchrist (1993b). According to this hypothesis, monetary policy actions induce changes in interest rates and prices that are propagated through their effect on borrowers' balance sheets.⁴ For example, restrictive monetary policy may reduce the net worth of borrowers, causing the premi-

¹These channels have been discussed by a number of writers. Bernanke (1993) and Gertler and Gilchrist (1993b) are two of the more accessible.

²Information asymmetry gives rise to two important principal-agent problems, adverse selection and moral hazard.

³For evidence that banks and other financial intermediaries mitigate the problems associated with asymmetric information, see James (1987); Gilson, Stuart and Lang (1990); Hoshi, Kashyap and Scharfstein (1990, 1991); and Slovin, Sushka and Polonchek (1993). For evidence that shocks to bank capital are due to changes in regulations or adverse changes in the economy, see Baer and McElravey (1993) and Calomiris (1993).

Unless it is explicitly stated otherwise, the word bank is used in this article to denote the four traditional depository financial intermediaries: commercial banks, savings and loan associations, mutual savings banks and credit unions. The last three are jointly referred to as "thrifts."

⁴Monetary policy is propagated through changes in net worth or cash flow that alter the size of the external finance premium. For evidence that investment is sensitive to balance sheet and cash flow consideration, see Fazzari, Hubbard and Peterson (1988); Oliner and Rudebusch (1992); and Calomiris and Hubbard (1993).

ums that small borrowers must pay for external finance to rise. Gertler and Gilchrist point out that this credit channel is operative "even if the central bank has no direct leverage over the flow of bank credit."⁵ An alternative credit channel, called the "credit view" of monetary policy by Bernanke and Blinder (1988), Bernanke (1993) and Gertler and Gilchrist (1993b), requires monetary policy actions to have a direct effect on bank lending.

This article outlines the credit view of monetary policy and points out that the conditions that are necessary for it are stringent. Consequently, there is reason to doubt whether the bank lending channel of monetary policy has ever been empirically significant. This article, however, does not attempt to evaluate whether the bank credit channel of monetary policy ever existed. Rather, it points out that financial innovation and deregulation have altered the structure of financial markets in ways that should have weakened the bank credit channel of monetary policy over time. In addition, it points out that the bank credit channel of monetary policy should have been further diminished by the Monetary Control Act of 1980 and subsequent changes in the structure of Federal Reserve reserve requirements that have significantly weakened the link between monetary policy actions and bank lending. Finally, the article presents evidence which suggests a weak and deteriorating relationship between Federal Reserve actions and the supply of bank credit.

WHAT IS "THE CREDIT VIEW?"

The credit view of monetary policy is part of a much broader literature on the role of credit in the macroeconomy. Several recent papers

(Bernanke and Blinder, 1988; Bernanke 1993; Gertler and Gilchrist, 1993b; and Kashyap, Stein and Wilcox, 1993) have defined the credit view more precisely within this broader framework. It is now generally understood that the credit view is the idea that monetary policy actions not only affect the economy through their effect on the liability side of banks' balance sheets, that is, by affecting the quantity of money, but also through their direct effect on bank lending.

In this literature, the "monetary view" of monetary policy tends to be rather narrowly focused on interest rates.⁶ Proponents of the credit view argue that even under extreme conditions where either interest rates do not respond to monetary policy actions or where spending is unresponsive to changes in interest rates, monetary policy actions affect the economy because of their direct effect on bank loans.⁷

Consequently, proponents of the credit view believe that the effects of monetary policy actions on the economy are larger than those that can be attributed to the effect of monetary policy actions on interest rates alone. For a separate bank credit channel for monetary policy to exist, it is generally acknowledged that two necessary conditions must be satisfied: Bank lending must be special and monetary policy actions must affect bank lending.⁸

Bank Lending Must Be "Special"

For bank lending to be special, banks must play a special role in the credit market, in that they make loans to a particular class of borrowers who find it difficult (very costly) or impossible (prohibitively costly) to obtain credit from other sources.⁹ This has been characterized

⁵Gertler and Gilchrist (1993b, p. 7), emphasis added.

⁶More generally, the monetary view of monetary policy is associated with the effects of policy actions on the supply of money and the subsequent effect of the change in the supply of money on the economy through a number of channels. Two important papers on the monetary transmission mechanism are Brunner and Meltzer (1976) and Stein (1976).

⁷The clearest statement of this is Bernanke (1993, pp. 55–57). Bernanke summarizes the distinction between the credit and monetary views by stating, "In a nutshell, the credit view asserts that in addition to affecting short-term interest rates, monetary policy affects aggregate demand by affecting the availability or terms of new bank loans" (p. 56).

⁸For example, see Bernanke (1993), Gertler and Gilchrist (1993b), and Kashyap and Stein (1993).

⁹The credit view should not be confused with "credit rationing," the idea that banks limit the availability of credit regardless of price. Several authors (for example, Bernanke, 1993; Bernanke and Blinder, 1988; Gertler and Gilchrist, 1993b; Kashyap and Stein, 1993; and Friedman and Kuttner, 1993) have pointed out that credit rationing is not essential for the credit view. In credit rationing models, individuals who are willing and able to pay the market interest rate are constrained from obtaining credit. In credit view models, this is not necessarily the case. All markets may clear. Friedman and Kuttner (1993, p. 14) note, "The fact that credit view models *can* encompass market non-clearing does mean that they necessarily do so, however, and on this point, too, substantial confusion exists."

(Bernanke and Blinder, 1988; and Bernanke, 1993) as the condition that bank loans and other credit are not perfect substitutes to either borrowers or lenders. That lenders are unwilling to make the same loans to all borrowers is plausible.¹⁰ Discontinuities associated with the size of transactions, costs associated with monitoring and controlling the behavior of borrowers, information costs and reputation may make it difficult, if not impossible, for some borrowers to raise funds in the open markets.¹¹ Indeed, it can be argued that banks and other nonbank financial intermediaries exist because of such credit market "imperfections." Banks have traditionally filled this void by specializing in gathering information and assessing the risk characteristics of such borrowers. They close the intermediation process by obtaining funds from individuals (bank depositors), some of whom have imperfect access to market-based liquid forms of savings.

Policy Actions Affect Bank Lending

The second necessary condition is that monetary policy actions have a direct effect on the supply of bank loans. The potential for a direct relationship between bank lending and policy actions arises from the fact that the Federal Reserve imposes legal reserve requirements on bank deposits.¹² Consequently, an open market operation that increases the quantity of reserves and bank deposits means that, other things being the same, banks have more funds to make more loans.

Care must be taken, however, to avoid the credit-view tautology. Other things being the same, an open market purchase of securities by

the Federal Reserve must raise bank assets and liabilities by an equal amount.¹³ If bank loans rise proportionately with other bank assets, the effect of policy actions on the supply of bank loans is tautological. The issue of whether bank credit is a separate channel for monetary policy deals with the broader question of whether policy actions induce a larger change in the *total* quantity of credit than that associated with the open market operation alone. Alternatively, the credit view deals with the question of whether Federal Reserve actions can alter the spread between the bank lending rate and open market interest rates.

An Illustration of the Role of the Specialness of Bank Lending to the Credit View of Monetary Policy

The credit view of monetary policy is made clear by two cases: one in which there is no separate credit channel for monetary policy because borrowers are free to obtain credit either from banks or in the open market, and one in which the access of bank borrowers to the open market is limited.

Figure 1 illustrates the effect of Federal Reserve actions on the supplies of bank and nonbank credit when lenders are indifferent to whom they supply credit. The banks' credit supply curve is vertical under the assumption that the supply of bank credit is totally determined by their deposit liabilities which, in turn, are assumed to be determined by the quantity of reserves supplied by the Federal Reserve.

