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DETERMINANTS OF CORRESPONDENT BANKING RELATIONSHIPS

WITH THE FEDERAL RESERVE SYSTEM

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The views expressed here are solely those of the authors and do not necessarily reflect the views of the Federal Reserve Bank of Richmond.

# Determinants of Correspondent Banking Relationships with the Federal Reserve System

## I. INTRODUCTION

In addition to its central banking responsibilities, the Federal Reserve System also plays an important role in correspondent banking. The twelve Federal Reserve banks supply services, including check collection, wire transfer of funds, provision of currency and coin, and safekeeping of securities, to thousands of financial institutions. It is estimated that the operating cost of providing such services exceeded \$400 million in 1978, which is more than two-thirds of total Federal Reserve operating expenses for the year.<sup>1</sup>

Historically, the System has offered its services to member banks free of explicit charge, with access to these services being largely restricted to member banks. The primary intent of Federal Reserve pricing and access policy has been to make System services cost-free benefits available directly only through membership. The availability of such services to member banks is considered a partial offset to the opportunity cost of holding nonearning reserve balances with the Federal Reserve. Legislation now being considered by Congress would require full cost pricing of and open access to System services by all depository institutions. Changes such as these would increase competition between commercial correspondent banks and the Federal Reserve, since correspondent banks would be free to choose a supplier of services primarily on the basis of price and quality rather than Federal Reserve membership status. Shifts in the existing pattern of demand for correspondent banking services would likely result from increased competition.

The factors explaining demand for correspondent services supplied by commercial banks have been investigated [4,6], but lack of data has prevented a study of correspondent relationships with Federal Reserve banks. Given the

Federal Reserve's substantial involvement in correspondent banking, and in view of the movement toward more competition in correspondent banking, a study of bank demand for System services is in order. More specifically, it would be useful to know how individual services offered by the Federal Reserve benefit their users. Also of interest are the characteristics of banks that use System services. This information would help financial institutions, including Federal Reserve banks, estimate changes in demand for their services in a more competitive correspondent banking environment.

This paper is a study of the use of Federal Reserve System services by member and nonmember banks in the five Fifth Federal Reserve District states.<sup>2</sup> Section II of the article describes the data base, defines the variables used in empirical tests conducted in subsequent sections, and outlines the method used in selecting the regression models. The benefits from use of System services, measured by the effect such use has on compensating balances held with private correspondent banks, is examined in Section III. A two-stage decision framework is introduced in Section IV to identify banks that use System versus private correspondent services. This framework is extended in Section V to explain the volume of services consumed. The main conclusions are summarized in Section VI.

## II. REVIEW OF DATA BASE AND REGRESSION METHODS

The data base is constructed around 759 commercial banks operating in the five states on June 30, 1977 that were not absorbed through merger over the period ending in January 1978. Data for each bank are of three basic types: 1) financial data; 2) structure data, e.g., holding company status, location, etc.; and 3) Federal Reserve service use data.

All financial data are taken from the June 30, 1977 Report of Condition.<sup>3</sup> Financial variables are defined as follows (dependent variables are marked by \*):

TD = total deposits, in thousands of dollars;

CI/TL = ratio of commercial and industrial loans to total loans;

TL/TD = ratio of total loans to total deposits;

FFS/TD = ratio of Federal funds sold to total deposits;

IPCDD/TD = ratio of demand deposits of individuals, partnerships, and corporations to total deposits;

DF/TD\* = ratio of demand balances due from domestic commercial banks to total deposits; and

CIPDF/TD\* = ratio of cash items in process of collection plus demand balances due from domestic commercial banks to total deposits.

Bank structure data are taken from the Federal Reserve Bank of Richmond structure file for June 30, 1977. All the variables are binary variables and are defined as follows:

BHC = 1 if the bank is holding company affiliated, 0 otherwise;

SMSA = 1 if the bank is located in a Standard Metropolitan Statistical Area, 0 otherwise;

MN = 1 if the bank is a member of the Federal Reserve System, 0 otherwise;

MD = 1 if the bank is located in Maryland, 0 otherwise;

NC = 1 if the bank is located in North Carolina, 0 otherwise;

SC = 1 if the bank is located in South Carolina, 0 otherwise; and

VA = 1 if the bank is located in Virginia, 0 otherwise.

