Effectiveness of State Reserve Requirements

R. ALTON GILBERT

AN important decision made by each commercial bank is whether to be a member of the Federal Reserve System (FRS). National banks are required by law to be members but can withdraw from membership with little difficulty by obtaining state charters. State banks may choose whether to be members without affecting the status of their state charters.

In recent years many banks have withdrawn from the FRS, and the primary reason given is that they must hold a larger share of their assets in non-earning form as members than if they were nonmembers.[1] The FRS has proposed to reduce member bank reserve requirements as a means of making membership more attractive. State bank regulators, however, might wish to counter this action in order to keep the number of banks under their supervision from declining, and might seek to do so by lowering reserve requirements for nonmember banks. For states to offset the effects of a reduction in FRS reserve requirements on the attractiveness of membership, state reserve requirements would have to be effective, in the sense of influencing the cash holdings of nonmember banks or other aspects of nonmember bank behavior. Thus, effectiveness of state reserve requirements is one of the issues to consider in estimating the attractiveness of proposals for reducing member bank reserve requirements.

Effectiveness of state reserve requirements is analyzed from three approaches. The first approach examines how close nonmember banks keep their cash reserves to required cash reserves. A second approach examines the influence of state reserve requirements on the way nonmember banks report their uncollected funds. Most states do not count cash items in the process of collection (CIPC) as cash reserves; however, nonmember banks in such states can use uncollected funds to meet reserve requirements by reporting them as demand balances due from correspondents, instead of as CIPC. This second approach tests whether nonmember banks in states which do not count CIPC as cash reserves report more of their uncollected funds as demand balances due from correspondents than nonmember banks in other states. A third approach tests the effects of state reserve requirements on the percentages of banks which are FRS members in various states. Details of state reserve requirements are reported in a previous issue of this *Review*.[2]

FIRST APPROACH

Nature of Data Available and Appropriate Comparisons

Most state banking authorities compare average cash assets to required cash reserves over one-week or two-week periods to determine whether banks are meeting their reserve requirements. However, data are available in a common format across states only as

[1]Peter Rose, "Exodus: Why Banks are Leaving the Fed," *The Bankers Magazine* (Winter 1976), pp. 43-49.

[2]R. Alton Gilbert and Jean M. Lovati, "Bank Reserve Requirements and Their Enforcement: A Comparison Across States," this *Review* (March 1978), pp. 22-32. Another approach that has been used to test the effectiveness of state reserve requirements is to estimate the relation between cash assets held by nonmember banks and required cash reserves. See Lawrence G. Goldberg and John T. Rose, "Do State Reserve Requirements Matter?" *Journal of Bank Research* (Spring 1977), pp. 31-39. That approach is not used in this paper for the following reasons. If state reserve requirements influence cash holdings of nonmember banks, demand for correspondent balances by nonmember banks would also be a function of additional variables, which should be held constant in testing the influence of state reserve requirements on cash holdings of nonmember banks. Data on some other determinants of demand for correspondent balances, such as daily variability of deposit liabilities, are not available for nonmember banks. For evidence on the significance of deposit variability for demand for correspondent deposits, see William G. Dewald and G. Richard Dreese, "Bank Behavior with Respect to Deposit Variability," *Journal of Finance* (September 1970), pp. 869-79. Another reason concerns the interpretation if a positive relation is found between cash holdings and required cash reserves of nonmember banks. Such a relation might indicate that banks which hold relatively large percentages of their assets in cash do so because of relatively high reserve requirements. On the other hand, such a relation might indicate that state banking authorities keep reserve requirements relatively high in states in which nonmember banks hold relatively high percentages of their assets in cash voluntarily. In such states there would be little pressure on banking authorities from banks to lower reserve requirements. In other states in which banks wish to hold lower cash ratios, banking authorities would be under pressure to keep reserve requirements no higher than voluntary cash holdings.

of individual days. One source is the quarterly *Report of Condition* for all Federally insured banks; the other is balance sheets as of each Wednesday for nonmember weekly reporting banks. Since these observations are for individual days, at quarterly or weekly intervals, observed cash holdings may be less than the required amounts without necessarily indicating that banks are violating state reserve requirements. Alternately, reserves could be above required levels as of individual days without necessarily indicating that nonmember banks voluntarily hold more reserves than required.

Another complication in drawing conclusions from ratios of reserves to required reserves for effectiveness of state reserve requirements is that banks often choose to hold excess reserves. Relatively small *member* banks hold substantial amounts of excess reserves, although most of them would tend to hold less cash if their reserve requirements were reduced.[3]

These problems of interpretation are dealt with by comparing the ratio of cash reserves to required cash reserves for nonmember banks with the ratio of reserves to required reserves for member banks of comparable size, calculated for the same individual days. The nonmember ratios are calculated using state requirements, and member bank ratios using FRS requirements. Member bank reserve requirements are used here as a standard for effective reserve requirements. To indicate how this standard is applied, suppose nonmember banks have ratios of cash reserves to required cash reserves which are significantly higher than such ratios for member banks of comparable size. State reserve requirements would be considered not effective, in the sense that cash holdings of nonmember banks apparently would not be determined by state reserve requirements to the same extent that reserves of member banks are determined by their required reserves.

Empirical Results

One recent quarterly *Report of Condition* is used to calculate ratios of cash reserves to required cash reserves for member and nonmember banks of comparable size. These calculations indicate that *nonmember banks in most states hold cash reserves which are substantially larger than their required cash reserves.* Cash reserves several times as large as required cash reserves were most common among the smallest nonmember banks, with larger banks having smaller ratios. In all but two of the 38 states for which such comparisons are made, the average ratios of cash reserves to required cash reserves *were significantly higher than those ratios for member banks of comparable size.* Thus, based upon this information, *state reserve requirements appear to be less effective than FRS reserve requirements.*[4] Details of calculations and statistical tests are presented in section I of the Appendix.