Under these assumptions, an open market sale of government securities by the Federal Reserve reduces the supply of bank credit and, thereby,

¹⁰There is evidence that many small and medium-size firms do not have the same access to credit markets as large, well-known firms. This does not necessarily imply that the credit view is correct, however. For example, much of the empirical evidence—Gertler and Gilchrist (1993a, b), Bernanke and Lown (1992), and Oliner and Rudebusch (1993)—suggests that the important distinction is between "large" and "small" firms rather than between bank-dependent and nonbank-dependent firms. Consequently, while monetary policy may not operate directly through the credit channel, for a variety of reasons, small firms may be affected more by monetary policy actions than large firms.

¹¹For these, and perhaps others, the loan market is not completely impersonal. For example, borrowers may not be indifferent from whom they borrow—even under identical terms—if they believe that establishing a relationship with a particular lender will reduce their future search costs.

¹²The relationship is pointed out in Bernanke and Blinder (1992), Gertler and Gilchrist (1993b), Kashyap and Stein (1993), Romer and Romer (1990) and Lebow (1993). In the absence of deposit insurance, banks would hold "reserves" in the form of cash and highly liquid assets even if there were no statutory reserve requirements. The extent of the relationship between policy actions and bank lending under such a voluntary reserve system is an empirical issue.

¹³Assuming, of course, no immediate effect on bank capital.

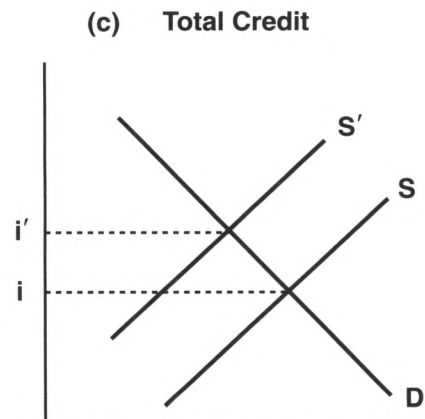
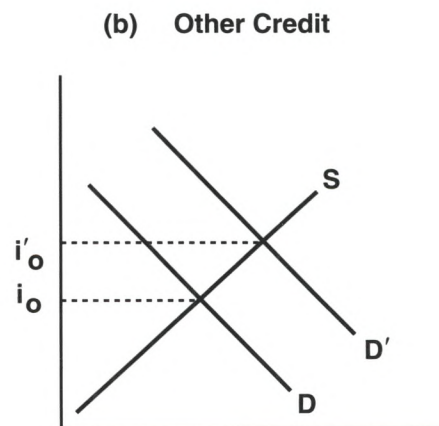
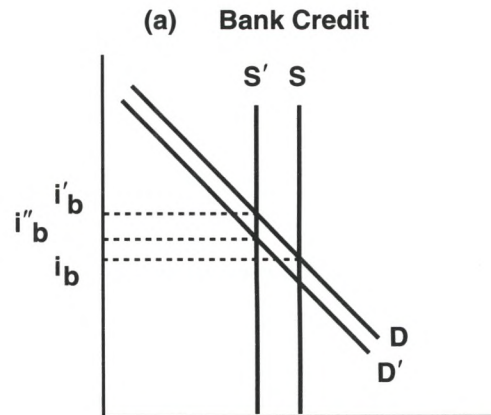
total credit. This is shown as a leftward shift in the banks' credit and total credit supply curves in Figure 1, panels a and c, respectively. The reduction in the supply of bank credit initially raises banks' lending rate relative to the rate on alternative sources of credit, from i_b to i'_b . As some borrowers go elsewhere, the demand for other credit increases and the demand for bank credit falls. This is illustrated by a rightward shift in the other credit demand curve in Figure 1, panel b, and a leftward shift in the demand for bank credit in panel a. Eventually, a new equilibrium is achieved, where once again bank rates and other rates are equal.

Federal Reserve actions fell disproportionately on bank credit, as the rise in interest rates resulted in an increase in the equilibrium level of other credit. Nevertheless, there was no separate bank credit channel for monetary policy. The decline in the supply of bank credit merely induced bank borrowers to go elsewhere.¹⁴ The change in the total quantity of credit is equal to the decrease in bank credit plus the increase in private credit induced by the rise in interest rates.

Imperfect Substitution

Now assume that some bank borrowers do not have access to alternative forms of credit. The fact that bank credit and other credit are not perfect substitutes requires this illustration to begin from an equilibrium in which the rate on bank loans is above the rate on other credit.¹⁵ In this case, the same policy-induced decline in

Figure 1



¹⁴Kashyap, Stein and Wilcox (1993) claim that the identification problem that arises in this literature can be circumvented by seeing whether policy actions affect the credit MIX, the ratio of bank loans to commercial paper. The idea is that if monetary policy affects the market in general and does not operate through the credit channel, there should be no correlation between the policy variables and the MIX variable. On the other hand, if monetary policy works through this credit channel, there should be a positive correlation between these variables. This illustration, however, shows an example in which there is no unique role for monetary policy through its effect on bank credit, yet monetary policy actions and the MIX variable are positively correlated.

¹⁵The fact that the rates on bank loans are generally higher than the rates on government securities and other credit is not sufficient for the credit view. Loans, securities, bank debt and other debt are not equally risky, so neither banks nor the market will be indifferent about their portfolio structures. The rates paid on each form of debt will differ by a risk premium that reflects both the banks' and the market's perception of their respective risk characteristics, including differences in the liquidity characteristics of the various assets.

the quantity of bank credit is associated with a smaller increase in the demand for other credit, as illustrated in Figure 2, as not all bank borrowers can obtain credit in the market. Consequently, when the new equilibrium is established, the bank loan rate will have risen relative to the rate on other credit.

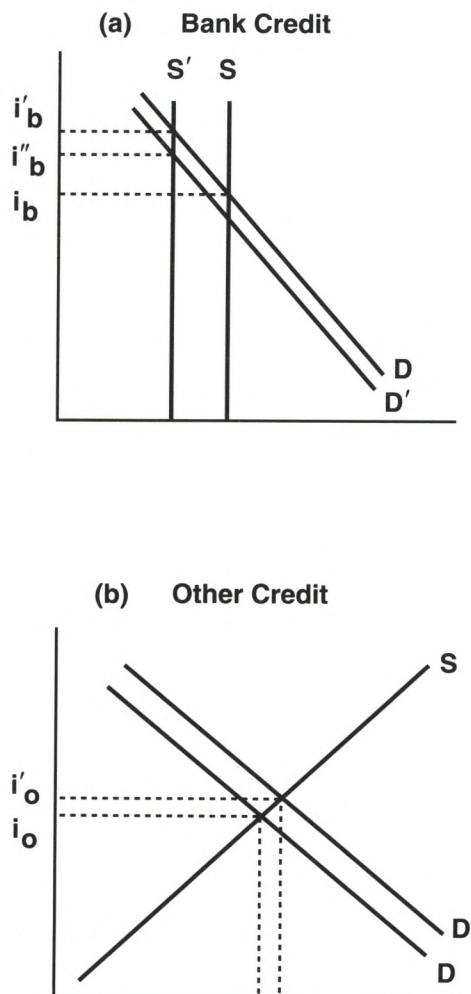
The effects of monetary policy in this case differ from the previous one in two critical respects. First, the restrictive policy action causes the equilibrium bank rate to rise relative to other rates. This means that if there is a separate credit channel for monetary policy, monetary policy actions would affect the spread between bank lending rates and rates on other forms of credit.¹⁶

Second, the change in the total quantity of credit is larger than in the previous case. This is most easily seen by noting that in the extreme case where none of the banks' customers can access the other credit market, there would be no mitigating effect of the open market operation on total credit resulting from a rise in the interest rate in the other credit market.¹⁷ Note that the effect of monetary policy actions on total credit will be larger, the smaller the proportion of bank borrowers who have access to other credit sources.