Data on commercial bank use of System services are from a special survey of Federal Reserve offices in the Fifth District conducted during the two month period December 1977-January 1978. Services included in the survey are: check collection; delivery of currency and coin; safekeeping of U.S. Government, Federal agency, municipal, and private securities; wire transfer of funds; and borrowing through the discount window. Except for check collection, direct use of these five services is limited to member banks. In the case of check collection, nonmember banks have direct deposit privileges for Regional Check Processing Center (RCPC) area clearing on the same terms as do member banks, except that settlement must be made through a member bank's reserve account. In the Fifth District, state boundaries correspond closely to RCPC area boundaries, an arrangement that gives nonmember banks clearing privileges for most items drawn

on banks in their state. Service use variables are defined as follows

(dependent variables are marked by \*):

CCV\* = daily average volume of regular checks cleared during a one month sample period by member and nonmember banks using the service (excludes government checks, postal money orders, and private checks shipped directly to Federal Reserve offices outside the Fifth District);

CCU\* = 1 if the bank direct deposits checks for clearing with the Federal Reserve, 0 otherwise;

MT = 1 if the bank receives currency and coin delivery, 0 otherwise;

SS = 1 if the bank has securities on account with the Federal Reserve for safekeeping, 0 otherwise;

WTV\* = volume of wire transfers initiated during a one month sample period by member banks using the service;

WTU\* = 1 if the member bank initiates wire transfers of funds using the Federal Reserve wire service, 0 otherwise, and

DWI\* = index of discount window use by member banks during 1977, defined as the number of reserve periods during which the bank borrowed times borrowings as a percent of required reserves across reserve periods during which borrowing occurred.<sup>4</sup>

Table 1 is a summary of the number of member and nonmember banks that actually use these services. The table gives the number of observations for variables entering the regressions presented below.

The regression equations discussed in the following two sections are presented in tables that list explanatory variables across the top. All of the explanatory variables enter the pooled data equations in Table 2. In the other equations, coefficients are estimated for only some of the regressors listed. These equations were chosen on the basis of a forward selection procedure using all of the theoretically reasonable regressors, with  $\bar{R}^2$  as the choice criterion [5, p. 125]. To check the assumption that the regression residuals have a common variance and are not systematically influenced by bank size, Glejser regressions were run for each equation having TD as an independent variable [5, p. 262]. These tests indicate that there are no problems with heteroscedasticity due to size.

Linear, log-linear, and log-log forms were tested, and the form giving

the best fit appears in the tables.<sup>5</sup> The regressions in Section IV are of the dummy dependent variable type and are estimated using the maximum-likelihood method under the assumption that the functional form relating the binomial probabilities to the explanatory variables is logistic. The logit model is discussed in more detail later.

### III. MEASURING THE BENEFITS FROM USING FEDERAL RESERVE SERVICES

The services offered by Federal Reserve banks are to varying degrees substitutes for similar services available through the private correspondent banking system.<sup>6</sup> Whereas System services are provided without explicit charge, services obtained from private correspondents carry a cost, usually in the form of a compensating balance requirement. Use of Federal Reserve services is beneficial if it allows banks to reduce due from compensating balances. Compensating balance requirements are determined by factors in addition to correspondent services, however.

Empirical work dealing with the determinants of correspondent balances is limited. Lawrence and Lougee [4] estimate a linear equation with the dollar amount of due from balances on the left hand side using 1966 Call Report data for 262 banks less than \$100 million in asset size and located in three western states. Their results indicate that bank size and membership status are the dominant factors influencing the dollar amount of due from balances held; due from balances are positively related to size but are lower for member banks. Meinster and Mohindru [6] analyze the ratio of correspondent balances to total deposits using daily average financial data for June 1970 for a sample of 65 independent banks less than \$400 million in deposit size and located in three northeastern states. Their results support the hypothesis that the proportion of correspondent balances held is influenced primarily by liquidity needs and very little by the use of correspondent services. Neither study, however, takes into account possible differences between book balances and collected balances.<sup>7</sup>

