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Market Discipline by Depositors: Evidence from Reduced Form Equations

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MARKET DISCIPLINE BY DEPOSITORS: EVIDENCE FROM REDUCED FROM EQUATIONS

ABSTRACT

This paper examines the effects of the estimated probability of bank failure on the growth rates of large time deposits and interest rates on those deposits. While riskier banks paid higher interest rates, they attracted less large time deposits in the second half of the 1980s. These results indicate that risky banks faced unfavorable supply schedules of large time deposits and, hence, support the presence of market discipline by large time depositors. The empirical analysis also considers the effects of bank size, but fails to find evidence that depositors preferred large banks.

KEYWORDS: Market Discipline, Bank Risk, Uninsured Deposits

JEL CLASSIFICATION: G21

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1. Introduction

The banking turmoil of the 1980s has raised concerns about the riskiness of banks. Since government regulation has limitations and imposes costs both on banks and regulators, banking authorities may more effectively discourage banks from taking risks by subjecting them to increased market discipline by debtholders. Depositors are the major debtholders of banks. Thus, it is an important question if depositors can impose reliable market discipline on banks.

Many previous studies find that riskier banks offer higher interest rates on their uninsured financial instruments.[1] They interpret higher interest rates offered by riskier banks as evidence of market discipline. Suppliers of uninsured funds compel risky banks to compensate high risks with high interest rates. To make the argument more convincing, however, we need to incorporate the quantity of uninsured funds in the analysis. The riskiness of banks may influence both the demand and supply of uninsured funds. To finance aggressive expansion, risky banks may want to rely more heavily on uninsured funds that are more sensitive to interest rates. Thus, higher interest rates may result from a leftward shift of the supply curve, a rightward shift of the demand curve, or both.

This paper studies the behavior of large time deposits ($100,000 or more) in the second half of the 1980s when bank failure rates were high. The behavior of the deposits that are not fully insured should reflect the depositors' ability to measure the failure risk of banks. The empirical study focuses on the effects of the riskiness of banks on the growth of large time deposits and interest rates

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[1]Those studies include Crane (1976), Baer and Brewer (1986), James (1987), Hannan and Hanweck (1988), and Cargill (1989). Avery *et al.* (1989), on the other hand, fail to find a strong relationship between measures of bank risk and interest rates on subordinated notes and debentures offered by banks.

on those deposits. Bank size will also be considered to examine if the "too big to fail" policy induced depositors to prefer large banks. I make cross-sectional comparison, using the estimated probability of failure as a risk measure. The estimated probability, which combines many risk measures, facilitates the interpretation of results. As mentioned above, a complete analysis requires a simultaneous equation model specifying demand and supply schedules. Due to the difficulties of identifying the demand and supply schedules, however, this paper infers the demand and supply effects from the coefficients of reduced form equations.

The empirical findings support the presence of market discipline by large time depositors. In general, riskier banks offered higher interest on large time deposits but attracted less large time deposits during the period examined by this study. Bank size does not appear to have significantly affected the depositors' selection of banks.

2. Estimation

The estimation involves two steps. In the first step, the probability of bank failure is estimated based on financial statements and actual failure records. The failure probability is probably the most relevant risk measure to large depositors because banks fully pay off depositors as long as they remain in business. In the second step, I examine how the estimated probability of failure affected the growth rates of large time deposits and interest rates on large time deposits.

2.a. Probability of failure

This section builds a failure prediction model to estimate the probability of bank failure. Many previous studies look at the possibility of identifying problem banks based on publicly available information and show that econometric models can predict bank failures with reasonable accuracy. Logistic regressions have been used most frequently in those studies and have produced reasonable results (e.g., Martin (1977), Avery and Hanweck (1984), Barth and others (1985), and Thompson (1991)). This study also adopts a logistic regression. In recent years, some authors adopted more sophisticated estimation techniques such as proportional hazards model (Whalen, 1991), two-step logit (Thompson, 1992) and split-population survival-time model (Cole and Gunther, forthcoming), but results were similar.

