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When Are Thrift Institutions Closed? An Agency-Theoretic Model

REBEL A. COLE
Board of Governors of the Federal Reserve System, 20th and Constitution Avenue, NW, Washington, D.C. 20551.

Abstract

This article examines the determinants of both book-value insolvency and regulatory closure in the thrift industry. Agency theory suggests that the determinants of insolvency and closure are a function of conflicts between shareholders and creditors, shareholders and managers, and regulators and taxpayers. Certain thrift attributes may have differing effects upon insolvency and closure because regulators' best interests may not be served by promptly closing insolvent institutions. In this study, both thrift insolvency and thrift closure are modeled as functions of two broad risk factors: operating risk and agency risk. Using a bivariate probit model to jointly examine determinants of insolvency and closure, the analysis reveals that measures of both operating risk and agency risk generally are statistically significant with the expected signs, providing evidence consistent with the existence both of moral hazard by thrift owners and of expense-preferent behavior by thrift managers. The results also show that agency conflicts between regulators and taxpayers are important in explaining why some thrifts were closed while others were not.

1. Introduction

During the 1980–1988 period that predates passage of the Financial Institutions Reform Recovery and Enforcement Act of 1989 (FIRREA), the Federal Home Loan Bank Board (FHLBB) sold, merged, or liquidated 800 thrift institutions.[1] According to thrift call report data, these 800 institutions were GAAP insolvent, on average, for 17 months at the time of final resolution. Some thrifts operating at the end of 1988 had reported GAAP insolvency in every period since 1979.[2]

Because neither market-value nor book-value insolvency necessarily resulted in closure for thrift institutions during the 1980s, previous studies of thrift resolutions have concentrated on explaining the determinants of either regulatory closure or the costs of closure rather than determinants of insolvency.[3] Previous studies of commercial bank

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resolutions have jointly modeled capital ratios and the regulatory closure decision, or have modeled the time until closure or the costs of closure, but have not explicitly modeled the relationship between insolvency and closure.[4]

Using data taken from the last financial report on which an institution reported positive GAAP net worth, this study constructs a bivariate probit model to explain both why thrifts became GAAP insolvent and why thrifts were closed by regulators during the 1980–1988 period that predates FIRREA. The model is based upon an agency-theoretic framework of failure. After this two-equation disturbance-related model is estimated, I use a single-equation probit model to analyze why some insolvent thrifts were closed while others were not.

In section 2, models of insolvency and closure are developed, followed by a description of the data and methodology in sections 3 and 4. Results and policy implications appear in section 5; section 6 presents a summary and conclusions

2. The models of insolvency and closure

This study models insolvency as a function of two broad risk factors: operating risk and agency risk. Operating risk is defined as encompassing risks associated with both interest-rate exposure and asset-quality problems, while agency risk is defined as encompassing risks arising out of principal–agent conflicts. When a thrift institution suffers accounting losses as a result of its operating- and agency-risk profiles, the institution's book-value capital cushion is dissipated to the point where the value of the institution's liabilities could exceed that of its assets, creating book-value insolvency.

Closure, however, is a more complicated phenomenon than insolvency because of the subjective nature of the regulatory process. Financial institutions issuing government-insured liabilities are fundamentally different from traditional firms because of the way in which creditors deal with a depository institution's distress. Unlike creditors of a traditional firm, creditors holding government-insured deposit liabilities issued by a financial institution have virtually no incentive to force the institution's management to cease operations as market-value net worth falls below zero, because the creditors expect the insuring government agency to make good on the insolvent institution's obligations, no matter how far the institution's balance sheet deteriorates.[5]

If the insuring government agency is to avert losses, regulators must intervene and close a depository institution as soon as its market-value net worth reaches zero. Because of informational, legal, political, and funding constraints under which they operate, regulators may act too late to avoid these losses (Kane, 1989). Consequently, thrift closure is modeled as a function both of the same factors determining insolvency and of these informational, legal, political, and funding constraints.