Table 2 contains the results of six regression equations designed to test the influence of certain service, financial, and bank structure variables on the ratios of 1) due from correspondent balances to total deposits for member banks using the Federal Reserve System check collection service and 2) cash items in process of collection plus due from balances to total deposits for all member banks. The independent variables summarize factors found to be important determinants of correspondent balances in previous studies. The observations in equation 2.1, which has DF/TD as a dependent variable, are limited to member banks clearing checks directly through Reserve banks. This restriction is made in order to allow for differences in accounting procedures between the Federal Reserve and private correspondents that make it difficult to differentiate book balances from collected balances. Since all the banks entering equation 2.1 clear checks directly through the Federal Reserve, this accounting problem is minimized, although it is not necessarily completely avoided since some banks clear checks through both Federal Reserve banks and commercial correspondent banks. Nonetheless, the dependent variable DF/TD provides the best available measure of collected due from balances to total deposits for this group of member banks. Very few banks clear checks through the System but do not use other Federal Reserve services. This limits degrees of freedom and consequently restricts estimation of DF/TD to one pooled data equation.

The first five regressors listed in Table 2 represent individual Federal Reserve System services. These services can be thought of as substitutes for similar services offered by private correspondent banks. It is expected that use of these services acts to reduce the proportion of due from balances held with private correspondents. The check clearing variable is not included in equation 2.1 since all of the banks use the service; if check clearing does influence the proportion of due from balances held, the effect is captured in the constant term. The MT, SS, and WTV variables enter equation 2.1 with the expected negative signs but with low t-statistics. Since their use is not significant in allowing member

banks to reduce compensating balances, the three services can be described as poor substitutes for similar services obtained through private correspondent banks. The discount window, unexpectedly, is positively related to the due from ratio.

The commercial and industrial loan to total loan variable is a proxy for the need for loan participations, a service available from correspondent banks but not the Federal Reserve. As the proportion of large loans, e.g., business loans, grows relative to total loans, the need for loan participations will increase. The CI/TL proxy variable, therefore, is expected to contribute to higher due from ratios. The next independent variable, the proportion of total loans to total deposits, is included as a proxy for bank liquidity. Higher TL/TD ratios, which are usually considered to be indicative of lower liquidity, are expected to increase the need for correspondent bank balances. Both the loan participation and liquidity requirement proxies have positive signs, but only the latter is significantly different from zero.

The last independent variables test for bank structure effects. The bank holding company dummy variable tests the hypothesis that holding company affiliation introduces economies of scale, for example, through centralized management of cash positions, that allow affiliated banks to minimize due from balances compared to independent banks. Likewise, location in a metropolitan area, represented by the SMSA dummy variable, can be thought of as working to reduce due from balances. Respondent banks located in SMSA's are nearer major correspondents than country banks, proximity acting to reduce the cost of providing an equivalent amount of services to an urban as compared to a more distant country respondent bank. The SMSA coefficient does not have the expected sign but is not significantly different from zero. The BHC coefficient has the expected negative sign and is significant at the .01 level.

Equations 2.2 - 2.6 have as their dependent variable a ratio with the sum of cash items in process of collection and due from balances in the numerator

and total deposits in the denominator. This specification allows inclusion of member banks that clear checks with private correspondents as part of the data base, since adding cash items in process to due from balances holds constant any differences in accounting treatment of these items by private correspondents and Federal Reserve banks. It should be noted that the dependent variable CIPDF/TD accurately reflects differences in compensating balances due to service use only if the member banks using System check clearing services do not themselves act as correspondents. Otherwise, their cash items in process would be inflated with the clearings of other banks. Comparison of the mean values of the dependent variables for the stratified regressions suggests that the assumption that member banks do not act as correspondents is reasonable only in the three smallest size groups. The dummy variable CCU is added to these equations to measure the effects of use of the Federal Reserve check clearing service on member bank CIPC plus due from to total deposit ratios.