Arbitrage

In the above analysis, the Fed's ability to alter the spread between bank lending rates and other rates depended critically on the assumption that some bank borrowers were unable to obtain credit in the open market. Less obvious is the results' dependence on the implicit re-

Figure 2



¹⁶This implication of the credit view is widely recognized in the literature, for example, Bernanke (1993), Kuttner (1992) and Romer and Romer (1993). Bernanke (1993) argues that this approach to testing for the empirical significance of the credit view has not been pursued widely because of problems associated with measuring the "true" price of bank loans. Nonetheless, Kuttner (1992) and Romer and Romer (1993) have looked at this issue using the spread between the prime rate and the commercial paper rate. Kuttner finds that the evidence does not support the credit view, while Romer and Romer find evidence supporting the credit view.

¹⁷The outcome is actually more complicated than this simple illustration suggests because in reality it is the banks' depositors, not the bank, who are making the loan to the banks' loan customers. The bank is simply an intermediary to the transaction. This means that some of the depositors of banks are forced to move funds into other assets. Hence, eventually the effect of an open market operation on the total supply of credit must be limited to the extent of the open-market operation.

striction that banks themselves cannot arbitrage the spread between the bank loan rate and market interest rates.

It is important to recognize that banks do not create credit, they merely allocate it. Banks are financial intermediaries. They acquire funds, primarily from depositors, and lend these funds to others in such a way as to maximize profits. Consequently, as the bank loan rate rises relative to other rates banks have an incentive to arbitrage the larger rate differential by inducing

more depositors to, in effect, make more bank loans.

Suppose that the banking industry is competitive so that individual banks are powerless to influence the rates paid on either bank loans or other earning assets like government securities.¹⁸ Further assume that banks can access other credit markets by issuing debt (that is, deposits) against themselves that is a substitute for other market debt. Now assume that restrictive monetary policy actions reduce the supply of bank credit, causing the rate on bank loans to rise relative to other rates as before. Individually, banks would have an incentive to borrow more from the private credit market to make more bank loans. Banks would raise the rates that they pay depositors to induce more private creditors to intermediate credit through banks.

Generally speaking, if the banking system is competitive and banks are as creditworthy as other debtors, the supply of bank credit will rise and the supply of other credit will fall until the rate differentials once again reflect the banks' and the market's perception of the differential risk. Consequently, if banks are free to arbitrage the interest rate differential, monetary policy actions will not be able to alter the spread between bank loan rates and open market interest rates, and there will be no separate bank credit channel for monetary policy.¹⁹

Monetary Policy Actions and the Supply of Bank Credit

The critical issue is whether the banking system as a whole will be able to arbitrage the wider rate differential if the Federal Reserve controls the total quantity of reserves and, hence, bank loans, as was assumed in Figures 1 and 2. The credit view of monetary policy depends critically on the relationship between monetary policy actions and bank lending, and is weakened by the extent to which banks have

access to funds that are not affected by the Fed's actions. This section considers the extent to which Federal Reserve actions influence bank lending and how financial innovation, deregulation and changes in the structure of reserve requirements have altered the Fed's ability to influence bank lending.

The Federal Reserve directly influences the supply of bank loans through its system of reserve requirements. The relationship is identical to that which allows the Federal Reserve to exercise direct control over the supply of money.²⁰ An open market sale of government securities by the Fed reduces the supply of reserves. Because of reserve requirements, banks as a whole are forced to reduce their deposit liabilities. As banks' liabilities contract, other things being the same, so too do bank assets, including loans. The crucial issue, however, is the extent to which reserve requirements impose limits on the ability of banks to make loans.

The Federal Reserve can completely control the supply of bank loans, as assumed in Figures 1 and 2, only if uniform reserve requirements are imposed on all sources of bank funds. If this were the case, an open market purchase of government securities would cause banks to reduce both their liabilities and assets equally. If banks reduced their loans, loan rates would rise relative to open market rates. Individually, banks would have an incentive to arbitrage this interest rate differential by creating deposit liabilities against themselves. Banks as a whole, however, would not be able to increase their deposit liabilities because of the Federal Reserve's control over the total quantity of reserves.

In reality, reserve requirements have never been this stringent. Reserve requirements have never applied to all bank sources of funds, nor have they been uniform across all banks or all deposit liabilities. The fact that reserve requirements have varied across classes of deposits and

¹⁸That banks have some degree of market power does not alter this conclusion.

¹⁹This does not, however, rule out the possibility that monetary policy actions have an *indirect* effect on the rate differential. For example, if monetary policy actions affect economic activity, this could raise the rate on bank loans relative to open market rates by increasing the likelihood of default by bank-dependent borrowers relative to other borrowers. This effect might be considered as part of a broader role for credit in the propagation mechanism of monetary policy influences to the economy. For example, see Gertler and Gilchrist (1993b, c) and Bernanke (1993).

²⁰For recent discussions of this process, see Garfinkel and Thornton (1991) and Thornton (1992).

institutions means that the effect of a given open market operation on total bank loans can vary, perhaps widely, with the distribution of deposits.²¹

In addition, there is the possibility of substitution on the asset side of banks' balance sheets. Banks may choose to alter loans and securities proportionately or may simply absorb the entire effect of policy actions in their holdings of securities. Indeed, banks would tend to substitute away from government securities to bank loans as bank loan rates rise relative to the rates on securities, dampening the effect of restrictive monetary policy actions on bank loans. The magnitude of this effect, however, is uncertain. Moreover, if restrictive policy actions affect output, they could increase the default risk of bank borrowers relative to that of the government, inducing banks to shift their portfolios in the direction of government securities.²²

Nevertheless, the ability of banks to alter their asset portfolios may be particularly relevant for counter-cyclical monetary policy. For example, if reserve growth accelerates sharply after the economy is already in recession and loan demand is weak, as in the early 1990s, banks may be content merely to increase their holdings of securities; policy actions may have little effect on the quantity of bank loans.²³

Finally, as the differential between bank lending rates and other open market rates widens, banks would have an incentive to seek funds that are not subject to reserve requirements. In addition, nonbank financial intermediaries would have an incentive to increase their loans to traditional, bank-dependent borrowers. The extent to which these possibilities have led to financial innovation and deregulation is difficult to say. Nevertheless, financial innovation and deregulation appear to have lessened the extent to which bank lending is special and have sig-

nificantly weakened the Federal Reserve's ability to influence bank lending through open market operations.

FINANCIAL INNOVATION

Increasingly, banks have had to compete with nonbank financial intermediaries for loan customers. Moreover, banks' access to financial markets has increased significantly, resulting in an increasing proportion of bank funds coming from sources that are not affected directly by Federal Reserve actions. In addition, the phasing out and eventual elimination of Regulation Q interest rate ceilings in 1986 enabled banks to compete with nonbank financial intermediaries for such funds. An analysis of such changes in the structure of financial markets, coupled with changes in the structure of reserve requirements, suggests that the so-called bank credit channel of monetary policy may no longer be relevant empirically, if it ever was.