The logistic regression is specified such that the estimated probability best serves the purpose of the second-stage analysis, which is to examine the growth rates and interest rates on large time deposits during year t (1985-1989). The dependent variable is failure or nonfailure in year t+1, and explanatory variables are financial characteristics derived from financial statements at the end of year t-1. In year t, depositors have access to year-end financial statements of year t-1. Thus, if depositors are able to process the available information accurately, they may estimate failure probabilities similar to those predicted by the model in year t. Although failure records in year t are also relevant, banks that failed in year t are not considered because we cannot calculate the growth rates and interest rates on large time deposits for those banks.

This analysis employs the Call Report (Consolidated Reports of Condition and Income) data. Unlike most other studies on failure predictions and market discipline that use small subsets of banks, the data set covers the entire population of FDIC-insured commercial banks with a few restrictions. I eliminate the banks less than 5 years old as of the Call Report date. The financial characteristics and growth pattern of relatively new banks may differ from those of established ones, and the differences may not stem from financial problems. For example, new banks may show low income, but low income while cultivating the customer base should not be viewed as a sign of financial trouble. I also exclude the banks that were involved in mergers and acquisitions in year t or t+1 because mergers and acquisitions can significantly affect the growth rate of large time deposits and the failure and survival of banks. In addition, banks that failed within one year from the report date are eliminated for the reasons mentioned above. In cases that many banks belonging to the same bank holding company failed in the same year, only the largest banks in total assets were included in the sample. The failures of smaller institutions can be caused by the failure of the lead bank of a bank holding company, rather than by their own financial problems.

The logistic regression adopts explanatory variables mostly among those variables that have been found significant by previous studies. The independent variables can be classified into the following six categories that include the five components of the examiners' CAMEL ratings.[2]

1. Capital adequacy

CA01 = Equity / total assets

CA02 = (loan loss reserves - loans 90 days or more past due - nonaccruing loans) / total assets

These two variables measure the adequacy of capital.[3]

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[2]CAMEL stands for capital adequacy, asset quality, management, earnings, and liquidity. Examiners analyze the five components to evaluate the financial strength of banks.

[3]Some earlier studies combine these two variables {eg,, Sinkey (1975) and Thompson (1991)}. Since delinquent loans may not result in a dollar for dollar reduction in capital, the two variable may capture capital adequacy more accurately when entered separately.

2. Asset quality

AQ01 = U.S. Treasury and agency securities (book value) / total assets

AQ02 = Other real estates owned / total assets

AQ03 = Total loans / total assets

AQ04 = Net chargeoffs / total loans

AQ05 = Income earned but not collected / total assets

AQ06 = Commercial and industrial loans / total loans

AQ07 = Loans secured by construction and commercial real estate, multifamily residential properties and farmland / total loans

The first three variables are the shares of broad asset categories of differing risk. While U.S. Treasury securities are regarded as relatively safe assets, loans are generally considered risky. Other real estates owned consist largely of foreclosed real estates whose market values are generally lower than the book values. The next four variables measure the quality of loan portfolios. AQ04 indicates collection problems, and AQ05 reflect both collection problems and capital adequacy. Commercial and industrial loans and commercial real estate loans are relatively risky loans.

3. Management risk

MR01 = Overhead (expenses of premises and fixed assets) / total assets

MR02 = Non-interest expenses / revenue

MR03 = Loans to insiders / total assets

The first two variables concern operating efficiency, which may depend on competence of managers. Loans to insiders can partly reflect the honesty of managers.

4. Earnings

EA01 = Net income after taxes / total assets

Current profitability of a bank may be a good indicator of its future performance.

5. Liquidity

LI01 = (Cash + Securities + Federal funds sold) / total assets (LI01)

Larger holdings of liquid assets may enable banks to manage financial problems more flexibly.