The check collection variable enters equation 2.2, the pooled data regression, with a negative sign at the .10 level of significance. This indicates that use of the Federal Reserve check clearing service allows member banks to reduce compensating balances. The stratified regressions indicate that use of the System check collection service results in significantly reduced CIPDF/TD ratios only for member banks in the \$25-50 million deposit size range. The CCU coefficient in equation 2.4 indicates that banks in the \$25-50 million deposit size range hold a combination of cash items in process and due from balances to total deposits that is 1.36 percentage points less than member bank nonusers of the check clearing service. The CCU variable enters equation 2.6 for the largest size group at the .10 level of significance but with a positive coefficient. This is a reasonable result given the size of the banks involved, indicating that large member banks using the System check clearing service act as correspondent clearing banks. The SMSA variable enters equations 2.2, 2.3, and 2.6 significantly and with positive sign, lending support to the idea that

metropolitan area banks have a greater dollar volume of check clearings than do country banks.

These results indicate that liquidity needs and holding company affiliation are more important determinants of due from balances held with correspondents than are Federal Reserve services. Nonetheless, the System check clearing service is a significant factor allowing user banks to economize on correspondent balances. The evidence also suggests that some member banks may be able to hold lower compensating balances by using Federal Reserve money transfer, security safekeeping, and wire transfer services. It is important to note that a substantial amount of the variation in the two dependent variables is not explained by the regressions. Other factors need to be considered in the search for a more complete understanding of correspondent balances.

#### IV. CHARACTERISTICS OF BANKS USING FEDERAL RESERVE SYSTEM SERVICES

Although Federal Reserve services appear to be only marginally important in allowing banks to reduce correspondent balances, it is nonetheless true that many member banks use them. These user banks may have common characteristics that explain why they establish correspondent relationships with the Federal Reserve. These characteristics are the non-price factors underlying demand for System services. If the Federal Reserve begins to explicitly charge for its services, knowledge of these factors would help identify banks that would be likely to shift to alternative sources of correspondent services.

Commercial banks face two basic decisions regarding use of correspondent services: first, whether to obtain services from Federal Reserve banks or private correspondent banks and second, how intensively to use such services. Thus, a two-stage decision framework is useful for analyzing bank service use.<sup>8</sup> With regard to the first decision, previous studies by Gilbert [1], Greenbaum [2], and Summers [7] show that relatively few banks have made

the decision to use Federal Reserve System services. Gilbert [1] has advanced the hypothesis that the System's procedural and operating standards act as administrative deterrents to service use, while Summers [7] has suggested that the availability of System services is geographically uneven, leading to greater use among some groups of banks than others. These hypotheses are tested for two Federal Reserve services, check collection and wire transfer of funds.

Identifying the characteristics of banks that use Federal Reserve System services can be accomplished by estimating equations with dummy dependent variables, where the outcome 1 is associated with use and the outcome 0 is associated with nonuse. Binary choice models are presented in Table 3 for users and nonusers of System check clearing and wire transfer services. The coefficients in the models are estimated using the maximum-likelihood method under the assumption of a logistic probability distribution [5, p. 162]. The coefficients indicate the direction and size of the effect of the independent variables in determining selection probabilities for the sample observations. Estimated probabilities greater than .50 lead to selection of the dummy dependent variable 1, while probabilities less than .50 lead to selection of the variable 0.

Total deposit and bank holding company variables are included to test Gilbert's administrative capacity hypothesis. Bank size (total deposits) is hypothesized to be positively related to service use, since larger banks have greater administrative capacity and therefore greater ability to directly manage use of System services than do smaller banks. Bank holding company affiliation is expected to positively influence the likelihood of service use since BHC affiliates can draw on the administrative capacity of their parent to take advantage of System services. SMSA and state dummy variables are included as tests of Summers' proposition that availability of Federal Reserve services may be geographically uneven. Location in an SMSA should positively influence the decision to use Federal Reserve services if metropolitan location makes physical access to Federal Reserve processing centers and transportation relay points easier compared to rural location. The state dummy variables are in-

tended to capture regionally unique influences that are difficult to measure directly, e.g., the effects of natural geographic barriers and transportation systems on availability of System services. An additional variable, the ratio of IPC demand deposits to total deposits, is included to test whether banks with higher proportions of demand deposits, and thus greater transaction account servicing requirements, prefer to establish direct contact with the Federal Reserve. The MN dummy is included in equation 3.1 since both member and nonmember banks are eligible to use System check clearing services.