The Specialness of Bank Credit

Financial innovation and deregulation have widened the array of financing options available to many small and medium-size firms, reducing their dependency on banks. Changes in technology and the structure of financial markets have reduced the information and monitoring costs associated with making loans to many businesses, increasing many firms' direct access to financial markets and nonbank sources of funds.

Access of a wider array of firms to the commercial paper market and the rise in business lending by domestic finance companies have significantly reduced the specialness of bank credit.²⁴ Meanwhile, financial innovation has all but eliminated the specialness of bank credit for a wide array of other types of bank borrowers. Banks now face stiff competition from nonbank

²¹Such slippage has been long recognized as a problem for monetary control. Indeed, one objective of the Monetary Control Act of 1980 was to reduce the sources of slippage between Federal Reserve actions and the M1 monetary aggregate (see Garfinkel and Thornton, 1989, for a discussion of these changes). While the Monetary Control Act strengthened the relationship between policy actions and M1, it significantly weakened the relationship between policy actions and M2 [see Thornton (1992)] and the supply of bank loans. The reasons for this will be apparent later.

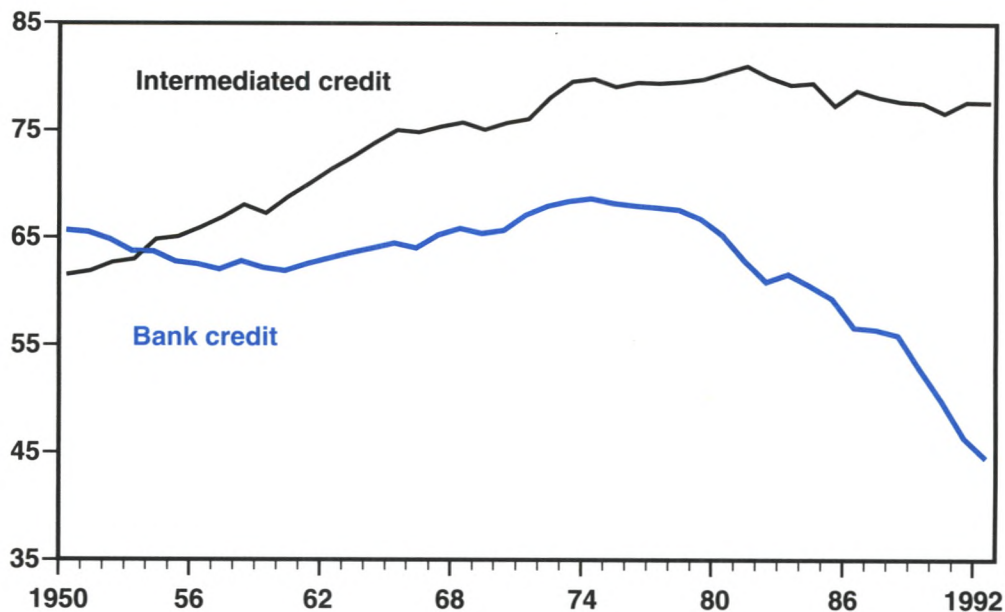
²²This could bias empirical tests in favor of finding a significantly positive relationship between monetary policy actions and bank loans.

²³Bernanke and Lown (1991) suggest that if banks respond to an easier monetary policy by simply holding more government securities, "the 'credit channel' of monetary policy will be shut down, and the real effects of a given monetary expansion will be smaller." This assumes, of course, that those desiring bank loans will be unable to obtain credit elsewhere.

²⁴See Wheelock (1993) for a discussion of these and other developments.

Figure 3

Credit Issued by Financial Intermediaries as a Percent of Total Domestic Credit, and Credit of Banks as a Percent of Credit of Financial Intermediaries



intermediaries in consumer finance and both residential and commercial real estate finance.²⁵

Moreover, loans are frequently securitized. That is, they are combined with similar loans from a wide variety of such borrowers to diversify the default risk. Shares in such pools of loans are sold as securities in financial markets. In effect, such borrowers have direct access to the credit market. Banks often facilitate the process by initiating the loans and servicing the loan contracts, but they are not the source of the credit.

That such financial market innovations have reduced the role of financial intermediaries in the allocation of credit is illustrated in Figure 3, which shows that the proportion of total domes-

tic non-financial credit on the balance sheets of financial intermediaries has declined since the early 1980s.²⁶ This decline roughly coincides with the sharp rise in the commercial paper market.²⁷

More important for the credit view, however, has been the decline in the proportion of intermediated credit accounted for by banks. The banks' proportion of intermediated credit generally rose until the mid-1970s, to a peak near 70 percent. Since then, it has declined dramatically—nearly 25 percentage points—and now accounts for only about 45 percent of the total intermediated credit.

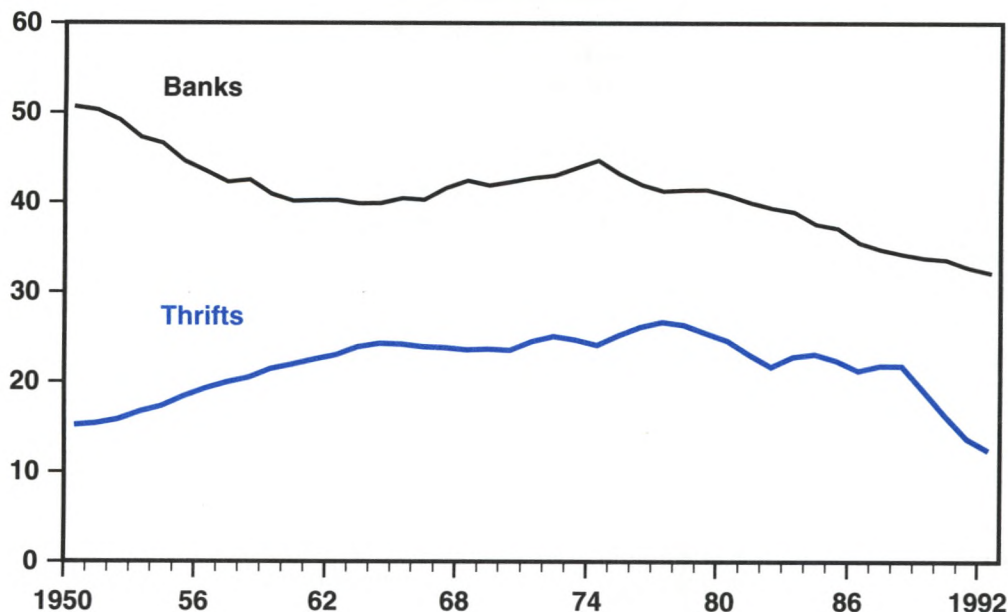
The proportions of intermediated credit supplied by commercial banks and thrifts is shown

²⁵For evidence on the changing role of finance companies and banks in the allocation of credit, and for an analysis of the importance of costly information in lending, see Remolona and Wulfekuhler (1992).

²⁶Financial intermediaries include the four depository institutions plus finance companies, pension funds and life insurance companies.

²⁷In addition, there has been increased competition from foreign banks. By 1989, foreign commercial banks accounted for about 20 percent of total U.S. commercial bank assets.

Figure 4
Credit Issued by Commercial Banks and by Thrifts as a Percent of All Credit Issued by Financial Intermediaries



in Figure 4. Both have declined in the last decade or so, with the proportion of intermediated credit supplied by commercial banks reaching its peak in the mid-1970s and that of the thrifts peaking in the late 1970s. The latter peak coincides with a sharp acceleration in the growth of money market mutual funds (MMMFs) in the late 1970s.