In 1976 there were 23 weekly reporting banks which were nonmembers. Two of those banks were located in states with no cash reserve requirements. Of the remaining 21 banks, 12 had average ratios of cash reserves to required cash reserves which were not significantly different from such ratios for member banks of comparable size.[5] These 12 banks are located in seven states. Thus, results for nonmember weekly reporting banks provide *evidence of effective state reserve requirements for some of the relatively large nonmember banks in several states.*

There are only a few nonmember banks that are as large as weekly reporting banks. Evidence from this approach indicates that state reserve requirements are not effective for most nonmember banks in all but a few states, since their cash holdings are so much larger than their required cash reserves.

SECOND APPROACH

All but seven states have reserve requirements which must be satisfied completely, or in part, with cash reserves, which include vault cash and demand deposits with other domestic commercial banks. Among the 43 states with reserve requirements which must be met with cash assets, 17 allow banks to count at least some types of cash items in the process of collection (CIPC) as cash reserves. CIPC represent primarily the dollar value of checks deposited with correspondent banks for which the correspondents have not received payment.

[3]There tend to be economies of scale in managing a bank's reserve position. For instance, Treasury bills have minimum dollar denominations, and correspondent banks generally have minimum dollar units in which they invest excess reserves of respondent banks in the Federal funds market. Also, there are efficiencies due to specialization, since the persons who manage the reserve positions of relatively small banks generally have additional responsibilities. Excess reserve ratios of relatively small member banks indicate that the transactions and cash management costs which are necessary to reduce excess reserves are larger than the potential increases in income from investing them.

[4]Note that this result does not imply a comparison of the burden of reserve requirements of FRS members to the burden of state reserve requirements for nonmembers. The issue being considered is how close member and nonmember banks keep their cash reserves to their respective required cash reserves.

[5]Each of the nonmember weekly reporting banks in 1976 had total deposits greater than $180 million.

Differences among states in treatment of CIPC as reserves could have significant implications for the effective levels of state reserve requirements if nonmember banks reported all of their uncollected funds as CIPC, because uncollected funds constitute substantial proportions of required reserves for most banks.[6] However, many banks report part or all of their uncollected funds as demand balances due from correspondents. Some banks may follow such an accounting practice to use uncollected funds for meeting reserve requirements. To illustrate why a bank might do this, consider a nonmember bank which desires to hold an amount of vault cash plus *collected* demand balances with correspondents which is less than its required cash reserves. If this bank is in a state which does not count CIPC as reserves, it could increase its reserves for purposes of meeting state requirements by classifying its uncollected deposits at correspondents as demand balances due from banks, rather than as CIPC.

Regression analysis is used to test the influence of state reserve requirements on the methods nonmember banks use for classifying uncollected funds. Two hypotheses are tested: in states that have cash reserve requirements and do not count CIPC as reserves, (1) nonmember banks report less of their uncollected funds as CIPC than do other banks, and (2) the percentage of banks reporting uncollected funds as CIPC is smaller in states with higher reserve requirements and in states which enforce reserve requirements more rigorously.

The regression results support both of these hypotheses (see Appendix, section III). The percentage of nonmember banks reporting CIPC as zero is significantly higher in states that have cash reserve requirements and do *not* count CIPC as cash reserves. Another measure of how nonmember banks report uncollected funds is the percentage of banks reporting CIPC less than 25 percent of their demand balances due from correspondents. With this second measure as the dependent variable, significant independent variables are those which reflect treatment of CIPC as cash reserves, the level of state reserve requirements, and methods of monitoring reserve positions of nonmember banks.

These results have implications for the level of state reserve requirements relative to cash assets nonmember banks would desire to hold voluntarily. *Cash reserve requirements of several states tend to be large enough relative to voluntary holdings of vault cash plus collected demand balances due from correspondents to induce behavior by nonmember banks which minimizes the burden of state reserve requirements.* Whether nonmember banks are able to fully offset the burden of state reserve requirements by reporting uncollected funds as demand balances due from correspondents cannot be determined from this analysis.

THIRD APPROACH

The major cost of Federal Reserve membership is reserves required of members, relative to reserves held by nonmembers. If state reserve requirements are effective, differences in requirements among states would tend to induce differences among states in the percentages of banks that choose Federal Reserve membership: the percentage of banks within a state that are members of the Federal Reserve System would tend to be higher in states with relatively high state reserve requirements and rigorous enforcement by state banking authorities.

This hypothesis is also tested using regression analysis.[7] Results of those tests indicate that the percentage of banks in the Federal Reserve is not significantly higher in states with relatively high reserve requirements. Thus, by just examining the *levels* of state reserve requirements, such requirements do not appear to influence the membership choice of banks.

Two aspects of the *enforcement* of state reserve requirements, however, do significantly influence the choices of banks concerning FRS membership. The most important variable reflects differences among states in methods of monitoring the reserve positions of nonmember banks. The most rigorous method state bank supervisors use to monitor the reserve positions of nonmember banks is frequent reports from banks on their reserve positions. *The percentage of banks in*

[6]Uncollected funds as a proportion of cash assets can be measured most accurately for member banks which send most of their checks to a Federal Reserve Bank for collection. Member banks receive credit for deposits with Reserve Banks according to a time schedule which approximates the time required for the FRS to make collection. Uncollected funds which represent deposits at Federal Reserve Banks for which member banks have not yet received credit must be reported as CIPC. For a group of 49 member banks which regularly deposit checks with their Federal Reserve Bank, CIPC was about 83 percent of their reserve balances with their Federal Reserve Bank. See R. Alton Gilbert, "Utilization of Federal Reserve Bank Services By Member Banks: Implications for the Costs and Benefits of Membership," this *Review* (August 1977), p. 3.

[7]See the Appendix, section IV, for a description of the data and statistical tests.

the Fed is significantly higher in states which require nonmember banks to file frequent reports on their reserve positions than in states which use less rigorous methods to monitor compliance with reserve requirements. This result is consistent with the hypothesis that banks are more likely to choose Fed membership in states with more rigorous enforcement of reserve requirements.

The other significant aspect of state reserve requirements is enforcement of penalties on reserve deficiencies. Several states have dollar penalties which are relatively low or, according to the state banking supervisors, are seldom enforced. The percentage of banks in the Fed is significantly lower in such states than in other states which have higher dollar penalties, enforce dollar penalties on reserve deficiencies more rigorously or have various types of nondollar penalties.