The CCU equation has a negative and highly significant constant term, indicating that the majority of banks do not use the System check clearing service. The variable IPCDD/TD does not make any contribution to the estimate, while bank size, holding company affiliation and metropolitan location all significantly increase the probability of using the check clearing service. Bank location in North Carolina and South Carolina also significantly increase this probability, while location in Virginia decreases the probability when compared to the control state, West Virginia. The MN dummy is positive and significant, indicating greater probability of use by member banks.

There are some interesting contrasts between the results for the CCU and WTU equations. First, the constant term in the WTU equation is positive and significant, indicating that the majority of member banks use System wire transfer services. Unlike equation 3.1, the BHC variable does not enter the WTU equation. Moreover, the influence of the SMSA variable is not as significant. The importance of bank location by state also differs between the two equations, the t-statistics for the state dummies not being nearly as great for WTU as for CCU. Bank size, however, similarly affects System check collection and funds transfer users. In general, it appears that the administrative capacity needed to manage use of the wire transfer service, and the importance of geographic location on its availability, are not nearly as great as for check collection.

## V. FACTORS EXPLAINING THE VOLUME OF SERVICES USED

If a major shift in correspondent relationships away from Federal Reserve banks were to occur as a result of new pricing policies, then it would be useful if private correspondents were able to anticipate changes in the quantity of their services demanded. Regression equations that explain volume of Federal Reserve check collection, wire transfer and discount window services used are presented in Table 4. The first two equations are estimated in log-log form and have daily average volume of the number of checks cleared and monthly volume of the number of wire transfers initiated, respectively, as dependent variables. They are similarly structured and can be treated together.

It is hypothesized that the higher the ratio of private demand deposits to total deposits ( $IPCDD/TD$ ), the greater will be a bank's volume of check clearing and wire transfer activity. It is also natural to expect a strong positive relationship between bank size ( $TD$ ) and the volume of checks cleared and wire transfers initiated. The IPC demand deposit ratio and deposit size enter equation 4.1 with the expected signs and both are significant at the .01 level. The coefficients show that these variables have a nonproportional relationship to check volume:  $CCV$  increases more than proportionally with  $IPCDD/TD$  and less than proportionally with  $TD$ .

The  $IPCDD/TD$  and  $TD$  variables also enter equation 4.2 significantly and with positive signs. Again, the coefficients show a nonproportional relationship to the dependent variable:  $WTV$  increases less than proportionally with  $IPCDD/TD$  and  $TD$ . The finding that volume of Federal Reserve services consumed is relatively greater for smaller compared to larger banks is consistent with results reported by Hume and Russell [3] for banks in the New York Federal Reserve District. An implication of this is that the introduction of full cost pricing for Federal Reserve services will tend to raise small bank expense ratios more than large bank expense ratios, at least insofar as check collection and wire transfer oper-

tions are concerned.

Bank holding company affiliation should have a positive affect on the volume of clearings and transfers if holding company banks are more aggressive than independent banks in seeking out demand accounts. It is also reasonable to expect that urban banks have greater clearings and a greater need to utilize wire transfers than country banks due to more financial activity in urban compared to rural areas, leading to the expectation that the SMSA variable should also be significant and positive. Both variables enter equations 4.1 and 4.2 positively and at least at the .05 level of significance.

The dependent variable CCV in equation 4.1 is observed for both member and nonmember bank users of the check clearing service. The dummy variable MN, therefore, measures differences due to membership status. On the surface, it is expected that the MN coefficient will be positive since member banks have more direct access to the System check clearing service and have had many more years to develop experience with it.<sup>9</sup> The MN dummy, however, enters equation 4.1 with a negative coefficient that is significant at the .20 level. This implies that nonmember banks to some extent use the Federal Reserve's check clearing facilities more intensively than do member banks, even though they are only permitted to clear checks drawn on banks located in RCPC areas and must settle through member bank reserve accounts. Not only do nonmember banks have access to RCPC clearing services without having to bear the "burden" of membership, they seem to take greater advantage of the service than do members of the Federal Reserve. Nonmember access to RCPC's is an institutional arrangement that likely exacerbates the System's membership problem.