The increased prominence of nonbank financial intermediaries relative to banks in supplying credit and the increased reliance on obtaining funds directly in the markets, rather than through traditional financial intermediaries, point to a decline in the specialness of bank lending.²⁸

The Supply of Bank Credit

If banks merely satisfied their loan demand by issuing publicly held debt, there would be nothing

unique about bank credit. Nothing would be fundamentally different from a bank making a loan with funds obtained from the sale of large, negotiable certificates of deposit, and a finance company making a loan with funds obtained from the sale of commercial paper. Monetary policy actions would have a similar effect on bank and other credit—there would be no separate bank lending channel for monetary policy.

The credit view of monetary policy is weakened by financial innovation and deregulation that have significantly increased banks' access to financial markets and reduced their dependence on sources of funds that are subject to the reserve requirements of the Federal Reserve.²⁹ Two important innovations were the introduction of large, negotiable certificates of deposit and the development of the Eurodollar market.

²⁸The trend toward increased competition with banks for business loans is likely to continue. See Goodwin (1992) and *American Banker* (1993).

²⁹The increasing recognition of this fact is one reason why some have turned their attention from the credit view per

se to the role of credit market "frictions" in propagating monetary policy impulses. For example, this type of analysis forms the foundation of what Gertler and Gilchrist (1993b, c) call the "excess sensitivity hypothesis."

Negotiable Certificates of Deposit

Citibank introduced the first negotiable certificate of deposit in 1961, to make CDs more liquid and, thus, more attractive to investors. Because of their large denomination—\$100,000 or more—they were frequently purchased by money market investors who otherwise would not have maintained large savings balances with banks. As the popularity of these instruments increased, they became a major source of funds for banks.

These deposits are part of banks' so-called managed liabilities, which banks can tap during periods of increasing loan demand or restrictive monetary policy actions. At such times, banks raised the rate that they paid on large CDs, circumventing the Regulation Q interest rate ceiling on other deposit sources of funds.

Eurodollar Borrowing

The development of the Eurodollar market also provided banks with a new source of non-traditional funds. Eurodollars, dollar-denominated deposits in foreign branches of U.S. banks, initially were not subject to the reserve requirements of the Federal Reserve. Consequently, banks discovered they could obtain funds that were free from reserve requirements and simultaneously circumvent the Fed's Regulation Q interest rate ceilings by borrowing Eurodollars from their foreign branches. Of course, the Fed realized that banks' Eurodollar borrowing circumvented reserve requirements and extended reserve requirements to these liabilities.³⁰

Since Eurodollars and large CDs were subject to reserve requirements, it can be argued that

the total amount of these liabilities were constrained by the Federal Reserve. This conclusion, however, need not be valid. It ignores the possibility that banks change the relative prices of their deposit liabilities in response to changes in credit market conditions. The "price" of deposits includes service fees, minimum and/or average balance requirements and other incentives and inducements, as well as the explicit interest paid.³¹ Because checkable deposits had a higher percentage reserve requirement than that of savings-type deposits, including large CDs and Eurodollar deposits, banks could effectively increase the supply of loans for a given level of reserves by raising the cost of checkable deposits relative to noncheckable deposits. In this way, the total supply of loans could increase without an increase in the supply of reserves.

If the bank loan rate were to rise relative to other rates, individually banks would attempt to attract more funds by making their deposits more attractive. In so doing, they would have an incentive to make savings deposits somewhat more attractive than transaction deposits since they would not only attract new depositors, but also induce existing depositors to switch from checking to savings accounts.

Unfortunately, information about banks' pricing of deposits is scarce, so there is no evidence that banks followed such pricing practices.³² In any event, the possibility that banks could change the relative price of high-reserve-requirement and low-reserve-requirement liabilities could be part of the explanation for the apparent, historically weak association between bank lending and policy actions presented later.

³⁰Banks that were part of a bank holding company found that they could avoid the reserve tax on funds by having the holding company borrow funds directly in the market by issuing commercial paper and by borrowing the funds so obtained from the bank holding company. The Fed saw this loophole and imposed reserve requirements on such funds at the same time it imposed reserve requirements on Eurodollar liabilities.

³¹For a discussion of some of these elements of the pricing of deposits, see Carraro and Thornton (1986).

³²There is evidence that the lack of uniformity of reserve requirements resulted in some considerable slippage between Federal Reserve actions and the monetary aggregates M1 and M2 (for example, see Garfinkel and Thornton, 1989, and Thornton, 1992). Since the argument that Federal Reserve actions exert considerable influence over the supply of bank loans is directly related to the existence of such reserve requirements, the slippage must

be about the same as the slippage between Federal Reserve actions and M2. The fact that about 10 percent of M2 is composed of assets that are not the liabilities of banks makes it difficult to make a stronger statement. If these deposit liabilities are ignored, the slippage between Federal Reserve actions and bank loans must be at least as large as that between Federal Reserve actions and M2. This is so because the fact that banks can also adjust their asset portfolios—and would have an incentive to do so in the way described in the text—means that there is an additional source of slippage in the relationship between Federal Reserve actions and bank loans that is not present in the relationship between Fed actions and M2.

The Rise of Money Market Mutual Funds

A financial innovation that had an even more profound effect on the empirical relevance of the credit view was money market mutual funds (MMMFs).³³ Two factors gave impetus to the creation of MMMFs: the high inflation of the 1970s, which became embedded in market expectations, and the rise of market interest rates to levels much higher than those permitted by Regulation Q interest rate ceilings. The resulting outflow of deposits from banks into MMMFs had two consequences for the credit view.

The first was the decision to eliminate Regulation Q interest rate ceilings on bank deposits. As the high inflation of the 1970s pushed nominal interest rates significantly above those that banks could pay to depositors under Regulation Q interest rate ceilings, banks confronted increased competition for funds by nonbank financial intermediaries, especially MMMFs. As a result, Regulation Q interest rate ceilings were phased out and eventually eliminated (for all but demand deposits) in March 1986. During the phasing out of Regulation Q, several new deposits were introduced, such as all-savers certificates and money market deposit accounts, to permit banks to compete more effectively with nonbank financial intermediaries for funds.³⁴ This meant that an increasing number of banks were now able to compete directly in the market for funds. Previously, only large banks could compete effectively in the large CD, Eurodollar and commercial paper markets.

The increased competition between banks and nonbanks for "traditional" bank sources of funds gave rise to a second change that has had an even more important consequence for the credit view—the elimination of required reserves on sources of funds by which banks were in direct competition with nonbank intermediaries.

The fact that banks were required to hold a percentage of such deposits in non-interest bearing reserves—either vault cash or deposit balances with Federal Reserve Banks—placed them at a competitive disadvantage relative to other, nonbank intermediaries.³⁵ Pressure to eliminate the reserve requirements gave rise to changes in the structure of reserve requirements that have significantly reduced the ability of the Federal Reserve to influence bank credit through open market operations. The discussion of these changes begins with the Monetary Control Act of 1980 (MCA).

The MCA, Changes in Reserve Requirements and the Supply of Bank Credit

The MCA made two changes to the structure of reserve requirements that had opposite effects on the Fed's ability to influence bank lending. On the one hand, the MCA extended the System's reserve requirements to all depository intermediaries, instead of just member commercial banks. This increased the Fed's ability to influence the availability of funds to all banks. On the other hand, the MCA eliminated reserve requirements (on all but demand deposits) on a broad category of time and savings deposits, significantly increasing the proportion of bank deposit liabilities that are not influenced directly by Federal Reserve actions.