These results indicate that *enforcement* of state reserve requirements, not the *level* of requirements, influences the choice of banks concerning Federal Reserve membership. One possible explanation for this finding is that the measures of enforcement — requirements for reporting on reserve positions, the level of dollar penalties, and degrees to which penalties are imposed — reflect differences among states in the nature of bank supervision in general, not just enforcement of reserve requirements. Additional research would be necessary to determine whether states with relatively more rigorous enforcement of reserve requirements also have more rigorous enforcement of other banking regulations.

CONCLUSIONS

Empirical tests presented in this paper provide conflicting evidence on the effectiveness of state reserve requirements. Most nonmember banks in all but a few states hold ratios of cash reserves to required cash reserves which are significantly larger than ratios of reserves to required reserves for member banks of comparable size. These results are consistent with the view that the cash holdings by most nonmember banks are not determined by state reserve requirements, but by cash requirements for banking transactions. Under this interpretation, most nonmember banks would *not* tend to hold less cash if their cash reserve requirements were reduced. Thus, states could not offset Federal Reserve System (FRS) actions intended to increase the attractiveness of membership — such as lowering member bank reserve requirements — by lowering reserve requirements for nonmember banks in response.

However, other evidence presented above calls for qualifications to this general conclusion. Several relatively large nonmember banks (total deposits of $180 million and above) keep their cash reserves as closely tied to their required cash reserves as do member banks of comparable size. This evidence indicates that state reserve requirements are effective for some of the relatively large nonmember banks in several states.

Other evidence which is not necessarily consistent with the general conclusion on effectiveness of state reserve requirements is that on reporting of uncollected funds by nonmember banks. In states which do not count cash items in the process of collection (CIPC) as cash reserves, nonmember banks report CIPC which is a smaller percentage of their demand balances due from correspondents than do nonmember banks in other states. This evidence indicates that nonmember banks tend to use their means of reporting uncollected funds to minimize the burden of state reserve requirements.

Additional evidence which supports the conclusion that state reserve requirements are not effective concerns the influence of state reserve requirements on the percentage of banks in various states which are FRS members. The *level* of state reserve requirements does not significantly influence the percentage of banks which are FRS members. However, some differences among states in methods of monitoring the reserve positions of nonmember banks and enforcing reserve requirements are significantly related to differences in the percentage of banks that are FRS members.

An overall assessment of results in this analysis supports the view that in general state reserve requirements are not effective. Evidence cited above which is inconsistent with this general conclusion calls for only limited qualifications, and may raise more questions than it answers.

Only a small number of nonmember banks have total deposits over $180 million. Thus, evidence on effectiveness of state reserve requirements for several nonmember banks in that size range applies to only a small percentage of banks which would posssibly be influenced by a reduction in FRS reserve requirements.

Evidence that nonmember banks in some states attempt to minimize the burden of state reserve requirements by the way they report uncollected funds does not indicate whether any burden remains after banks take such actions. Nonmember banks in states

which do not count CIPC as cash reserves may be able to avoid all burden of state reserve requirements by reporting their uncollected funds as demand balances due from correspondents.

Differences among states in methods of monitoring reserves of nonmember banks and enforcing reserve requirements may be related to differences among states in overall stringency of banking regulation. Therefore, the evidence cited above concerning variables which influence the percentages of banks which are FRS members may indicate as much about the influence of differences among states in overall bank regulation as it does about the influence of state reserve requirements on membership choice.

Thus, evidence developed in this paper indicates that the FRS could increase the attractiveness of membership by lowering member bank reserve requirements. With only a few exceptions, states could not offset the effects of such an action by lowering reserve requirements for nonmember banks.

APPENDIX

Specification of Data and Empirical Results

RATIOS OF CASH RESERVES TO REQUIRED CASH RESERVES FOR MEMBER AND NONMEMBER BANKS

Ratios from the Report of Condition

Ratios of cash reserves to required reserves are calculated for all nonmember banks in states that have cash reserve requirements, using data as of June 30, 1976.[1] The ratios are averaged for nonmember banks in each state within the following size groups in terms of total deposits:

(a) up to $10 million,

(b) $10 million to $50 million,

(c) $50 million to $100 million, and

(d) $100 million to $500 million.[2]

Average ratios of reserves to required reserves are presented in Table A-I. Each t-statistic (calculated for the difference between the mean ratio for nonmember banks and the mean ratio for members of comparable size) is used to test the hpothesis that reserve requirements of a state are effective.[3] In each case in which the difference in mean ratios is not significantly different from zero, reserve requirements of that state are considered as significant in determining the cash holdings of nonmember banks as FRS reserve requirements are in determining the reserves of member banks.

Results in Table A-I indicate that nonmember banks in most states hold cash reserves which are substantially above their required cash reserves. Nonmember banks in all but two states, South Dakota and Wisconsin, had average ratios of reserves to required reserves which were significantly higher than the average reserve ratios for member banks of comparable size. Reserve requirements are relatively high in both of these states. Thus, based upon the criterion used in this section, state reserve requirements are as effective as FRS reserve requirements in only two of the 38 states examined.

[1]See Appendix, section II, for discussion of a possible bias in the *Report of Condition* data.

[2]In most states there are few, if any, nonmember banks with total deposits over $500 million. The influence of bank size on the ratios of reserves to required reserves is held constant by dividing nonmember banks in each state into these size groups. A few banks which had extreme ratios were eliminated from the analysis. The banks which were eliminated from calculations in this section were also eliminated from analysis in the following sections. Another study has drawn inferences about the effectiveness of state reserve requirements based upon reserve ratios from the *Report of Condition*. One limitation of the study is that no criterion was developed from determining how large reserves can be in relation to required reserves as of an individual day and yet be consistent with effective state reserve requirements. See Perry D. Quick, Appendix A, "Nonmember Bank Reserve Requirements," in "The Burden of Federal Reserve Membership, NOW Accounts, and the Payment of Interest on Reserves," prepared by the Staff of the Board of Governors of the Federal Reserve System, June 1977, pp. 71-96.

[3]Mean ratios of reserves to required reserves, based upon the *Report of Condition* for June 30, 1976, are calculated for the combined group of member banks in those states which have cash reserve requirements. This group of states includes most member banks in the nation.