The ratio of Federal funds sold to total deposits is tested under the assumption that active participation in the short-term funds market leads to greater bank demand for electronic interbank transfer services. A positive coefficient is expected for FFS/TD, but the variable does not prove to be a significant factor explaining wire transfer volume and therefore does not enter equation 4.2.

- 17 -

Equation 4.3 has as its dependent variable DWI, an index of discount window use by member banks that actually borrowed during 1977. All of the variables listed in Table 4 except the member bank dummy are tested in equation 4.3. Bank size is expected to be positively related to borrowing from the Federal Reserve since this variable is characteristic of more aggressive banking behavior. The ratio of Federal funds sold to total deposits is expected to be negatively related to DWI. A higher ratio of private demand deposits to total deposits might be taken as an index of greater funds variability giving rise to higher liquidity requirements and possible greater borrowing. Likewise, location in an urban area might lead to greater deposit variability and consequently greater borrowing to adjust reserve positions. Finally, the BHC dummy is included to test whether holding company affiliation leads to more active use of the discount window. There is a theory that holding companies avoid Federal Reserve surveillance of discount window borrowing by spreading their use of the facility among affiliates that are System members. If true, this would imply a positive and significant coefficient for the BHC variable. The results for the DWI equation are disappointing. The constant and the bank size variable together explain only 4 percent of the variation in the dependent variable. Use of the discount facility, therefore, seems to depend very little on the financial characteristics tested or on structure characteristics such as location and holding company status.

## VI. CONCLUSIONS

The empirical evidence presented here indicates that Federal Reserve System check clearing, wire transfer, and discount window services allow some member banks to economize on compensating balances held with private correspondent banks. The potential for reducing costs that is associated with use of these services appears limited, however. Strong inverse relationships between use of individual System services and the proportion of due from balances held were not found, suggesting that these services are not perfect substitutes for those offered by private correspondent banks.

The probability that a bank will decide to use Federal Reserve check clearing and wire transfer services is positively related to its administrative capacity to manage the services and its geographic proximity to those services. Small size, lack of holding company backup, and distance from Federal Reserve offices are greater deterrents to the use of the check clearing than to use of the wire transfer service. One implication of this is that Federal Reserve banks are more competitive offering services that do not involve bulk processing and that do not require direct contact with user banks.

Once a bank makes the decision to use Federal Reserve services, the volume of services demanded is influenced by a number of factors. The number of checks cleared and wire transfers initiated increases with bank size, the ratio of private demand deposits to total deposits, holding company affiliation, and urban location. The volume of services consumed is relatively greater for smaller compared to larger banks. For this reason, introduction of full cost pricing of Federal Reserve services would raise expense ratios at smaller user banks more than at large use banks. The unexpected result is obtained that non-member banks using the Federal Reserve check clearing service do so more intensively than do members, even though nonmembers' access to Reserve bank clearing facilities is restricted. Federal Reserve regulations allowing nonmembers access to RCPC clearing, therefore, probably act to make the problem of declining membership worse than it would otherwise be.

It should be kept in mind that the results of this study are specific to commercial banks in the Fifth Federal Reserve District. Generalization based on the results should be done carefully. The approach to data collection and analysis followed here, however, might be a useful guide to further research. Indeed, the findings suggest that analysis of current patterns of demand for Federal Reserve System services can provide information useful to planning for the adjustment to a more competitive correspondent banking system.