Continued pressure to increase the competitive position of banks caused the Fed to eliminate required reserves on the remaining categories of time and savings deposits in December 1990. Today, reserve requirements apply to less than 25 percent of banks' deposit liabilities and less than 20 percent of banks' total sources of loanable funds. Consequently, it should not be too surprising to find that current bank lending is relatively unresponsive to changes in the supply of reserves.

³³MMMFs were introduced in 1970. Their growth, however, was modest until interest rates rose to historically high levels in the late 1970s.

³⁴See Gilbert (1986) for a more detailed discussion of the effects of Regulation Q interest rate ceilings and for a chronology of their eventual elimination.

³⁵It should be pointed out that banks also get various government subsidies in the form of deposit insurance, access to the Fed's discount window, and government regulated oligopoly power in their franchise to issue trans-

action deposits. It is not clear whether the combination of these taxes and subsidies result in a net tax or a net subsidy to banks relative to their nonbank competitors.

EVIDENCE OF THE EFFECT OF FEDERAL RESERVE ACTIONS ON THE SUPPLY OF BANK CREDIT

The credit view of monetary policy is based on a chain of causation from the supply of reserves to the supply of bank loans. The literature on the credit view, however, has not examined the link between the supply of reserves and the supply of bank loans closely. This section investigates the association between bank loans and total reserves adjusted for reserve requirement changes.

Whatever its immediate or long-run objectives, the Fed pursues them through open market operations, changes in reserve requirements and changes in the discount rate. These actions are directly reflected in total reserves. Because of reserve requirements, bank lending and total reserves should be positively related, regardless of whether changes in total reserves represent an exogenous change in monetary policy or whether the Fed is merely accommodating shifts in the demand for deposits subject to reserve requirements.³⁶ Other commonly used measures of monetary policy, like the federal funds rate or policy indicators based upon an examination of Federal Reserve documents, are not necessarily closely related to Federal Reserve actions that affect the availability of bank loans.³⁷ Consequently, they cannot necessarily provide evidence about the relationship between the supply of reserves and bank lending.

The availability of reserves can be affected by the actions of the public, however. For example, if the demand for currency were to rise, other things being the same, the availability of reserves to the banking system would decline. Consequently, an increase in the public's demand for currency would have the same effect on bank

liabilities and lending as an equivalent sale of government securities by the Federal Reserve.

The Federal Reserve's operating procedures, however, have tended to automatically accommodate such shifts.³⁸ The Fed supplies additional reserves to offset the reserve drain when the demand for currency increases. The reverse is true when the demand for currency decreases. Total reserves change only when the Fed takes actions other than those required to accommodate swings in currency demand. Thus, total reserves adjusted for changes in reserve requirements is a good indicator of Federal Reserve actions that affect banks' balance sheets.

Interpreting the Relationship Between Total Reserves and Bank Lending

Finding that reserves and bank lending are unrelated would suggest that there is no credit channel for monetary policy. Finding that reserves and bank lending are highly and positively associated, on the other hand, does not ipso facto mean the credit view is valid. The problem is that bank loans and total reserves may respond endogenously to the same shocks. For example, suppose there is a decline in economic activity and with it, a decline in the demand for liquid deposits, nominal interest rates and credit demand. If the Fed accommodates the decline in the demand for liquid deposits by reducing the growth of reserves, reserve growth and loan growth would be positively associated even if there was no direct association between reserves and loans.³⁹

This problem is particularly acute for total reserves because total reserves consist of both borrowed and nonborrowed reserves. Borrowed reserves have tended to respond endogenously

³⁶Some analysts would associate the stance of monetary policy with reserve growth, but this would certainly not be true of all. For example, some believe that the Fed controls the federal funds rate and associate changes in monetary policy with changes in the federal funds rate despite the fact that the funds rate can fall (monetary policy becomes easier) when reserves are declining, for example, the period from April through June 1989. Others prefer to gauge the thrust of monetary policy from the behavior of M2. For example, Friedman (1992) and Buchanan and Fand (1992) argued that monetary policy was excessively tight in 1991-92 because M2 growth was slow and decelerating, despite the fact that reserve growth accelerated sharply during this period and increased at double-digit rates.

³⁷Garfinkel and Thornton (1994) argue that there is no monetary information in the federal funds rate that is not contained in other short-term interest rates.

³⁸This is the case if the Fed is targeting the federal funds rate, nonborrowed reserves or borrowed reserves.

³⁹The Fed's preoccupation with interest rate targeting [see Goodfriend (1991)] would tend to exacerbate this tendency, as the Fed would attempt to put downward pressure on the federal funds rate by reducing the growth of reserves.

to changes in the spread between the federal funds and discount rates. Consequently, borrowed reserves and, hence, total reserves will tend to rise and fall when market interest rates are rising and falling, respectively. Because of this, some have argued that nonborrowed reserves is a better indicator of monetary policy actions than are total reserves.⁴⁰

If the objective is merely to measure the degree of association between reserves and bank loans that results from the existence of reserve requirements, this distinction is unimportant.⁴¹ However, if the objective is to determine whether monetary policy works through the bank lending channel, the distinction is critical. A statistically significant, positive association between total reserves and loans does not necessarily imply that policy actions affect bank loans in the manner suggested by the credit view of monetary policy. A positive association between reserves and bank loans could result from the effect of monetary policy on the economy through the standard monetary channel. For example, an increase in reserve growth could stimulate economic activity through the monetary channel, increasing the demand for credit and, consequently, the quantity of bank loans.

Kashyap, Stein and Wilcox (1993) try to deal with this identification problem by using a MIX variable, the ratio of bank loans to the sum of bank loans and commercial paper outstanding. They argue that if monetary policy works through the bank credit channel, a restrictive monetary policy action should be associated with a decline in bank loans relative to commercial paper, that is, the MIX variable should decline.⁴² Alternatively, if monetary policy works through the standard monetary channel, both

bank loans and commercial paper should be affected more or less equally so that the credit MIX should be unaffected by policy actions.

If Federal Reserve actions affect bank credit with a lag, however, it will be particularly difficult to distinguish the monetary channel from the credit channel. When the Fed increases the supply of reserves, banks have an incentive to expand their deposit liabilities quickly because the Federal Reserve does not pay interest on reserves. Consequently, an increase in the supply of reserves will be associated with an immediate increase in the supply of money. If bank credit responds with a lag, there will be little or no immediate change in the supply of bank credit. Thus, it will appear as though monetary policy works solely through the monetary channel even though the bank lending channel may be operative as well.⁴³

The Contractual Nature of Loans Made Under Commitment

The fact that loans are contractual obligations not quickly changed and that many loans are made under commitment (for example, a line of credit) suggests that policy actions may affect bank loans with a lag. For example, if the Fed reduces the supply of reserves, banks will have an incentive to reduce loans and not issue new ones. Given such rigidities, however, banks may initially reduce their holdings of government securities and later reduce their quantity of outstanding loans.

Policy actions that result in a decrease in total reserves are fairly extreme. Reserves tend to grow over time, with policy actions characterized by changes in the growth rate of reserves. Because of the contractual nature of loans and

⁴⁰For example, see Christiano and Eichenbaum (1991, 1992). This proposition that nonborrowed reserves is a better policy indicator has been challenged by Gilles, Coleman and Labadie (1993).

⁴¹For example, borrowed reserves increased dramatically in May-June of 1984, when Continental Bank made heavy use of the Federal Reserve's discount window. As a result, there was a sharp drop in nonborrowed reserves, with virtually no change in total reserves. There was no need for banks to contract loans despite the drop in nonborrowed reserves.