2.1. Operating risk

Operating risk is defined as encompassing both interest-rate risk and credit risk. Interest-rate spread problems are the predominant explanation offered for insolvencies that occurred when the thrift industry as a whole fell into market-value insolvency in the late

1970s and early 1980s.[6] By funding long-duration, fixed-rate mortgage loans with short-duration savings deposits, thrifts expose themselves to market-value losses in the event of interest-rate increases. With such a balance-sheet structure, firms as highly leveraged as depository institutions are subject to significant declines in market-value net worth if market interest rates rise even moderately. When interest rates soared to record levels in the early 1980s, the impact on the market value of thrift industry capital was predictable.

Prior to 1984, the thrift call report collected by FHLBB included no data on loan or deposit maturity or duration, so that no regulatory measure of interest-rate risk is available over the 1980–1988 period analyzed by this study. Therefore, I measure the effect of duration mismatching on thrift insolvency indirectly.

In an effort to capture the ex post effects of interest rates on the market value of a duration-mismatched thrift portfolio, I calculate approximations of market-value discounts from book value for residential mortgages and mortgage-backed securities:

$$\text{MARKM14} = \text{M14} - \text{M14}/(1 + R) \quad \text{for one- to four-family residential mortgages, and}$$

$$\text{MARKMBS} = \text{MBS} - \text{MBS}/(1 + R) \quad \text{for mortgage-backed securities,}$$

where M14 and MBS are the ratios of one- to four-family mortgages and mortgage-backed securities to total liabilities, respectively, and R is the one-year Treasury rate. The logic of these measures is that, when interest rates are high, previously originated mortgages will sell at a discount. Conversely, when interest rates are low, previously originated mortgages will sell at a premium. These measures, which, for a given asset balance, are greater when rates are high and lesser when rates are low, should serve as instrumental variables for the true discounts from market values for these asset categories. Each of these discount measures should be positively related to insolvency.

The relationship between these discount measures and regulatory closure is ambiguous. While thrifts with larger discounts from market values should be more likely to be closed if regulators seek to minimize losses to the deposit insurance fund, thrifts with very large discounts may be less likely to be closed if regulators exhibit a policy of forbearance toward insolvencies induced by the systemic effects of high interest rates. Many of the regulations passed during 1980–1982 suggest that thrift regulators pursued just such a policy (Kane, 1989). They simply did not have the staff necessary to examine nor the funds necessary to close all of the insolvent institutions.

Beyond interest-rate-induced losses, I hypothesize that both insolvency and closure are increasing functions of asset-quality problems. Asset-quality problems are the end result of one of two phenomena. A thrift's management either chooses to make high-risk loans, many of which later go into default, or chooses to make prudent loans that later turn sour as a result of exogenous economic factors. In either case, an institution recognizes its asset-quality problems either by reclassifying these assets as delinquent loans or real estate owned or by establishing contra-asset valuation allowances, the thrift equivalent of bank loan loss reserves.[7] Therefore, variables measuring delinquent loans, real estate owned, and valuation allowances, each as a percentage of total liabilities, are expected to have positive coefficients in both the insolvency and closure models.

One broad measure of operating risk included in the model is net interest margin—interest income less interest expense as a percentage of total liabilities. Net interest margin reflects both interest-rate risk and credit risk. High margins are associated with ex post low-risk investments, while low or negative margins are associated with ex post high-risk investments; thus, net interest margin should be negatively related to both insolvency and closure.

2.2. *Agency risk*

The second broad category of firm riskiness explored in this study encompasses the conflicts arising between principals and their agents (Jensen and Meckling, 1976; Jensen and Ruback, 1983). Owner-type agency risk arises as owners try to maximize the value of the deposit insurance to their firm by funding ex ante high credit-risk assets with volatile liabilities. Future asset-quality problems are expected to result from ex ante high-risk asset and liability portfolio selections.