Table A-I

RATIOS OF CASH RESERVES TO REQUIRED CASH RESERVES OF NONMEMBER BANKS[1]

State	Size Group (millions of dollars)	Percent Reserves are of Required Reserves	t-statistic[2]
Alabama	up to $10	160.31%	6.568
	$10 to $50	137.11	8.007
Arkansas	up to $10	209.07	13.958
	$10 to $50	170.41	18.672
California	up to $10	254.89	22.246
	$10 to $50	193.09	24.315
	$50 to $100	156.44	15.447
	$100 to $500	138.52	16.745
Connecticut	$10 to $50	249.14	46.290
Georgia	up to $10	373.19	23.858
	$10 to $50	311.54	48.760
Indiana	up to $10	135.97	2.158
	$10 to $50	126.74	4.515
	$50 to $100	121.86	2.009
Iowa	up to $10	168.42	6.662
	$10 to $50	144.05	9.513
Kansas	up to $10	198.01	9.821
	$10 to $50	168.33	17.578
Kentucky	up to $10	393.93	37.602
	$10 to $50	366.17	66.537
Louisiana	$10 to $50	305.88	54.920
	$50 to $100	217.35	38.815
Maryland	up to $10	257.78	24.392
	$10 to $50	248.20	44.192
Massachusetts	up to $10	750.57	82.297
	$10 to $50	694.43	158.275
Michigan	up to $10	223.75	17.321
	$10 to $50	204.33	29.772
	$50 to $100	177.70	23.772
	$100 to $500	160.48	32.349
Minnesota	up to $10	222.97	12.884
	$10 to $50	161.08	12.532
Mississippi	up to $10	307.82	29.688
	$10 to $50	217.57	32.779
Missouri	up to $10	175.34	7.829
	$10 to $50	142.86	9.474
	$50 to $100	132.51	6.174
Montana	up to $10	153.83	5.586
	$10 to $50	119.45	2.126
Nebraska	up to $10	174.96	7.122
	$10 to $50	153.16	13.257
New Hampshire	up to $10	227.72	18.810
	$10 to 50	148.16	12.039
New Jersey	$10 to $50	148.78	12.083
	$100 to $500	121.99	6.053
New Mexico	$10 to $50	266.21	51.053
New York	$10 to $50	134.28	7.198
North Carolina	up to $10	205.90	14.929
	$10 to $50	171.30	19.862
North Dakota	up to $10	136.63	2.384
	$10 to $50	133.11	6.714
Ohio	up to $10	265.28	23.989
	$10 to $50	218.67	33.300
	$50 to $100	175.85	23.248
Oklahoma	up to $10	205.09	12.276
	$10 to $50	172.73	19.001
Oregon	$10 to $50	208.00	32.538
Pennsylvania	up to $10	278.15	27.375
	$10 to $50	196.38	27.186
	$50 to $100	159.11	16.678
	$100 to $500	181.31	44.859
South Carolina	up to $10	218.11	16.866
	$10 to $50	185.09	24.542
South Dakota	up to $10	133.50	1.850
	$10 to $50	131.18	6.167
Tennessee	up to $10	171.08	7.971
	$10 to $50	151.91	12.648
	$50 to $100	166.33	19.659
Texas	up to $10	180.81	8.870
	$10 to $50	166.74	15.762
	$50 to $100	155.93	14.250
	$100 to $500	174.68	38.898
Utah	up to $10	250.86	20.367
	$10 to $50	157.20	15.127
Virginia	up to $10	190.05	11.944
	$10 to $50	145.62	11.093
Washington	up to $10	193.29	12.598
	$10 to $50	155.98	14.665
West Virginia	up to $10	206.05	13.773
	$10 to $50	179.97	22.361
Wisconsin	up to $10	134.81	1.898
	$10 to $50	109.74	−1.161
	$50 to $100	113.53	−1.233
Wyoming	$10 to $50	169.97	19.538

[1]Observations of cash assets and deposit liabilities for member and nonmember banks are derived from the *Report of Condition*, June 30, 1976. Average ratios of reserves to required reserves are calculated for nonmember banks in each of the four size groups in each state with cash reserve requirements. Ratios are reported for size groups with ten or more nonmember banks. Ratios of reserves held to required reserves are calculated for member banks in 43 states that have cash reserve requirements for nonmember banks. Information on the ratios of reserves to required reserves for member banks is provided below:

Size Group (Total Deposits in Millions of Dollars)	Number of Banks	Mean Percent that Reserves are of Required Reserves	Standard Deviation of Ratio
up to $10	1082	123.18	48.710
$10 to $50	2608	113.29	28.942
$50 to $100	512	116.79	33.183
$100 to $500	408	113.25	33.658

[2]t-statistics are calculated for differences between mean ratios of reserves to required reserves of nonmember banks and mean ratios of reserves to required reserves of member banks of similar size. With the exception of all three size categories for Wisconsin and the "up to $10 million" category for South Dakota, all t-statistics are significant at the 5 percent level.

Ratios for Nonmember Weekly Reporting Banks

Weekly reporting banks comprise a national sample of relatively large commercial banks which report balance sheet information as of each Wednesday. In 1976, 23 weekly reporting banks were nonmembers, each with total deposits over $180 million. Two of those banks are located in states with no cash reserve requirements. Ratios of cash reserves to required cash reserves were calculated for the remaining 21 banks as of each Wednesday in 1976 and averaged for each bank over the year (see Table A-II).

As a basis for comparison, average ratios of reserves to required reserves, under reserve requirements of the Federal Reserve, were calculated for 18 member banks in the Eighth District, with total deposits of at least $180 million. For comparability with data for nonmembers, the measure of cash reserves for each member bank is its reserve balance at the Federal Reserve at the close of each Wednesday plus average daily vault cash during the reserve settlement week ending two weeks earlier. Average daily required reserves are based upon deposit liabilities two weeks earlier. Ratios of reserves to required reserves are calculated for each member bank for each Wednesday in the period from September 15, 1976 through January 12, 1977.