⁴²In footnote 11, I have noted why a positive association between the MIX variable and Federal Reserve actions does not necessarily mean that the credit view is valid because such a correlation can arise in the situation in which policy actions limit bank lending, but where the bank lending is

not special. Nonetheless, essentially finding no relationship between policy actions and the MIX variable is indicative of policy actions affecting both the banks and the credit markets equally. Consequently, the lack of association between these variables is evidence that there is no unique channel of monetary policy through bank lending.

⁴³This observation has been made by Bernanke and Blinder (1992) and Bernanke (1993) as an argument why evidence by Romer and Romer (1989) and Ramey (1993) that monetary aggregates are more closely linked to economic activity than credit aggregates is not necessarily evidence against the credit view.

the existence of loan commitments, a significant slowing of the growth of reserves may be reflected initially more in banks' holdings of government securities than in loans.⁴⁴ A significant acceleration in reserve growth should be associated with an acceleration in the growth of both banks' holdings of government securities and loans. Consequently, policy actions should affect loans more quickly when the Fed increases the growth rate of reserves. Other things being the same, the contractual nature of loans and the existence of loan commitments suggest that the timing of the effect of policy actions on bank loans should be asymmetric: Open market purchases should be associated with an immediate response in bank lending, while open market sales should affect bank lending with a lag.⁴⁵

The Relationship Between Total Reserves and Bank Loans

Because of reserve requirements, one would expect to find a fairly close association between reserves and bank liabilities prior to the 1980s. There are several caveats, however. First, prior to the MCA, only member commercial banks were required to maintain reserves, so the connection necessarily exists only between total reserves and deposits of member commercial banks. Second, the percentage reserve requirement varied by the size of the member bank and deposit classification. Consequently, the relationship between total deposits and total reserves, even among member commercial banks, might have varied significantly with the distribution of deposit liabilities. Third, financial innovations that were designed to circumvent reserve requirements and Regulation Q interest rate ceilings should have weakened even the longer-run relationship between total reserves and bank liabilities, especially since the late 1970s. Finally, the passage of the MCA and the phasing out and eventual elimination of Regula-

tion Q should have all but eliminated the relationship since the early 1980s.

Reserves, loans and deposits all tend to rise over time. This should not be mistaken as evidence in favor of the credit view, however, since they are all merely expanding with an expanding economy and inflation. Statistical tests of the association between total reserves and bank loans must account for the dominant trends in these data. In the regression analysis that follows, this is done by taking the first difference of these variables.⁴⁶

The reported regression results are from estimates of equations of the general form

$$(1) \Delta y_t = \beta(L)\Delta TR_t + \varepsilon_t,$$

where Δ is the difference operator, that is, $\Delta x_t = x_t - x_{t-1}$, y is the dependent variable, L is the lag operator, that is, $Lx_t = x_{t-1}$, $\beta(L) = \beta_0 + \beta_1 L + \beta_2 L^2 + \dots + \beta_k L^k$, and TR denotes total reserves.

The primary interest is in the contemporaneous and long-run effects, so it is convenient to rewrite equation 1 as

$$(2) \Delta y_t = \theta \Delta TR_{t-k} + R(L)\Delta^2 TR_{t-1} + \varepsilon_t,$$

where $\theta = \beta_0 + \beta_1 + \dots + \beta_k$ and $R_0 = \beta_0$,

$R_1 = \beta_0 + \beta_1$, and so on. The coefficient θ

the long-run response of the dependent variable to a permanent change in total reserves. The credit view requires θ to be positive and statistically significant. The coefficient $\beta_0 (= R_0)$ gives the initial response and $\theta - \beta_0$ gives the subsequent response of the dependent variable to changes in total reserves.

The Results

Equation 2 was estimated separately for loans and for deposits of commercial banks, thrifts, and commercial banks and thrifts com-

⁴⁴Indeed, in the short run, loans may actually increase as customers exercise their loan options.

⁴⁵It is interesting to note that this interpretation is at odds with the standard view of the asymmetry of monetary policy and with the empirical evidence (Cover, 1992; DeLong and Summers, 1988; and Rotemberg, 1993) that suggests restrictive monetary policy actions are more effective than expansionary monetary policy actions. The asymmetry of the effects of policy actions on bank credit, suggested by Bernanke and Blinder (1992) and others, that expansionary policy actions should have more immediate—and perhaps larger—effects on bank credit and, consequently, economic activity than restrictive policy actions.

⁴⁶There is always the danger of over-differencing data. To see if the results are robust for the filter used, the equations were also estimated using data obtained from the Hodrick-Prescott (1980) filter. There were no qualitative differences in these results from those reported here.

Table 1

The Relationship Between Bank Deposits and Loans: 1959.1-1979.4

	Commercial banks		Thrifts		Commercial banks and thrifts	
	Deposits	Loans	Deposits	Loans	Deposits	Loans
Constant	13.059* (4.30)	3.949 (1.49)	-.209 (0.17)	-0.082 (0.46)	12.802* (3.82)	6.540* (1.97)
β	12.317* (2.60)	7.232* (2.08)	.024 (0.01)	0.492* (1.71)	9.544* (1.85)	7.599* (1.70)
θ	29.311* (1.76)	23.128* (1.77)	-2.725 (0.48)	0.876 (0.99)	-3.978 (0.24)	9.552 (0.61)
$\theta - \beta$	16.995 (1.07)	15.896 (1.25)	-2.749 (0.52)	.384 (0.45)	-13.522 (0.85)	1.953 (0.13)
\bar{R}^2	.742	.786	.792	.720	.772	.821
S.E.	6.523	4.899	2.712	0.416	7.106	6.178

*Indicates statistically significant at the 5 percent level using a one-tailed test.

bined. These data, taken from the Flow of Funds Accounts, are for the last day of the quarter and are not seasonally adjusted. The estimated equations include a third-order lag of the dependent variable, three quarterly seasonal dummy variables, and contemporaneous and eight lags of ΔTR . Only the estimated constant and estimates of the β_0 , θ and $\theta - \beta_0$ are reported. Garfinkel and Thornton (1989) show that the MCA was essentially phased in by February 1984, when the large member banks were completely phased in. Because of the limited number of quarterly observations, however, the results reported here are for two periods broken at the introduction of the MCA: 1959:4 to 1979:4 and 1980:1 to 1993:2.

As noted previously, unless demand factors are explicitly controlled, a positive association between reserves and bank loans does not necessarily imply that monetary policy works through the bank lending channel. In an attempt to control demand factors, two cyclical variables, the spread between the federal funds rate and the 10-year government securities rate and the growth rate of nominal GDP, were included in the regressions. These variables were generally insignificant and the qualitative results when these variables were included differed little from the results when they were not excluded. Consequently, only the latter results are

presented here. In addition the empirical work was also conducted using nonborrowed reserves. The qualitative conclusions regarding the credit view were the same as those obtained using total reserves, so only the latter results are reported.

Estimates of equation 2 for both periods are presented in Tables 1 and 2, respectively. The estimates show that both deposits and loans were significantly related to total reserves during the first period. Not surprisingly, the statistically significant relationship for deposits is due entirely to commercial banks because deposits at thrifts are essentially unrelated to reserves. The statistically significant relationship for loans is primarily due to commercial banks. While statistically significant, the relationship between reserves and loans at thrifts is not large.

The results for the pre-1980s point to the potential validity of the credit view. Loans and reserves are positively and significantly associated for both banks and thrifts, although the relationship was quite weak for the latter. All of the effect is contemporaneous, however, as the subsequent response of deposits or loans to a changes in total reserves, $\theta - \beta$, is never statistically significant at the 5 percent level.