6. Others

OT01 = Core deposits (nontransactions accounts + money market deposit accounts + savings deposits) / total assets

OT02 = Natural logarithm of total assets

OT03 = Natural logarithm of total assets of the highest bank holding company

OT04 = the growth rate of the average number of nonfarm payrolls in the state where the bank is located between the year preceding the financial statements and the year of the financial statements.

The first three variables intend to capture banks' ability to raise capital. The ratio of core deposits can be a proxy of banks' charter value. Even if its book value of capital is low, a bank with a large charter value should be able to raise the needed capital to avoid failure. Larger banks, which are better known in financial markets, may suffer less information asymmetry in rasing capital. In addition, the failure probability can be lower for larger banks because of the "too big to fail" policy. It is also possible that the size of holding companies is more relevant than the size of individual banks. The strength of local economies may affect the quality of existing loan portfolios and lending opportunities in the future.

Table 1 presents the results of the logistic regressions that estimate the probability of failure. The coefficients of most variables have expected signs, and all but one variable, AQ03 in 1987, with unexpected signs are statistically insignificant. Both type 1 and type 2 errors (misclassification of failure as nonfailure and misclassification of nonfailure as failure, respectively) at the cutoff probability of 0.01 are mostly under 10 percent, indicating high prediction accuracy.[4] Thus, the regressions provide reliable estimates of failure probability. If depositors are concerned about the risk of banks and able to measure the risk, they may use similar probability estimates in selecting banks. Thus, market discipline by depositors means significant effects of the estimated probability on the depositors' selection of banks.

2.b. Effects of failure probability on large time deposits

To accurately ascertain market discipline by depositors, we need to analyze the behavior of large time deposits in a demand and supply framework that incorporates both the price and quantity. A high failure probability of a bank will make depositors reluctant to deposit in the bank. On the other hand, a bank facing imminent failure may need more funds to turn around the situation by taking risks aggressively. Then the bank may rely heavily on large time deposits because they are relatively sensitive to interest rates.

Ideally, we need to specify a simultaneous equation model with demand and supply equations. It is difficult, however, to identify demand and supply equations due to the lack of exogenous variables that are significant. Thus, this paper estimates the following reduced form equations.

$$IRATE = a_0 + a_1 \cdot PROBA + a_2 \cdot MATUR + a_3 \cdot SHARE$$

$$DEPST = b_0 + b_1 \cdot PROBA + b_2 \cdot MATUR + b_3 \cdot SHARE$$

where INTER = the estimated average interest rate on large time deposits during

[4]The cutoff probability is set at 0.01 because it was about the average failure rate in the second half of the 1980s.

year t (annual interest expenses on large time deposits divided by the average amount of large time deposits outstanding during year t).

DEPST = the growth rate of large time deposits during year t.

PROBA = the estimated probability of failure.

MATUR = the weighted average maturity of large time deposits.

SHARE = the ratio of large time deposits to total assets at the end of year t.

The variables MATUR and SHARE are included to control for accounting relationships. The maturity structure of deposits will affects the average interest rate. The growth rate of large time deposits may relatively be low for banks that are already heavy users of large time deposits.

The two equations above estimate the effects of the failure probability on the equilibrium growth rate and interest rate, resulting from the interaction between the banks' demand and depositors' supply of large time deposits. We can better infer the extent of market discipline, the responsiveness of the supply curve to the failure probability, by looking at both the equilibrium quantity and price, than from the price alone. The following rules of thumb can be constructed in interpreting the results. If the sign of PROBA is:

1. Positive in E1 and positive in E2 - the major effect is a rightward shift of the demand curve.
2. Positive in E1 and negative in E2 - the major effect is a leftward shift of the supply curve.
3. Negative in E1 and positive in E2 - the major effect is a rightward shift of the supply curve.
4. Negative in E1 and negative in E2 - the major effect is a leftward shift of

the demand curve.

The presence of market discipline is most convincingly supported in Case 2, least likely in Case 3, and inconclusive in Cases 1 and 4.