## Footnotes

1. This cost estimate is from the Federal Reserve Board's Proposal for Pricing of Federal Reserve Check Collection and Automated Clearing and Settlement Services, dated November 17, 1978.
2. The five states are Maryland, North Carolina, South Carolina, Virginia and West Virginia.
3. The Call Report is used inasmuch as it is the only source of comparable balance sheet information for member and nonmember banks. While single day financial data are not as desirable as data based on daily averages, it is reasonable to assume that deviations between daily average figures and Call Report figures are constant for member and nonmember banks. Moreover, some elements of the balance sheet, such as bank loan portfolios, are not likely to change dramatically in response to official reporting requirements. One balance sheet category, cash assets, may be subject to short-run variation. Tests have shown, however, that data taken from the Call Report are generally representative of the behavior of cash assets over monthly periods prior to the mid-year call date [7].
4. This index is designed to take into account both the frequency and degree of borrowing. There were fifty-two reserve periods in 1977. Hypothetically, if a bank borrowed 100 percent of its average required reserve for every reserve period, its index would equal 52. Conversely, banks that did not borrow at all have an index number of zero.
5. Natural logs are used throughout the article.
6. See [8] for a comparison of Federal Reserve services and services provided through the private correspondent banking system.
7. Private correspondent banks often grant immediate book credit for cash items received for clearing, although they only count collected balances toward compensating balance requirements. Federal Reserve banks, on the other hand, grant credit for funds presented for clearing in accordance with a predetermined collection schedule that involves lags of up to several days. Thus, the reported due from balances of banks clearing checks through private correspondents may be inflated with uncollected funds compared to those of banks clearing directly through the Federal Reserve.
8. This two-stage framework is superior to a simultaneous approach to determining choice between System and private correspondent suppliers and volume of services consumed. Under the simultaneous approach, following say, the tobit model, the dependent variable would be volume of services consumed where a number of observations are massed at the zero limit. However, the fact that observed values of services consumed for nonusers of Federal Reserve System services are zero does not mean that such banks do not use correspondent services. Rather, these banks obtain their services from private correspondents. Using the tobit model would be inappropriate as it assumes that banks not using System services use no correspondent services. This erroneous assumption would lead to biased estimates of the regression parameters.
9. Regional Check Processing Center area clearing was opened to nonmember banks in the early 1970's.

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Table 1

Numerical Summary of Federal Reserve System Service Use  
by Membership Classification and Deposit Size Group

Deposit Size Group (\$ millions)	Total Member	Number of Member Banks Using					Total Nonmember	Number of Nonmember Banks Using Check Collection
		Check Collection	Money Transfer	Security Safekeeping	Wire Transfer	Discount Window		
0-25	202	48	163	156	131	18	256	24
25-50	96	38	79	83	77	16	69	18
50-100	36	20	30	34	32	11	22	14
Over 100	52	39	49	51	50	28	26	18
All banks	386	145	321	324	290	73	373	74
All banks clearing checks through the Federal Reserve	145	145	136	134	129	45	74	74

Table 2

Regression Results for Member Bank Due From Ratios

Equation Number	Deposit Size Group (\$ millions)	Constant	CDR	MT	SS	MTV	DMI	CI/TL	TL/TD	BHC	SMSA	R <sup>2</sup>	SRM	Y	N.O.	F
<div style="border: 1px solid black; padding: 2px; display: inline-block;">                     Dependent Variable: DF/TD                      Functional Form: log-linear                 </div>																
2.1	Pooled data, all member banks clearing checks directly through Fed	-4.3708 (-7.5174)*	1/	-0.1797 (-0.4375)	-0.3966 (-1.4130)	2/ (-0.1372)	0.1134 (1.8035)***	0.6109 (1.1932)	1.1808 (2.1601)**	-0.9471 (-5.5250)*	0.0800 (0.4936)	.20	0.8728	-4.1900	145	5.671
<div style="border: 1px solid black; padding: 2px; display: inline-block;">                     Dependent Variable: CIPDF/TD                      Functional Form: linear                 </div>																
2.2	Pooled data, all member banks	0.0232 (2.9072)*	-0.0052 (-1.6803)***	0.0039 (0.9804)	-0.0005 (-0.1304)	3/ (5.9936)*	-0.0012 (-0.9941)	0.0381 (3.7588)*	0.0157 (1.5362)****	-0.0064 (-1.8029)***	0.0146 (4.5851)*	.20	0.0268	0.0458	186	12.200
2.3	0-25	0.0211 (2.2300)**				0.0002 (1.0408)		0.0392 (2.6491)*	0.0239 (1.6668)***	-0.0078 (-1.3023)****	0.0092 (1.9277)***	.06	0.0396	0.0459	202	1.760
2.4	25-50	0.0288 (3.5823)*	-0.0136 (-2.2951)**	0.0115 (1.3806)****		0.0001 (1.1760)		0.0347 (1.7885)***				.06	0.0769	0.0196	96	2.560
2.5	50-100	0.0349 (9.6067)*				-0.0001 (-1.7619)***	-0.0021 (-2.0345)**	0.0582 (4.2187)*		-0.0129 (-2.6377)**		.34	0.0117	0.0391	36	5.526
2.6	Over 100	0.0016 (0.3471)	0.0135 (1.7160)***			4/ (4.5592)*		0.0791 (2.1036)**			0.0212 (2.7561)*	.60	0.0225	0.0606	52	20.216