I classify "nontraditional" thrift asset categories as ex ante high credit risk and classify "traditional" thrift investments as ex ante low credit risk for two reasons. First, thrifts had much less prior expertise in assessing the creditworthiness of nontraditional assets than did their competitors because most thrifts had only been permitted to hold significant amounts of such assets following federal legislation in 1980 and 1982. Ex ante, thrifts are more likely to underprice these credits, which subsequently results in ex post losses as portions of these investments are written off. Second, as a new source of funding for nontraditional assets, thrifts are more likely to attract the marginal credits and investments that are unable to obtain funds from the traditional lenders or investors in these areas—an adverse selection or "lemons" problems. For both of these reasons, investments in nontraditional assets, expressed as percentages of total liabilities, are expected to increase the ex ante probabilities of insolvency; however, because regulators encouraged thrifts to use nontraditional investments to "grow" out of their interest-rate spread problems, these investments are expected to reduce the likelihood of closure. Nontraditional thrift assets analyzed in this study are loans for the acquisition and development of land, direct equity investments both in real estate and in service corporations, nonresidential mortgages, consumer loans, and commercial nonmortgage loans.[8]

It must be noted that, in the absence of moral hazard, expansion into new asset categories holds the potential for *reducing* aggregate portfolio credit risk through diversification. Moreover, as thrifts develop greater expertise investing in these asset categories over time, the average quality of their credits in these categories should increase. Certainly, if thrifts had not been so highly concentrated in long-term, fixed-rate mortgages during the late 1970s and early 1980s, they would have been much better prepared to weather the interest-rate spike occurring during that period.

"Traditional" assets classified in this study as ex ante low credit risk are one- to four-family mortgages and mortgage-backed securities. Thrifts should possess superior information about such investments as a result of their long-term relationships with mortgage borrowers and their extensive experience in evaluating and monitoring mortgage credits. Consequently, investments in both types of residential mortgage assets, expressed as

percentages of total liabilities, should be negatively related to both insolvency and closure. To avoid the confounding effects of underwater residential mortgages and mortgage-backed securities, the calculated discounts on each, defined earlier, are subtracted from the reported asset balances in an attempt to more closely approximate market values.

One type of liability is classified in this study as an indicator of high risk—large deposits obtained through brokers. Unlike other thrift liabilities, such as reverse repurchase agreements and FHLB advances, brokered deposits represent uncollateralized borrowing, allowing a thrift to obtain funds at rates competitive with those on core deposits, even when the thrift has no remaining unpledged collateral assets. Hence, the level of brokered deposits, expressed as a percentage of total liabilities, should be positively related to insolvency. Regulators claim that brokered deposits allow the executives of depository institutions to pursue policies of rapid growth unchecked by traditional market forces, because all deposits up to $100,000 per account are fully insured. As a "safety and soundness" concern of regulators, brokered deposits also should be positively related to closure.

Manager-type agency risk arises when managers attempt to maximize their return by expropriating wealth from owners, unsecured creditors, and the government agency insuring deposits. As managers effect these wealth transfers, their behavior should be observable through indicators of expense-preferent behavior. Salary expense and equipment expense, each expressed as a percentage of total liabilities, are two potential indicators of such behavior. Both insolvency and closure should be positively related to these two expense items.

Organizational form, through its effect on agency conflicts, also may affect the probabilities of insolvency and closure. Thrifts institutions can be classified into three different organizational forms—closely held stock, publicly traded stock, and mutual.

At closely held stock thrifts, the owners and managers are one so that there are no conflicts between owners and management; however, agency conflicts between owners and creditors are expected to be the worst. Such institutions should undertake the riskiest investments because the owner-manager conflict—whereby managers with large, undiversified investments in human capital specific to an institution are expected to undertake less risky investments than are optimal from the viewpoint of owners—has been eliminated. In addition, owners of closely held stock firms may expropriate wealth most easily from creditors by expense-preferent behavior while, at the same time, escaping the double taxation of dividend income by extracting ownership profits through management salary and perquisites.