The estimation of the above equations involve some data problems. The estimated interest rates contain several outliers possibly due to reporting errors (see Table 2). Growth rates commonly show some extreme values. The outliers can seriously contaminate regression results. Furthermore, the estimated probability is distributed heavily toward the left tail. The skewed distribution of PROBA suggests that the relationship may not be linear. To remedy these problems, I replace the raw data with their corresponding ranks. With the rank transform, outliers do not significantly affect regression results. In addition, the rank transform improves regression results when the dependent variable is a monotonic but nonlinear function of independent variables (Iman and Conover, 1979). A disadvantage with the rank transform is that the economic significance of explanatory variables cannot be inferred from regression coefficients. Regressions using raw data do not overcome this problem because the magnitude of coefficients is not reliable when the sample contains many outliers. Thus, it is sensible to use a method that estimates statistical significance more accurately.

The regression results are reported in Table 3. The estimated probability positively affected the interest rate in 1985 and 1986, meaning that riskier banks offered higher interest rates on large time deposits in those years. In the following three years, however, the coefficient of PROBA was statistically insignificant. The second set of regressions shows that large time deposits grew faster at banks with low failure probabilities in the all five years examined by this study. A combination of lower equilibrium quantity and the same or high equilibrium price requires a leftward shift of the supply curve. Thus, these results indicate that risky banks faced unfavorable supply schedules of large time deposits and, hence, the presence of market discipline.

2.c. Size of banks

Bank size may also affect the supply of large time deposits. Since the failure of a large banks can disturb the entire banking system, the government is more likely to bail out large banks ("too big to fail" policy). The possibility of government bailouts may make depositors perceive smaller failure probabilities for larger banks. If this is the case, large banks face favorable supply schedules. Then assuming that demand schedules are same across banks of different size, larger banks may enjoy a lower equilibrium price and a higher equilibrium quantity.

Table 4 presents the results of regressions that include banks size (BSIZE), the rank of total assets, as an additional explanatory variable. If depositors perceive that larger banks are safer than the failure probabilities calculated based on actual failure records, BSIZE should have a negative effect on IRATE and a positive effect on DEPST. The estimation shows positive effects of BSIZE both on IRATE and DEPST in 1985 and 1986. The signs of BSIZE reversed in the following three years.[5] In other words, large banks attracted less large time deposits when they offered lower interest rates and more large time deposits when they offered higher interest rates. These results, thus, do not tell much about the effects of bank size on the supply of large time deposits. It appears that large banks differed from small banks in their funding needs, rather than in supply conditions. The regression results suggest that large banks demanded

[5]The results are similar when the size of bank holding companies, instead of banks, is used as an explanatory variable.

less large time deposits in 1985 and 1986 and more large time deposits between 1987 and 1989.

The regression estimating the failure probability includes the size of banks and bank holding companies (OT02 and OT03). Then a possible reason for the failure to find the relationship between bank size and the supply of large time deposits is that the estimated probability of failure already incorporates the effects of the too big to fail policy. To test this possibility, I use failure probabilities (PROBB) estimated by logistic regressions excluding OT03 and OT04. When the two variables are excludes, prediction accuracy is slightly lower, but qualitative results are roughly the same.

Table 5 reports the results of the regressions that use the new estimate of failure probabilities (PROBB). The new regressions do not suggest significant effects of banks size on the supply of large time deposits either. Large banks attracted more large time deposits only when they offered higher interest rates.