Estimation method OLS.

1/ Not tested since all 145 banks use check collection.

Figures in parentheses are t-statistics (two-tailed test).

2/ -0.00007

\*significant at the .01 level

3/ 0.00001

\*\*significant at the .05 level

4/ 0.00000002

\*\*\*significant at the .10 level

\*\*\*\*significant at the .20 level

Table 3  
Logit Results for Check Collection  
and Wire Transfer Services

Equation Number	Dependent Variable	Constant	IPCDM/TD	TD	BIC	SISA	MD	MC	SC	VA	MM	C-ratio <sup>1/</sup>	Percentage correct prediction based on individual selection probabilities
3.1	CCU	-2.7756 (-11.4661)*		2/ (4.5525)*	1.1776 (4.2186)*	0.6789 (3.3556)*		1.7709 (5.8652)*	1.2235 (3.9948)*	-0.7562 (-2.8943)*	1.3918 (6.4909)*	198.674*	78.5
1.7	WU	0.5959 (2.0697)**		3/ (3.6751)*		0.5384 (1.6845)**	-0.3975 (-0.8293)		-11.1459 (0.7423)	-0.4141 (-1.3977)****	X	89.020*	81.0

Estimation method ML.

Figures in parentheses are asymptotic t-ratios.

\*significant at the .01 level

\*\*significant at the .05 level

\*\*\*significant at the .10 level

\*\*\*\*significant at the .20 level

X - variable not tested.

<sup>1/</sup> Tests the hypothesis that the independent variables jointly are significant in explaining the dependent variable. The C-ratio is chi squared distributed.

<sup>2/</sup> 0.00009

<sup>3/</sup> 0.00003

Table 4

Regression Results for Degree of Use of Check Collection,  
Wire Transfer and Discount Window Services

Equation Number	Dependent Variable	Functional Form	Constant	IFCDD/TD	TD	NIC	SHSA	HM	FFS/TD	R <sup>2</sup>	SEB	S	N.O.	F
4.1	CCV	log-log		1.1306 (7.1988)*	0.8618 (43.2071)*	0.2727 (2.4775)**	0.2571 (2.3491)**	-0.1736 (-1.5904)****	X	.77	0.7445	8.0485	219	194.995*
4.2	WTV	log-log	-6.3986 (-9.6811)*	0.5230 (2.2468)**	0.0967 (17.3239)*	0.3733 (2.5012)**	0.7194 (4.9915)*	X		.67	1.0018	2.8399	261 <sup>1/</sup>	136.371*
4.3	DWI	linear	0.2504 (4.1710)*		2/ (4.3264)*			X		.04	1.1223	0.3302	73	18.719*

Estimation method OLS.

Figures in parentheses are t-statistics (two-tailed test).

\* significant at the .01 level

\*\* significant at the .05 level

\*\*\* significant at the .10 level

\*\*\*\* significant at the .20 level

X = variable not tested.

<sup>1/</sup> Observations are over those banks having wire transfer volume greater than one.<sup>2/</sup> 0.0000009