At publicly traded firms, where shareholders monitor the actions of managers, the excessive perquisite consumption is expected to be attenuated. At the same time, undiversified, risk-averse managers are expected to undertake investments that are less risky than those undertaken by their owner-manager counterparts at closely held stock firms. Therefore, publicly traded thrifts should undertake less risky investments than their closely held stock counterparts.

At a mutual-charter thrift, depositors often sign over their shareholder proxies to management so that managers serve the role of de facto owners of the firm (Masulis, 1987); however, unlike the owner-managers of closely held stock firms, mutual-charter thrift managers cannot recognize increases in firm value except through excessive salary

and perquisite consumption.[9] In addition, the wage contracts of mutual-charter thrift managers are fixed liabilities whose values fall as firm risk increases (Masulis, 1987). Therefore, mutual-charter thrifts should undertake the least risky investments of the three types of thrift organizational forms, as risk-averse managers seek to preserve their essentially perpetual status as de facto owners of the firm and maximize the value of their wage contracts. Dummy variables indicating both mutual-charter firms and publicly traded firms appear in the model to test for these effects. Both are expected to be negatively related to insolvency relative to the omitted category—closely held stock firms.

Agency conflicts between regulators and taxpayers also influence the probabilities of insolvency and closure. Public choice theory suggests that regulator-type agency conflicts arise as thrift regulators attempt to fulfill their personal agendas at the expense of the public's best interests (Kane, 1988, 1989). I analyze two such instances.

First, I examine competition between state and federal thrift regulators. In attempts to maintain their clienteles, many state regulators granted portfolio powers to their regulatees that were not available to federally chartered thrifts or that were available only at a later date.[10] In addition, there have been charges that lax supervision of these institutions by state regulators led to more severe problems at state-charter than at federal-charter thrifts. If these charges are true, then federal-charter thrifts should be less likely to become insolvent and be closed than their state-charter counterparts. A dummy variable for federal charter appears in the model to test this hypothesis.

Second, I test for the existence of forbearance by regulators toward southwestern thrifts. Because of the powerful congressional presence from southwestern states and the ties of these politicians to the thrift industry, many have charged that these politicians pressured thrift regulators to grant forbearance to thrifts located in the Ninth FHLB District (Dallas).[11] If such forbearance was, indeed, granted, then Ninth District thrifts should be less likely to be closed than thrifts located in other FHLB districts.

At the same time, insolvency should be more likely for Ninth District thrifts than thrifts in other FHLB districts for two major reasons. First, the precipitous decline in oil price occurring during the early 1980s severely depressed the southwestern economy. Second, the Ninth FHLB District moved from Little Rock to Dallas in 1982. A major unintended consequence of this move was that most of the supervisory staff elected not to move from Little Rock to Dallas. This left the Ninth FHLB District critically short of experienced supervisory staff.[12] Compounding this problem was the fact that the move occurred just as the Depository Institution Deregulation and Monetary Control Act of 1980 and the Garn-St. Germain Depository Institutions Act of 1982 granted new portfolio powers to the Ninth District's federal-charter thrifts and removed constraints on growth by phasing out deposit rate ceilings and increasing the deposit insurance coverage limit from $40,000 to $100,000 per account. These factors significantly increased the need for supervision just as the supervisory apparatus had been severely weakened.[13] If regulatory forbearance was, indeed, granted to Ninth District thrifts, then these institutions should be less likely to be closed even though more likely to be insolvent.

3. Data

Data used in this study come from FHLBB semiannual and quarterly call reports and include balance sheet data on portfolio composition, income statement data on revenues and expenses, and structure data documenting organizational charter type. All balance sheet and income statement variables taken from the call reports are expressed as a percentage of total liabilities, which should be less subject to variations in market value than total assets. Interest-rate data are obtained from the *Federal Reserve Bulletin*. Variable definitions and sources appear in the appendix.

The sample consists of 769 institutions that the FHLBB sold, merged, or liquidated during the period January 1980 through December 1988[14] and of 2,783 institutions that were operating at the end of this period and filed a September 1988 quarterly thrift call report. Of the 2,783 operating institutions, 270 reported GAAP insolvency on their September 1988 call report.