Mean ratios of reserves to required reserves of the 18 member banks are used to establish an acceptance region for testing the hypothesis that the mean reserve ratio for each nonmember bank was drawn from the same distribution as that for member banks. This hypothesis is not rejected, at the 5 percent level of significance, if the mean ratio for a nonmember is in the range from 0.585 to 1.509.

Using this criterion, the hypothesis that reserve requirements are effective is *not* rejected for 12 of the 21 nonmember banks, located in California, Hawaii, Michigan, New York, North Carolina, Ohio, and Pennsylvania. Thus, results in Table A-II provide evidence of effective reserve requirements in several states for some of the relatively large nonmember banks.

Table A-II

RATIO OF RESERVES TO REQUIRED RESERVES: COMPARISON FOR LARGE MEMBER AND NONMEMBER BANKS

State	Bank Number	Average Ratio for Each Wednesday, 1976	Interpretation: Hypothesis of Effective State Reserve Requirements*
California	1	1.166	Accept
	2	1.484	Accept
	3	1.091	Accept
	4	1.020	Accept
Connecticut	1	1.810	Reject
	2	2.329	Reject
	3	2.241	Reject
Delaware	1	5.625	Reject
Hawaii	1	0.986	Accept
	2	0.839	Accept
Maryland	1	1.846	Reject
Michigan	1	1.353	Accept
Missouri	1	2.004	Reject
New York	1	2.029	Reject
	2	1.112	Accept
North Carolina	1	1.800	Reject
	2	1.445	Accept
Ohio	1	1.300	Accept
Pennsylvania	1	1.553	Reject
	2	1.062	Accept
	3	1.333	Accept

*The hypothesis of effective state reserve requirements is not rejected if the average ratio of reserves to required reserves for a nonmember bank is in the range from 0.585 to 1.509.

ANALYSIS OF POSSIBLE BIAS IN *REPORT OF CONDITION* DATA

One possible problem with relying upon the *Report of Condition* for information on cash holdings of nonmember banks is that banks might increase their cash holdings on the known dates for the *Report of Condition* and reduce them immediately afterwards. Banks might behave that way if they generally hold cash reserves which are less than required reserves, since that report is disclosed to the public and made available to state banking authorities.

Determining whether cash holdings of nonmember banks from the *Report of Condition* are unusually high requires information from other sources for comparison. One source is the data for nonmember weekly reporting banks discussed above.

Although weekly reporting banks are larger than most nonmembers used in the calculations from the *Report of Condition*, they are probably part of the nonmember group which would have the greatest incentives to hold unusually high cash reserves on the *Report of Condition* dates. Nonmember banks in the smaller size groups in most states report cash reserves which are substantially above required cash reserves. These banks would not have incentives to hold cash reserves that much larger than their required cash reserves for just the day of the report. In contrast, the larger nonmember banks in most states tend to have lower ratios of cash reserves to required cash reserves than the small banks. Therefore, if any nonmember banks increase their cash reserves on *Report of Condition* dates to appear to be meeting reserve requirements, the relatively large nonmember banks would be most likely to do so.

One Wednesday in 1976 occurred on June 30, which is a *Report of Condition* date. For each of the 21 nonmember weekly reporting banks in states with cash reserve requirements, cash reserves reported as of June 30 are compared to the average of their cash reserves as of the four previous Wednesdays and the following four Wednesdays.

Eight of the 21 banks had higher cash reserves on June 30 than the average of both the previous and fol-

Table A-III

IDENTIFICATION OF INDEPENDENT VARIABLES AND SPECIFICATION OF HYPOTHESES

Symbol	Description of Variable	Direction of Influence on Dependent Variables: Percentage of Banks Reporting CIPC (a) equal to zero, (b) less than 10 percent of due from balances, or (c) less than 25 percent of due from balances	Percentage of Banks in the Federal Reserve System
MPC 0	Percentage of member banks reporting CIPC equal to zero.	+	
MPC 10	Percentage of member banks reporting CIPC less than 10 percent of their demand balances due from correspondent banks.	+	
MPC 25	Percentage of member banks reporting CIPC less than 25 percent of their demand balances due from correspondent banks.	+	
EFF	Dummy variable with value of unity if a state has cash reserve requirements and CIPC are not counted as reserves.	+	
RR	Measure of state cash reserve requirements. For each nonmember bank in a group, cash reserves required by the state are subtracted from reserves that would be required as a Federal Reserve member, and the difference is divided by total deposits. These ratios are averaged for nonmember banks in each group.	−	−
WEEKLY	Value of unity if the reserve settlement period is weekly, zero otherwise.	+	+
BIWEEKLY	Value of unity if the reserve settlement period is biweekly or semimonthly, zero otherwise.	?	?
REPORT	Value of unity if nonmember banks must file frequent reports with the state banking authorities on deposit liabilities and reserve positions, zero otherwise.	+	+
REC EXAM	Value of unity if nonmember banks do not have to report on reserve positions regularly, but must keep records on reserve positions to be inspected by state examiners during regular examinations, zero otherwise.	?	?
REP DEF	Value of unity if nonmember banks must report reserve deficiencies to state banking authorities within a short period of time after deficiencies occur, zero otherwise.	+	+
LO PEN	Value of unity if there are small dollar penalties on reserve deficiencies or if dollar penalties are infrequently enforced, zero otherwise.[1]	?	?
HI PEN	Value of unity if there are relatively large dollar penalties for reserve deficiencies which are enforced with relative frequency, zero otherwise.[2]	+	+
NE	Dummy variable with value of unity if a state has no cash reserve requirements, zero otherwise.		−
Ratio 150	Dummy variable with value of unity if the average ratio of cash reserves to required cash reserves for a group of nonmember banks is less than 1.5, zero otherwise.		+

[1]States in this category are Georgia, Iowa, Louisiana, Mississippi, New Mexico, North Dakota, South Dakota, and Wisconsin.

[2]States in this category are Alabama, Arkansas, California, Minnesota, Nebraska, New York, Oklahoma, Oregon, Texas, Washington, and West Virginia.

lowing four weeks. However, such results may reflect largely the degree to which cash holdings of banks fluctuate on a daily basis. To illustrate such an effect, seven banks had cash reserves on June 30 *smaller* than their average in the previous and the following four weeks.