Another possibility is that the effects of the too big to fail policy may be confined to a small number of banks. In this case, the large sample used by this study may bury the effects of bank size. To test this possibility, I examine the residuals of the regressions presented in Table 5 for large banks. If only a few large banks enjoyed favorable supply schedules, those banks on average may have paid lower interest rates and attracted more deposits than predicted by the regressions. Then the average residuals should be negative in the regression with the dependent variable IRATE and positive in the regression with the dependent variable DEPST. The average residuals for large banks, however, do not show consistent patterns (Table 6). Thus, this paper fails to support that large banks enjoyed favorable supply schedules due to the too big to fail policy. These analyses, of course, do not reject the effect of bank size on the supply of large time deposits. The estimation of the reduced form equations simply indicates that the demand effect was dominant.[6]

3. Conclusion

This paper has examined how the riskiness of banks affected the depositors supply and banks' demand for large time deposits in the second half of the 1980s. While riskier banks generally paid higher interest rates on large time deposits, they attracted less large time deposits. These results indicate that the high interest rates paid by risky banks resulted from leftward shifts of the supply schedule rather than rightward shifts of the demand schedule of large time deposits. Thus, this paper more convincingly supports the presence of market discipline by depositors than previous studies looking only at the interest rates.

The examination of the effects of bank size fails to support that depositors preferred large banks because of the too big to fail policy. Large banks attracted more large time deposits only when they offered high interest rates. Thus, it appears that the relationship between bank size and interest rates largely reflects the funding need of large banks, rather than depositors' preference.

In sum, large time depositors forced risky banks to pay risk premiums, and the risk premiums were not significantly affected by the too big to fail policy in the second half of the 1980s. Thus, market discipline by depositors contributed to restraining banks from taking risks during the period.

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[6]It is also possible that the estimate of interest rates introduces a systematic bias with respect to bank size. The uninsured portion of large time deposits increases with the average denomination of large time deposits, which may be positively correlated with bank size. Then the average interest rates on large time deposits may be higher for larger banks even if they are perceived safer.

Table 1: Regression Results

Dependent Variable: Failure or Nonfailure

	1985	1986	1987	1988	1989
INTCT	-8.744 (6.5)	8.362* (4.5)	3.622 (4.6)	8.489** (3.2)	5.687 (5.1)
CA01	-29.989** (7.0)	-36.679** (6.2)	-40.782** (6.3)	-36.115** (6.3)	-53.317** (6.5)
CA02	-12.769** (4.3)	-16.323** (3.5)	-12.671** (4.3)	-10.552* (5.0)	-18.438** (4.9)
AQ01	2.115 (2.0)	-0.064 (1.6)	1.163 (1.9)	-4.104* (1.9)	-5.851** (1.8)
AQ02	11.355 (9.1)	9.430 (6.7)	11.337 (6.7)	9.726 (5.2)	6.998 (6.7)
AQ03	7.914 (6.0)	-4.639 (4.0)	1.857 (4.2)	-8.978** (2.8)	-6.839 (4.6)
AQ04	6.548 (6.5)	4.940 (5.2)	-9.979 (6.4)	6.082** (1.6)	12.183* (5.6)
AQ05	96.532** (14.8)	72.256** (14.6)	29.268 (22.4)	68.000** (24.9)	63.000* (26.9)
AQ06	3.177** (0.8)	3.514** (0.8)	2.926** (0.9)	4.149** (1.0)	0.066 (1.1)
AQ07	2.209* (1.1)	1.244 (1.1)	1.389 (1.2)	3.663** (1.2)	3.440** (1.0)
MR01	-28.456 (52.1)	59.002** (15.9)	35.551 (44.0)	4.899 (41.4)	97.181* (42.8)
MR02	3.020 (2.3)	0.140 (1.6)	0.444 (1.6)	0.175 (0.1)	0.189 (1.7)
MR03	7.854* (3.8)	4.425 (2.6)	1.568 (6.1)	4.191 (7.0)	13.877** (4.6)
EA01	-7.506 (11.4)	1.658 (8.5)	-19.749* (9.4)	-14.722* (6.7)	0.641 (9.9)
LI01	-0.352 (6.1)	-10.135* (4.1)	-3.454 (4.2)	-10.482** (3.0)	-4.870 (4.7)
OT01	-5.295** (1.4)	-4.706** (1.2)	-3.502** (1.3)	-4.406** (1.3)	-2.932* (1.2)