For resolved institutions, data are taken from the last period in which an institution reports positive GAAP net worth on its call report.[15] From a theoretical standpoint, this can be viewed as the last period in which a firm operates prior to insolvency. From an empirical standpoint, this approximates the last period in which a thrift would not face supervisory actions that would limit the thrift's preferred portfolio choices. Once a thrift's capital falls below regulatory minimums, its regulator can more easily initiate supervisory actions that seriously curtail the institution's asset opportunity set, impairing the thrift's ability to make high-risk, high-return investments in a bid to return to solvency. Thus, a thrift is expected to make such investments prior to the point in time when regulators could intervene.

Previous closure studies, such as Benston (1985), Barth et al. (1989), Pantalone and Platt (1987), Rudolph and Hamden (1988), and Barth, Bartholomew, and Bradley (1990), use data for closed institutions taken from three months to two years prior to closure, with one year prior being the norm. Because the closed institutions report book-value insolvency on their call reports for approximately one and a half years, with more than 10 percent of these thrifts reporting insolvency for more than four years, a significant shortcoming of previous studies is that their sample data reflect portfolio compositions *after* sufficient asset writedowns have been taken to eliminate net worth, not the portfolio compositions that *led* to the writedowns.[16] Thus, portfolio balances used as independent variables in these studies are biased downward relative to those actually held by the troubled institutions prior to the writedowns. Hence, inferences made from the results of these previous studies may be misleading.

4. Methodology

Because both the insolvency and closure dependent variables are binary, I use a probit maximum-likelihood estimation procedure to test the models of insolvency and closure.[17] The models are written as

$$P_j = \Phi(X_j, \beta, \epsilon_j) \quad j = 1, 2, \ldots, N, \tag{1}$$

where P_j is equal to one if the institution was insolvent/closed and zero otherwise, Φ is the probit maximum-likelihood operator, X_j is a vector of independent variables representing characteristics of individual thrift institutions, β is a vector of parameter estimates for the independent variables, ϵ_j is a normally distributed random distribution term with zero mean and unit variance, and N is sample size.

I define insolvent thrifts as those reporting continuous GAAP insolvency on their call report beginning in some quarter after December 1979 and continuing through September 1988, while I define closed institutions as those resolved at a cost to the FSLIC during the sample period as well as all supervisory mergers overseen by the FHLBB from January 1980 through December 1988. I define solvent thrifts as those reporting positive GAAP net worth on their September 1988 call report, while I define nonclosed thrifts as those filing a September 1988 call report and not closed by regulators during October through December 1988.

These definitions of solvency and insolvency may impart some degree of bias in the analysis because some of the "solvent" thrifts report GAAP insolvency at some period during the sample period but return to solvency by the end of the sample period. Rudolph (1989), for example, finds that 68 of the 237 thrifts reporting GAAP insolvency on their December 1982 call report return to solvency by December 1987. These thrifts "gambled for resurrection" and won. Any gains recorded by the owners of these thrifts should, in fact, have gone to the taxpayers who, after the insolvency of the FSLIC, bore the risks of the formerly insolvent thrifts' investments.

While the single-equation probit methodology provides consistent estimates for the insolvency and closure models, this methodology may not provide efficient estimates, because it ignores the potentially significant correlation between the disturbance terms of the two equations. These error terms will be correlated if there are significant explanatory variables that are omitted from both the insolvency and closure models' specifications.