The magnitude of the effect is quite small, however. A \$1 billion increase in total reserves

Table 2

The Relationship Between Bank Deposits and Loans: 1980.1-1993.1

	Commercial banks		Thrifts		Commercial banks and thrifts	
	Deposits	Loans	Deposits	Loans	Deposits	Loans
Constant	46.435* (3.97)	8.043 (0.64)	-3.842 (0.51)	-0.342 (0.16)	27.252* (2.37)	-5.044 (0.33)
β	2.350 (0.69)	-0.933 (0.22)	2.813 (0.98)	-0.563 (0.73)	8.642* (2.08)	-1.443 (0.26)
θ	-1.509 (0.26)	4.211 (0.67)	-1.145 (0.25)	0.865 (0.68)	1.707 (0.26)	9.721 (1.11)
$\theta-\beta$	-3.859 (0.68)	5.145 (0.79)	-3.958 (0.87)	1.428 (1.10)	-6.935 (1.04)	11.164 (1.19)
\bar{R}^2	.765	.416	.766	.470	.820	.668
S.E.	13.772	16.254	11.263	3.234	16.836	21.814

*Indicates statistically significant at the 5 percent level using a one-tailed test.

resulted in a estimated \$12 billion long-run increase in banks loans. Since total reserves increased about \$8 billion from 1960 to 1979, policy actions would appear to account for less than \$100 billion of the about \$1,178 billion increase in bank loans during this period. While these estimates should be interpreted cautiously, they suggest that the direct effect of monetary policy actions on bank lending during the period was modest.

The estimates for the second period in Table 2 show that there is no statistically significant relationship between total reserves and loans for commercial banks or thrifts. Consistent with the discussion of the effects of financial innovation and changes to the structure of reserve requirements, it appears that the modest association between Federal Reserve actions and bank loans that was evident prior to 1980 has vanished.

Commercial and Industrial Loans and Reserves

Because the credit view is most likely to apply to businesses that have less access to alternative sources of credit, most of the empirical work to

date has focused on commercial and industrial (C&I) loans. Seasonally adjusted data on C&I loans are available on a monthly basis, but only for commercial banks and only since November 1972. Equation 2 was also estimated with commercial bank holdings of government securities, SEC, as the dependent variable, to test whether any potential lag in the effect of reserves on C&I loans can be attributed to changes in banks' holdings of liquid assets. Finally, the equation was estimated using a Kashyap-and-Stein-type MIX variable, the ratio of C&I loans to commercial paper. Equation 2 was estimated separately for the periods of November 1972 to February 1984, and March 1984 to May 1993, to test whether changes in reserve requirements under the MCA significantly reduced the effect of policy actions on bank loans.⁴⁷ All the estimated equations include three lags of the dependent variable and contemporaneous plus 12 lags of ΔTR .

Estimates for the two periods are presented in Tables 3 and 4, respectively. The results for the first period indicate a statistically significant relationship between total reserves and C&I loans, but not between total reserves and SEC.

⁴⁷In each case, contemporaneous and 12 lags of ΔTR were included along with three lags of the dependent variable.

Table 3

**The Effect of Federal Reserve
Actions on Selected Commercial
Bank Assets: 1972.11-1984.2**

	C&I loans	SEC	Mix
Constant	.247 (0.83)	.459* (2.02)	-.000 (0.75)
β_0	1.081 (1.37)	1.218 (1.63)	.002 (1.45)
θ	7.602* (2.66)	-1.124 (0.36)	-.004 (0.87)
$\theta-\beta_0$	6.522* (2.39)	-2.341 (0.81)	-.006 (1.34)
\bar{R}^2	.423	.405	.052
S.E.	1.719	1.566	.003

*Indicates statistically significant at the 5 percent level using a one-tailed test.

Table 4

**The Effect of Federal Reserve
Actions on Selected Commercial
Bank Assets: 1984.3-1993.5**

	C&I loans	SEC	Mix
Constant	0.271 (0.50)	1.179* (1.84)	-.002* (2.98)
β_0	0.903 (1.02)	-0.589 (0.60)	-.000 (0.14)
θ	0.087 (0.06)	0.022 (0.01)	.002 (1.41)
$\theta-\beta_0$	-0.816 (0.55)	0.610 (0.36)	.002 (1.42)
\bar{R}^2	.225	.335	-.038
S.E.	3.040	3.407	.003

*Indicates statistically significant at the 5 percent level using a one-tailed test.

Reserves appear to affect C&I loans with a lag. There is a positive, contemporaneous relationship between reserves and SEC and a negative subsequent relationship; however, neither is statistically significant. Nevertheless, these estimates provide some qualitative support to the finding of Bernanke and Blinder (1992) and others that monetary policy is reflected initially in banks' holdings of securities and subsequently in bank loans.

The results for the second period provide no support for the credit view. None of the coefficients is statistically significant at the 5 percent level, and the qualitative pattern of first expanding SEC and, subsequently, C&I loans that is evident in the first-period results has vanished.

The results for the MIX variable are not supportive of the credit view in either period. The coefficient on the contemporaneous MIX variable is positive in the first period, as the credit view predicts, however, the long-run coefficient is negative and neither coefficient is statistically significant.

Finally, changes in C&I loans made under commitment are regressed on changes in total reserves.⁴⁸ These results appear in Table 5. Because these data are available only from January 1975 to June 1987, the results are reported for a sample ending in February 1984 and for the entire sample period. The relationship between loans made under commitment and total reserves is positive and immediate. Moreover, there is no statistically significant long-run relationship. The results suggest that loan commitments do not account for the failure of the lending channel.

CONCLUSIONS AND COMMENTARY

The empirical results presented here lend little support to the credit view of monetary policy. There was a positive and statistically significant relationship between Federal Reserve actions and both bank lending and bank deposits prior to the early 1980s. The effect, however, was quite small.

⁴⁸The data on loans made under commitment come from a Federal Reserve Survey of about 138 large, weekly reporting commercial banks that account for about 85 percent of all commercial and industrial loans of all weekly reporting banks. The official survey ran from January 1975 to June 1987.

Table 5

Effects of Monetary Policy Actions on Loans Made Under Loan Commitments

	1975.1-1984.2	1975.1-1987.6
Constant	.247 (0.93)	.322 (1.45)
β_0	1.419* (1.92)	2.336* (4.16)
θ	1.691 (0.62)	1.160 (1.14)
$\theta - \beta_0$.272 (0.11)	-1.176 (1.11)
\bar{R}^2	.233	.258
S.E.	1.488	1.696

*Indicates statistically significant at the 5 percent level using a one-tailed test.

Consistent with financial innovation and changes in reserve requirements under the MCA, the relationship between Federal Reserve actions and bank lending since the early 1980s is nil. Consequently, whatever the nature of the relationship between bank lending and Federal Reserve actions prior to the 1980s, it appears that changes in the structure of reserve requirements under the MCA of 1980 have essentially eliminated it. Indeed, given the existing structure of reserve requirements, it is difficult to see how monetary policy can work through the hypothesized bank credit channel, if it ever did.

These results notwithstanding, there is a growing recognition that the relative position of depository financial intermediaries in allocating credit has diminished over time. It is now generally accepted that banks compete directly with other intermediaries for most of their funds and that they no longer have a unique place in supplying consumer and real estate credit. Moreover, other intermediaries are becoming increasingly competitive with banks in the market once thought to be the bastion of banks—extending credit to small and medium-sized businesses. At the same time, financial innovations have significantly redefined the meaning of small and medium when it comes to the size of firms with direct access to credit markets. Indeed, it is ironic interest in the bank

credit channel of monetary policy has been rejuvenated at a time when justification for it has eroded.

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