OT02	0.676**	0.383	-0.089	0.604	1.005*
	(0.3)	(0.3)	(0.3)	(0.3)	(0.4)
OT03	-0.677**	-0.786**	-0.461**	-0.781**	-0.982**
	(0.2)	(0.2)	(0.2)	(0.3)	(0.4)
OT04	-7.812	-22.281**	-29.625**	-38.631**	-57.652**
	(7.4)	(6.2)	(5.3)	(6.2)	(18.4)
-2 Log L	715.0	845.0	610.7	479.9	549.5
Type 1 Error	9.6%	9.5%	10.9%	3.6%	2.1%
Type 2 Error	12.1%	14.7%	9.8%	7.5%	8.6%
Number of Obs.	11,823	11,336	10,717	10,504	10,377

Numbers in the parenthesis are standard errors.
*Significant at the 5 percent level.
**Significant at the 1 percent level.

Table 2: Descriptive Statistics

Variable		1985	1986	1987	1988	1989
IRATE	Mean	0.08725	0.07355	0.06493	0.07029	0.08219
	Median	0.08644	0.07278	0.06500	0.07073	0.08299
	S.D.	0.01924	0.01635	0.01374	0.01264	0.01408
	Max	0.39779	0.48500	0.43220	0.21259	0.32526
	Min	0.00000	0.00000	0.00000	0.00593	0.00000
DEPOT	Mean	0.24128	0.32501	0.28246	0.30008	0.23992
	Median	0.06283	-0.00104	0.06815	0.12983	0.09571
	S.D.	1.02971	18.94128	3.18627	1.01410	0.86226
	Max	30.48	1976.90	307.95	48.15	42.25
	Min	-1.00000	-1.00000	-1.00000	-1.00000	-1.00000
PROBA	Mean	0.00795	0.01112	0.00858	0.00790	0.00935
	Median	0.00100	0.00121	0.00079	0.00029	0.00059
	S.D.	0.03559	0.04863	0.04427	0.04776	0.05518
	Max	0.91040	0.97841	0.98377	0.99678	0.99914
	Min	1.9E-10	1.5E-10	3.3E-15	1.2E-13	7.7E-26

Table 3: Regression Results

Dependent Variable: IRATE

	1985	1986	1987	1988	1989
INTCT	4,514	3,300	3,388	3,851	4,840
	(40.2)	(29.0)	(30.5)	(35.8)	(44.5)
PROBA	0.0805	0.1006	0.0101	0.0013	-0.0004
	(7.3)	(8.9)	(0.8)	(0.1)	(-0.0)
MATUR	0.2447	0.3905	0.3860	0.2431	-0.0018
	(22.1)	(34.2)	(32.4)	(20.2)	(-0.2)
SHARE	0.0557	0.1003	0.1403	0.1755	0.1940
	(4.9)	(8.5)	(11.2)	(13.4)	(15.5)
Adjusted R-Square	0.0498	0.1086	0.0990	0.0531	0.0259
Number of Obs.	11,232	10,801	10,187	10,061	10,036

Dependent Variable: DEPST

	1985	1986	1987	1988	1989
INTCT	7,256	6,448	6,855	6,777	6,500
	(78.2)	(68.6)	(77.4)	(80.0)	(74.4)
PROBA	-0.0883	-0.1068	-0.1084	-0.0778	-0.0443
	(-9.7)	(-11.4)	(-11.3)	(-7.8)	(-4.6)
MATUR	0.0413	0.0824	0.0342	0.0459	0.0507
	(4.5)	(8.7)	(3.6)	(4.9)	(5.3)
SHARE	-0.1984	-0.1304	-0.2211	-0.2764	-0.2719
	(-20.9)	(-13.4)	(-22.2)	(-26.9)	(-27.0)
Adjusted R-Square	0.0597	0.0458	0.0791	0.1056	0.0902
Number of Obs.	11,232	10,801	10,187	10,061	10,036

Numbers in the parenthesis are t-ratios.