Taken together, the insolvency and closure equations constitute a bivariate qualitative dependent variable model. Estimates obtained from a bivariate probit model should be more efficient than those obtained by separate estimation of the two equations, because joint estimation accounts for the correlation between the disturbance terms in the two equation. Consequently, I also estimate a bivariate probit model to account for this correlation and increase efficiency.[18]

The insolvency and closure equations are defined as:

$$I_j = \tau(X_j, \beta, \epsilon_j) \quad j = 1, 2, \ldots, N \tag{2}$$

and

$$C_j = \tau(Z_j, \Theta, \mu_j) \quad j = 1, 2, \ldots, N, \tag{3}$$

where I_j is equal to one if an institution is insolvent and equal to zero if an institution is solvent, C_j is equal to one if an institution is closed and equal to zero if an institution is not

closed, X_j and Z_j are vectors of independent variables representing characteristics of individual thrift institutions, τ is the bivariate probit maximum likelihood operator, β and Θ are vectors of parameter estimates for the independent variables, ϵ_j and μ_j are random disturbance terms with a bivariate standard normal distribution and correlation ρ and N is the sample size. Table 1 lists the explanatory variables appearing in the models of insolvency and closure along with the expected sign of each relationship.

Finally, to test why some insolvent thrifts were closed while others were not, I estimate a single-equation probit model using a subsample consisting solely of the insolvent institutions. In this model, the dependent variable takes on a value of one if the institution was closed and zero if the institution was insolvent but not closed as of December 31, 1988.

The proper interpretation of individual parameter estimates from these models is the effect on the probability of insolvency or closure of an increase in that variable, holding constant all other *included* variables. However, because of the accounting identity that

Table 1. Independent variables with expected signs

Variable	Expected sign	
	Insolvency	Closure
Operating risk		
Net interest margin	−	−
Discount on residential mortgages	+	?
Discount on mortgage securities	+	?
Real estate owned	+	+
Delinquent loans	+	+
Valuation allowances	+	+
Agency risk		
Owner-type		
One- to four-family mortgages	−	−
Mortgage-backed securities	−	−
Nonresidential mortgages	+	−
Commercial loans	+	−
Consumer loans	+	−
Real estate held for investment	+	−
Service corporation investment	+	−
Land loans	+	−
Brokered deposits	+	+
Manager-type		
Officer/employee expense	+	+
Equipment expense	+	+
Mutual charter	−	?
Publicly traded stock	−	?
Regulator-type		
Federal charter	−	−
District 9 membership	+	−

assets must equal liabilities plus capital, an increase in any asset category must, by definition, be offset by an increase in one of the excluded liability categories, i.e., regular deposits, FHLB advances, or reverse repurchase agreements; by an increase in capital; or by a decrease in another asset category. Thus, use of this methodology implicitly assumes that any of the above shifts in the structure of the balance sheet would have same impact on the probability of insolvency or closure.[19]

5. Results

Table 2 presents univariate statistics (means and standard errors) for the explanatory variables introduced in section 2. Statistics are presented separately for the solvent/insolvent and the nonclosed/closed subsamples. Also in table 2 are the results of *t*-tests to determine whether the mean values for the two groups in each subsample are statistically different.

The left half of table 2 shows that solvent thrifts report a positive 63 basis point net interest margin while insolvent thrifts report a negative margin of 8 basis points. Solvent thrifts report portfolio proportions of real estate owned, delinquent loans, equity real estate investments, service corporation investments, land loans, and brokered deposits that are less than half the corresponding proportions reported by insolvent thrifts. Solvent thrifts also report larger portions of residential mortgages, mortgage-backed securities, and consumer loans; report smaller portions of nonresidential mortgages and valuation allowances; report higher equipment expense; are more likely to be publicly traded and federally chartered; and are less likely to be located in the Ninth FHLB District. All of these differences are statistically significant at the 5 percent level and, in most cases, at the 1 percent level. In fact, of the 21 variables presented in table 2, only the differences in the discount on mortgage-backed securities, commercial loan, salary expense, and mutual charter variables are not statistically significant at the 5 percent level.

The right half of table 2 shows similar distinctions between nonclosed and closed thrifts, but with a few distinctions. Closed thrifts hold significantly fewer commercial nonmortgage loans and are significantly more likely to be mutual organizations. In addition, *t*-statistics for differences in means of many of the explanatory variables, including real estate owned, delinquent loans, valuation allowances, nonresidential mortgages, land loans, and District Nine membership, are far lower for the closed/nonclosed sample than for the solvent/insolvent sample.