Also, some of the eight banks that had higher cash holdings on June 30 would have little incentive for holding unusually high cash reserves on the *Report of Condition* date. Three of them are located in states that require nonmember banks to file reports on daily reserve positions shortly after each reserve settlement period. Of the remaining five banks with especially high cash reserves on June 30, two had exceptionally high average ratios of reserves to required reserves over the year 1976 (average ratios of 1.85 and 2.33), indicating that they generally

hold excess cash reserves. Thus, data for nonmember weekly reporting banks provide little evidence that they hold unusually high reserves on *Report of Condition* dates.

EFFECTS OF STATE RESERVE REQUIREMENTS ON REPORTING OF UNCOLLECTED FUNDS BY NONMEMBER BANKS

Specification of Variables

Banks in each state are divided into the size groups used in Table A-I. The following measures are used separately as *dependent variables.*

(a) percentage of nonmember banks which report CIPC that is equal to zero on their June 30, 1976 *Report of Condition,*

(b) percentage of nonmembers which report CIPC that is less than ten percent of their demand balances due from correspondents, and

(c) percentage of nonmember banks which report CIPC that is less than 25 percent of their demand balances due from correspondents.

Independent variables are described below. Their hypothesized influences are summarized in Table A-III.

Influence of Bank Size — Means of classifying uncollected funds appear to be related to bank size, the percentages specified above tending to be higher for smaller banks. Influences of bank size are estimated by using dummy variables (see Table A-III for specification of those variables).

Classification of Uncollected Funds by Member Banks — Ratios of CIPC to demand balances due from correspondents for *member* banks may be systematically related to the same ratio for nonmember banks of similar size in the same state. Independent variables reflecting the practices by member banks of reporting uncollected funds are constructed in the same way as the dependent variables specified above.

Geographic and transportation factors may influence the speed with which checks are collected by both member and nonmember banks in different states. Including independent variables based upon the ratios for member banks of CIPC to balances due from correspondents would account for these common influences on uncollected funds.

Another reason for including these measures for member banks is the variation among correspondent banks in methods of accounting for uncollected funds. Most of the observations in this paper are for banks with total deposits of less than $50 million. Many member banks in that size range clear checks through correspondents instead of through the FRS.[4] For these member banks, the practice of classifying uncollected funds as CIPC or balances due from correspondents will be influenced by the accounting practices of the correspondent banks through which they and nonmember banks clear checks. Member banks have no incentive to classify uncollected funds as due from balances, since both CIPC and demand balances due from correspondents are subtracted from gross demand deposits to determine demand deposits subject to member bank reserve requirements.

Use of these measures for member banks as independent variables could bias the results. Correspondents might adjust their methods of accounting for uncollected funds to accommodate the desire of nonmembers to use uncollected funds to meet state reserve requirements. Methods of accounting for uncollected funds by member banks would reflect, to some extent, the accommodation of correspondents to nonmember bank wishes. In this case, inclusion of variables for classification of uncollected funds by member banks in the regression analysis would bias downward the estimated influence of state reserve requirements on the classification of uncollected funds by nonmembers. To allow for such bias, variables for member banks are removed in some regression equations.

Classification of CIPC in State Reserve Requirements — A dummy variable is specified to reflect the incentives of nonmember banks to classify uncollected funds as demand balances due from correspondents: EFF has a value of unity for states that have cash reserve requirements and do not count CIPC as reserves, and has a value of zero otherwise.[5]

Measurement of State Reserve Requirements — Levels of state reserve requirements are difficult to compare. Some apply to demand deposits only; others apply to all deposits grouped together. Most states have different reserve requirements for demand and time deposits. Reserve requirements are flat percentages in some states and graduated in others. Thus, comparison of reserve requirements among states depends upon the size of banks for which comparisons are made and the composition of their deposit liabilities.

If a state allows nonmember banks to meet all of their reserve requirements with interest-earning assets, that state is considered to have no cash reserve requirements. Levels of reserve requirements are not calculated for those states. For each nonmember bank in other states, the relative level of state cash reserve requirements is measured by calculating cash reserves that would be required as a Federal Reserve member, subtracting cash reserves required as a nonmember, and dividing the difference by total deposits. This ratio, denoted as RR, is averaged for banks in each size group in the various states.

Monitoring and Enforcing State Reserve Requirements — There is substantial variation among states in procedures for monitoring the reserve positions of nonmember banks and for enforcing state reserve requirements. Dummy variables are used to reflect differences in reserve settlement periods, in methods of monitoring reserve posi-

[4]R. Alton Gilbert, "Utilization of Federal Reserve Bank Services By Member Banks: Implications for the Costs and Benefits of Membership," this *Review* (August 1977), pp. 2-15.

[5]Values for the levels of state cash reserve requirements and the indicators of monitoring and enforcement discussed below are set equal to zero for states that count CIPC as reserves and for those states with no cash reserve requirements.

Table A-IV

EFFECTS OF STATE RESERVE REQUIREMENTS ON THE REPORTING OF UNCOLLECTED FUNDS BY NONMEMBER BANKS

INDEPENDENT VARIABLES
(t-statistics in parentheses under regression coefficients)