Table 4: Regression Results

Dependent Variable: IRATE

	1985	1986	1987	1988	1989
INTCT	4,838	3,631	2,925	3,145	4,021
	(39.5)	(28.3)	(22.8)	(26.8)	(34.9)
PROBA	0.0759	0.0842	0.0359	0.0223	0.0045
	(6.9)	(7.2)	(2.9)	(1.8)	(0.4)
MATUR	0.2532	0.3994	0.3751	0.2204	-0.0264
	(22.7)	(34.7)	(31.3)	(18.4)	(-2.2)
SHARE	0.0722	0.1154	0.1216	0.1365	0.1459
	(6.2)	(9.6)	(9.6)	(10.3)	(11.6)
BSIZE	-0.0731	-0.0643	0.0877	0.1708	0.2215
	(-6.6)	(-5.5)	(7.2)	(14.3)	(18.9)
Adjusted R-Square	0.0534	0.1110	0.1035	0.0720	0.0591
Number of Obs.	11,232	10,801	10,187	10,061	10,036

Dependent Variable: DEPST

	1985	1986	1987	1988	1989
INTCT	7,334	6,599	6,344	6,407	6,220
	(72.4)	(62.1)	(62.1)	(69.0)	(66.1)
PROBA	-0.0894	-0.1142	-0.0800	-0.0668	-0.0427
	(-9.8)	(-11.8)	(-8.0)	(-6.7)	(-4.4)
MATUR	0.0433	0.0865	0.0222	0.0341	0.0423
	(4.7)	(9.1)	(2.3)	(3.6)	(4.4)
SHARE	-0.1944	-0.1235	-0.2417	-0.2968	-0.2884
	(-20.1)	(-12.4)	(-23.9)	(-28.3)	(-28.1)
BSIZE	-0.0176	-0.0293	0.0966	0.0893	0.0758
	(-1.9)	(-3.0)	(9.9)	(9.5)	(7.9)
Adjusted R-Square	0.0600	0.0466	0.0879	0.1134	0.0958
Number of Obs.	11,232	10,801	10,187	10,061	10,036

Numbers in the parenthesis are t-ratios.

Table 5: Regression Results

Dependent Variable: IRATE

	1985	1986	1987	1988	1989
INTCT	4,873	3,799	2,956	3,048	3,821
	(40.25)	(31.08)	(24.49)	(26.72)	(33.89)
PROBA	0.0742	0.0678	0.0415	0.0650	0.0754
	(6.67)	(5.92)	(3.43)	(5.14)	(6.20)
MATUR	0.2556	0.4010	0.3753	0.2198	-0.0276
	(23.00)	(34.82)	(31.32)	(18.35)	(-2.34)
SHARE	0.0721	0.1204	0.1201	0.1190	0.1221
	(6.14)	(9.99)	(9.49)	(9.04)	(9.64)
BSIZE	-0.0795	-0.0838	0.0777	0.1648	0.2143
	(-7.19)	(-7.41)	(6.62)	(13.90)	(18.21)
Adjusted R-Square	0.0532	0.1096	0.1038	0.0741	0.0627
Number of Obs.	11,232	10,801	10,187	10,061	10,036

Dependent Variable: DEPST

	1985	1986	1987	1988	1989
INTCT	7,385	6,512	6,243	6,314	6,267
	(73.86)	(64.57)	(65.12)	(69.77)	(68.16)
PROBA	-0.1112	-0.1291	-0.0834	-0.0512	-0.0687
	(-12.11)	(-13.66)	(-8.67)	(-5.11)	(-6.93)
MATUR	0.0415	0.0868	0.0214	0.0333	0.0425
	(4.53)	(9.13)	(2.25)	(3.50)	(4.42)
SHARE	-0.1874	-0.1193	-0.2413	-0.3040	-0.2790
	(-19.34)	(-11.99)	(-23.99)	(-29.11)	(-27.02)
BSIZE	-0.0096	-0.0040	0.1190	0.0995	0.0832
	(-1.05)	(-0.43)	(12.77)	(10.58)	(8.67)
Adjusted R-Square	0.0642	0.0506	0.0888	0.1117	0.0984
Number of Obs.	11,232	10,801	10,187	10,061	10,036

Numbers in the parenthesis are t-ratios.