Table 3 presents results for the single-equation probit models, while table 4 presents results for the two-equation bivariate probit model. The pseudo R-squares in table 3 indicate that both single-equation models have relatively high explanatory power—0.63 for the insolvency equation and 0.58 for the closure equation. Because the results from single-equation estimation (presented in table 3) and from joint-estimation (presented in table 4) are qualitatively similar, I will focus only on results from the joint estimation; however, one important distinction between results in the two tables is that standard errors in general are much lower in table 4, a result of the increase in efficiency from the joint estimation procedure.

Table 2. Univariate statistics for solvent/insolvent and nonclosed/closed thrifts.

	Insolvency			Closure		
Variable	Solvent	Insolvent	*t*-Statistic	Nonclosed	Closed	*t*-Statistic
Net interest margin	0.635	−0.083	58.70*	0.581	−0.141	51.28*
	(0.006)	(0.011)		(0.006)	(0.013)	
Discount on residential mortgages	3.995	5.330	−13.75*	3.965	5.907	−17.39*
	(0.030)	(0.092)		(0.030)	(0.107)	
Discount on mortgage securities	0.763	0.694	1.89	0.753	0.701	1.08
	(0.018)	(0.032)		(0.017)	(0.040)	
Real estate owned	0.937	1.987	−9.38*	1.178	1.484	−2.57†
	(0.038)	(0.105)		(0.043)	(0.111)	
Delinquent loans	2.252	5.101	−11.63*	2.731	4.368	−6.05*
	(0.059)	(0.238)		(0.079)	(0.259)	
Valuation allowances	0.446	0.757	−6.12*	0.497	0.681	−3.02*
	(0.015)	(0.048)		(0.016)	(0.059)	
One- to four-family mortgages	49.194	47.649	2.23†	48.379	50.056	−2.19†
	(0.362)	(0.591)		(0.346)	(0.685)	
Mortgage-backed securities	9.399	6.528	7.94*	9.204	6.225	7.54*
	(0.223)	(0.284)		(0.208)	(0.336)	
Nonresidential mortgages	6.968	8.280	−5.03*	7.212	7.856	−2.18†
	(0.125)	(0.229)		(0.121)	(0.270)	
Commercial loans	1.193	1.037	1.64	1.205	0.939	2.54†
	(0.0049)	(0.081)		(0.047)	(0.093)	
Consumer loans	4.717	4.159	3.07*	4.701	4.022	3.51*
	(0.110)	(0.145)		(0.104)	(0.163)	
Real estate held for investment	2.454	6.217	−4.83*	2.816	6.227	−3.54*
	(0.238)	(0.742)		(0.238)	(0.934)	
Service Corp. investment	0.700	1.500	−6.27*	0.774	1.513	−4.83*
	(0.037)	(0.122)		(0.039)	(0.148)	
Land loans	1.531	4.054	−9.08*	1.872	3.707	−5.67*
	(0.076)	(0.267)		(0.087)	(0.312)	
Brokered deposits	1.214	3.257	−6.51*	1.393	3.327	−4.99*
	(0.097)	(0.299)		(0.974)	(0.376)	
Salary expense	0.009	0.008	1.12	0.009	0.008	1.15
	(0.0002)	(0.0004)		(0.0002)	(0.0005)	
Equipment expense	0.059	0.051	5.42*	0.059	0.048	6.38*
	(0.001)	(0.001)		(0.001)	(0.002)	
Mutual charter	59.133	61.694	−1.42	58.462	65.020	−3.35*
	(0.981)	(1.509)		(0.934)	(1.721)	
Publicly traded stock	10.943	2.984	9.75*	10.241	2.731	9.13*
	(0.623)	(0.528)		(0.575)	(0.588)	
Federal charter	56.586	52.839	2.04†	56.558	51.625	2.43†
	(0.989)	(1.549)		(0.940)	(1.803)	
District 9 membership	10.385	27.719	−11.43*	13.223	23.537	−6.21*
	(0.609)	(1.389)		(0.642)	(1.531)	
Number of thrifts	2,513	1,039	—	2,783	769	—

*Indicates that means of the two groups of thrifts are statistically different at 1 percent level.
†Indicates that means of the two groups of thrifts are statistically different at the 5 percent level.
Note: For each variable, the first row is the mean and the second row is the standard error.