Equation Number	Size 10	Size 50	Size 100	MPC 0	MPCI 25	EFF	EFF*RR	EFF*RR* REC EXAM	EFF*RR* REP DEF	EFF*RR* WEEKLY	Constant	$\bar{R}^2$	Standard Error	Degrees of Freedom[a]
(Dependent variable: percent of nonmember banks reporting CIPC as zero)														
1	38.65	8.64	−0.99								19.45	0.495	15.582	77
	(5.094)	(1.169)	(−0.113)								(2.791)			
2	8.47	−3.19	−3.10	0.87							15.92	0.775	10.404	76
	(1.429)	(−0.628)	(−0.533)	(9.834)							(3.412)			
3	8.80	−3.17	−3.22	0.85		4.01					14.41	0.781	10.270	75
	(1.504)	(−0.633)	(−0.561)	(9.583)		(1.734)					(3.074)			
4	7.91	−3.67	−3.56	0.85		4.75	−1.21				14.86	0.780	10.284	74
	(1.331)	(−0.727)	(−0.619)	(9.610)		(1.929)	(−0.890)				(3.147)			
5	37.77	8.09	−1.31			7.39					16.49	0.519	15.216	76
	(5.091)	(1.120)	(−0.155)			(2.180)					(2.377)			
6	37.65	8.01	−1.371			7.52	−0.21				16.57	0.513	15.315	75
	(4.984)	(1.097)	(−0.160)			(2.067)	(−0.104)				(2.358)			
7	34.35	8.276	−3.718			7.02					16.66	0.507	14.829	93
	(5.272)	(1.279)	(−0.501)			(2.343)					(2.671)			
(Dependent variable: percent of nonmember banks reporting CIPC as less than 25% of demand balances at correspondents)														
8	13.34	8.14	−2.74								80.50	0.246	8.542	77
	(3.207)	(2.010)	(−0.575)								(21.073)			
9	5.73	2.59	−4.58		0.15						75.62	0.296	8.254	76
	(1.145)	(0.579)	(−0.983)		(2.545)						(18.176)			
10	5.90	2.69	−4.50		0.16	−2.44					76.52	0.303	8.212	75
	(1.184)	(0.603)	(−0.971)		(2.597)	(−1.334)					(18.246)			
11	13.61	8.32	−2.64			−2.30					81.42	0.251	8.516	76
	(3.277)	(2.057)	(−0.555)			(−1.211)					(20.966)			
12	13.45	8.22	−2.72			−2.12	−0.29				81.53	0.241	8.569	75
	(3.181)	(2.011)	(−0.567)			(−1.041)	(−0.254)				(20.738)			
13	14.20	8.53	−0.09					7.50	−8.02	−2.12	80.69	0.361	7.865	74
	(3.671)	(2.276)	(−0.020)					(3.720)	(−3.559)	(−1.409)	(22.659)			
14	11.08	7.24	−4.34								81.37	0.225	8.903	94
	(2.833)	(1.864)	(−0.974)								(22.388)			
15	11.29	7.45	−2.38					6.01	−7.97	−1.91	81.95	0.304	8.436	91
	(3.033)	(2.016)	(−0.559)					(2.994)	(−3.495)	(−1.184)	(23.604)			

[a]Observations are for size groups in states with 10 or more nonmembers and 10 or more members, except equations 7, 14, and 15, which are for groups with 10 or more nonmembers with no minimum number of members.

tions of nonmember banks, and in penalties for reserve deficiencies.

Interaction Terms — Variation in the level of state reserve requirements may have a stronger effect on the classification of uncollected funds by nonmember banks in those states with more strict monitoring and enforcement of state reserve requirements. Interaction terms for the level of reserve requirements and dummy variables for enforcement are included as independent variables to test this hypothesis.

Empirical Results

In the first seven equations in Table A-IV, the dependent variable is the percentage of nonmember banks reporting CIPC equal to zero. The percentage of *member* banks reporting CIPC as zero is positively related to that percentage for nonmember banks [equations (2) – (4)]. Thus, the accounting practices of member and nonmember banks appear to reflect the common influences discussed above.

The one aspect of state reserve requirements which influences the percentage of nonmember banks that report CIPC as zero is the variable for states that have cash reserve requirements and do *not* count CIPC as reserves (EFF), having a positive influence as hypothesized [equations (5) – (7)]. Among states with cash reserve requirements which do not count CIPC as reserves, the level of reserve requirements (RR) does not add significantly to the explanation of the dependent variable [equation (6)].

However, when the percentage of member banks reporting CIPC as zero is included as an independent variable, the variable that reflects the status of CIPC in state reserve requirements (EFF) is not significant [equations (3) and (4)]. This result is consistent with the view that both member and nonmember banks base their methods of accounting for uncollected funds upon the accounting methods of correspondent banks, and that correspondent banks adjust their accounting methods to serve the interests of nonmember banks in meeting reserve requirements.

Equations (8) – (15) of Table A-IV present regression results with another dependent variable — the percentage of nonmemebr banks reporting CIPC which is less than 25 percent of their demand balances due from correspondents.[6] Several measures of state reserve requirements are significant, if the variable reflecting the reporting of uncollected funds by member banks is eliminated from regressions. The combination of measures of reserve requirements which yields the lowest standard error [reported in equation (13)] includes levels of state reserve requirements (RR), dummy variables reflecting differences among states in treatment of CIPC as reserves (EFF), and methods of monitoring reserve positions of nonmember banks (REC EXAM, REP DEF, and WEEKLY).[7]

[6]Effects of state reserve requirements were insignificant with the percentage of banks reporting CIPC which is less than ten percent of due from balances as the dependent variable.

[7]Value of the F-statistic for testing the combined influence of these three variables, compared to the explanation due to bank size variables alone, is 5.61. With 3 degrees of freedom in the numerator and 74 in the denominator, the F-statistic is significant at the 0.5 percent level. Equations (8) and (13) were reestimated with the expanded sample used in equation (7). The combination of variables reflecting state reserve requirements in equation (15) is significant at the 5 percent level (F-statistic of 4.564 with degrees of freedom of 3 and 91).

EFFECTS OF STATE RESERVE REQUIREMENTS ON CHOICE OF MEMBERSHIP STATUS BY BANKS

Specification of Variables

Percentage of banks that are members (as of June 1976) is the dependent variable. Membership status is strongly related to bank size; most very small banks are nonmembers and most large banks are members (see Table A-V). Effects of bank size are held constant by calculating the percentage of banks that are members in individual size groups in the various states, using the same size categories as in the previous sections.[8] Independent variables and hypotheses concerning the direction of influence of these variables on the percentage of banks that are Federal Reserve members are presented in Table A-III.