Table 6: Average Residuals for Large Banks

Group	Dependent Variable	1985	1986	1987	1988	1989
10 Largest	IRATE	103.2	-309.2	2175.3	2145.3	833.6
	DEPST	-1147.9	-348.4	-367.1	-850.2	-1243.9
20 Largest	IRATE	-697.8	-299.6	1591.4	1778.6	773.9
	DEPST	-406.1	900.5	661.8	-336.3	-333.5
50 Largest	IRATE	-840.7	-504.7	1072.4	1334.1	669.0
	DEPST	-60.4	752.7	963.8	-2.9	110.1
100 Largest	IRATE	-477.4	-388.6	1035.8	1636.1	1065.4
	DEPST	70.4	889.0	804.6	327.0	-203.2

References

Avery, Robert B., Belton, Terrence M., and Goldberg, Michael A., "Market Discipline in Regulating Bank Risk: New Evidence from the Capital Markets," *Journal of Money, Credit, and Banking*, 1988, pp.597-610.

Avery, Robert B. and Gerald A. Hanweck, "A Dynamic Analysis of Bank Failures," *Proceedings of the 20th Annual Conference on Bank Structure and Competition*, Federal Reserve Bank of Chicago, 1984, pp.380-395.

Baer, Herbert and Brewer Elijah, "Uninsured Deposits as a Source of Market Discipline: Some New Evidence," *Economic Perspectives*, Federal Reserve Bank of Chicago, October 1986, pp.23-31.

Barth, James R., Dan Brumbaugh, Jr., Daniel Sauerhaft, and George H.K. Wang, "Thrift-Institution Failures: Causes and Policy Issues," *Proceedings of the 21st Annual Conference on Bank Structure and Competition*, Federal Reserve Bank of Chicago, 1985, pp.184-216.

Cargill, Thomas F., "CAMEL Ratings and the CD Market," *Journal of Financial Services Research*, 1989, pp.347-358.

Cole, Rebel A. and Jeffery W. Gunther, "Seperating the Likelihood and Timing of Bank Failure," *Journal of Banking and Finance*, Forthcoming.

Crane, Dwight B., "A Study of Interest Rate Spreads in the 1974 CD Market," *Journal of Bank Research*, 1976, pp.213-24

Hannan, Timothy H. and Hanweck, Gerald, "Bank Insovency Risk and the Market for Large CDs," *Journal of Money, Credit, and Banking*, 1988, pp.438-46.

Iman, Ronald L. and Conover W. J., "The Use of the Rank Transform in Regression," *Technometrics*, 1979, 499-509.

James, Christopher, "Off-Balance Sheet Banking," *Economic Review*, Federal Reserve Bank of San Francisco, Fall 1987, pp.21-36.

Martin, Daniel, "Early Warning of Bank Failure: A Logit Regression Approach," *Journal of Banking and Finance*, 1977, pp.249-276.

Sinkey, Joseph F., Jr., "A Multivariate Statistical Analysis of The Characteristics of Problem Banks," *Journal of Finance*, 1995, pp.21-36.

Thompson, James B. "Predicting Bank Failures in the 1980s," *Economic Review*, Federal Reserve Bank of Cleveland, 1st Quarter 1991, pp.9-20.

Thompson, James B., "Modeling the Bank Regulator's Closure Option: A Two-Step Logit Regression Approach" *Journal of Financial Services Research*, 1992, pp.5-23.

Whalen, Gary, "A Proportional Hazards Model of Bank Failure: An Examination of Its Usefulness as an Early Warning Tool," *Economic Review*, Federal Reserve Bank of Cleveland, 1st Quarter 1991, pp.21-31.