Empirical Results

Regression results are presented in Table A-VI. One test involves two measures of reserve requirement levels as

Table A-V

PERCENT OF INSURED COMMERCIAL BANKS IN EACH SIZE GROUP THAT WERE MEMBERS OF THE FEDERAL RESERVE SYSTEM AS OF DECEMBER 31, 1976

Asset Size (in millions)	Percent
$ 5 or less	18.7%
5 - 9.9	25.5
10 - 24.9	38.0
25 - 49.9	48.9
50 - 99.9	58.5
100 - 299.9	66.3
300 - 499.9	78.6
500 or more	86.7

Source: Federal Deposit Insurance Corporation

[8]The influence of state reserve requirements on choice of membership status by banks has been tested in other studies. See Chris Joseph Prestopino, "Do Higher Reserve Requirements Discourage Federal Reserve Membership?," *Journal of Finance* (December 1976), pp. 1471-80; John T. Rose, "Do Higher Reserve Requirements Discourage Federal Reserve Membership?: Comment," Board of Governors of the Federal Reserve System, mineo, June 1977. However, a major problem with those studies is that percentages of banks in the Federal Reserve System are calculated for entire states. They include measures to reflect the size distributions of banks in individual states. The approach in this study probably deals with that effect more directly. Another advantage of the approach in this paper is that it increases the number of degrees of freedom for statistical tests.

Table A-VI

EFFECTS OF STATE RESERVE REQUIREMENTS ON THE PERCENT OF BANKS THAT ARE FEDERAL RESERVE MEMBERS

INDEPENDENT VARIABLES
(t-statistics in parentheses under regression coefficients)

Equation Number	Size 10	Size 50	Size 100	RR	NE	RR* Ratio 150	REPORT	REC EXAM	REP DEF	LO PEN	Constant	$\bar{R}^2$	Standard Error	Degrees of Freedom[a]
1	−38.04 (−6.573)	−23.69 (−4.165)	−9.82 (−1.582)								68.95 (13.709)	0.340	17.422	111
2	−37.46 (−6.368)	−23.36 (−4.080)	−9.62 (−1.544)	0.12 (0.091)	5.89 (1.138)						67.91 (13.152)	0.336	17.477	109
3	−36.99 (−6.238)	−22.64 (−3.889)	−8.76 (−1.379)	−0.41 (−0.269)	5.39 (1.030)	2.81 (0.738)					67.82 (13.105)	0.333	17.514	108
4	−36.16 (−5.513)	−22.41 (−3.457)	−8.74 (−1.238)				13.99 (3.383)				66.97 (11.615)	0.297	18.234	98
5	−34.85 (−5.577)	−20.79 (−3.364)	−8.74 (−1.302)					−14.46 (−4.225)			62.77 (11.170)	0.365	17.334	97
6	−35.91 (−5.926)	−21.95 (−3.666)	−9.46 (−1.450)						5.35 (1.228)		75.65 (13.251)	0.400	16.844	97
7	−34.20 (−5.468)	−20.13 (−3.254)	−8.20 (−1.223)				15.52 (3.602)				60.71 (10.375)	0.368	17.289	96
8	−34.11 (−5.536)	−20.06 (−3.291)	−7.85 (−1.185)				11.75 (2.784)			−8.92 (−2.014)	64.34 (11.514)	0.384	17.067	96

[a]Observations in equations (1) - (8) are for size groups in all states with five or more members and five or more nonmembers. Observations in the remaining equations exclude size groups in states with no cash reserve requirements.

independent variables: the measure of the level of cash reserve requirements (RR) and a dummy variable for states in which there are no cash reserve requirements (NE) [equation (2)]. The regression coefficients of those variables are not significant.

The regression coefficient for the level of state reserve requirements might be insignificant due to variation among states in the amounts of cash assets that banks hold in relation to their required reserves. In some states nonmember banks hold cash assets which, on average, are several times larger than required reserves, while in other states the ratios of reserves to required reserves are close to unity. Influence of the level of state reserve requirements on the percentage of banks that are Fed members might be greatest in those states in which cash holdings are relatively close to required cash reserves.

This hypothesis is tested by adding an independent variable calculated as the level of reserve requirements (RR) multiplied by a dummy variable with a value of unity if cash reserves are less than 150 percent of required cash reserves, and zero otherwise (Ratio 150). This variable is insignificant. Therefore, if state reserve requirements influence choice of membership status, the effects will have to reflect aspects of those requirements other than just the levels of cash requirements.

The most significant aspect of state reserve requirements in influencing membership choice is the procedure for reporting reserve positions to state banking authorities. The percentage of banks which are members is significantly higher in states that require nonmember banks to file periodic reports on their reserve positions (REPORT) [equation (5)].[9]

Some states monitor the reserve positions of banks by requiring them to report reserve deficiencies to the banking authorities shortly after incurring reserve deficiencies. The regression coefficient of a dummy variable which reflects this requirement (REP DEF) is not significantly different from zero [equation (7)]. With the

[9]The dummy variable for states in which nonmember banks do not send reports to their state banking authorities, but keep records of reserve positions for inspection by examiners (REC EXAM), has a negative regression coefficient which is approximately the same in absolute value as the regression coefficient for REPORT [equation (6)]. This result indicates that these two variables provide essentially the same information. In all but 18 of the 102 observations, either one or the other has a value of unity. Of these two variables, only REPORT is used in the other equations.

variable for periodic reporting of reserve positions to state banking authorities (REPORT) as an independent variable, the requirement of reporting reserve deficiencies (REP DEF) does not significantly influence the membership choice of banks.

Another variable which does significantly influence the percentage of banks in the Federal Reserve is a dummy variable for states which indicated that their dollar penalties for reserve deficiencies are relatively low or seldom imposed (LO PEN). The regression coefficient for this variable is negative [equation (8)], indicating that the percentage of members is relatively low in such states.[10]

[10]In regressions not reported in Table A-VI, the dummy variable for states with more strict enforcement of dollar penalties for reserve deficiencies (HI PEN) was substituted for LO PEN, other variables the same as in equation (8). The regression coefficient of HI PEN was not significantly different from zero. Additional tests were conducted to determine whether differences in levels of reserve requirements among states have significant influences on the percentage of banks that are members if significant features of state policies on monitoring and enforcement are held constant. Those tests involved adding independent variables derived by multiplying the measure for levels of reserve requirements (RR) by each of the significant dummy variables for enforcement (REPORT, LO PEN). In those equations (not reported in Table A-VI) the regression coefficient for those additional independent variables were insignificant.