Table 3. Probability of thrift insolvency/closure: Single-equation probit estimates

Log-likelihood	−786	—	−784	—
Restricted (slopes = 0) log-likelihood	−2,146	—	−1,856	—
Pseudo *R*-square	0.63	—	0.58	—

	Insolvency		Closure	
Variable	Estimate	*t*-statistic	Estimate	*t*-statistic
Operating risk				
Net interest margin	−0.3330	−23.09*	−0.2440	−19.34*
Discount on residential mortgages	0.0344	6.70*	0.0384	9.59*
Discount on mortgage securities	0.0351	1.73	0.0396	2.39†
Real estate owned	−0.0044	−2.83*	−0.0072	−4.94*
Delinquent loans	0.0047	5.11*	0.0012	1.55
Valuation allowances	0.0059	1.63	0.0114	3.36*
Agency risk				
Owner-type				
One- to four-family mortgages	−0.2329	−4.02*	−0.3055	−5.81*
Mortgage-backed securities	−0.3506	−1.91	−0.4361	−2.69*
Nonresidential mortgages	0.0015	2.54†	0.0005	0.92
Commercial loans	0.0282	1.91	0.0369	2.60*
Consumer loans	0.0257	3.64*	0.0216	3.02*
Real estate held for investment	0.0025	1.46	0.0031	1.92
Service corporation investment	−0.0030	−2.28†	−0.0016	−1.27
Land loans	0.0190	2.92*	0.0162	2.68*
Brokered deposits	0.0012	2.66*	0.0015	3.71*
Manager-type				
Salary expense	0.0045	1.63	0.0047	1.74
Equipment expense	0.0607	6.84*	0.0410	4.62*
Mutual charter	0.4502	4.80*	0.3596	3.73*
Publicly traded stock	−0.3054	−2.02†	−0.1783	−1.12
Regulator-type:				
Federal charter	0.0136	0.18	−0.1667	−2.14†
District 9 membership	0.2158	2.19†	−0.0552	−0.55

†Indicates statistical significance at the 5 percent level.
*Indicates statistical significance at the 1 percent level.

5.1. *Insolvency*

As hypothesized, insolvency is negatively related to net interest margin and positively related to the two asset discount measures. The residential mortgage discount measure and net interest margin variable are statistically significant at the 1 percent level.

All three ex post credit risk variables are statistically significant at the 1 percent level. Two of the three—delinquent loans and valuation allowances—have the expected positive signs; however, the third—real estate owned—exhibits a negative relationship with

Table 4. Probability of thrift insolvency/closure: Full information maximum likelihood probit estimates
Log-likelihood: −1,292.7

Variable	Insolvency		Closure	
	Estimate	*t*-statistic	Estimate	*t*-statistic
Operating risk				
Net interest margin	−0.3512	−32.30*	−0.2898	−23.16*
Discount on residential mortgages	0.0392	10.14*	0.0382	10.45*
Discount on mortgage securities	0.0209	1.47	0.0302	2.03†
Real estate owned	−0.0035	−3.23*	−0.0086	−6.38*
Delinquent loans	0.0037	4.64*	−0.0006	−1.01
Valuation allowances	0.0129	4.80*	0.0264	11.12*
Agency Risk				
Owner-type				
One- to four-family mortgages	−0.2467	−4.71*	−0.3025	−5.91*
Mortgage-backed securities	−0.3548	−2.77*	−0.4391	−3.01*
Nonresidential mortgages	0.0021	3.64*	0.0009	1.64
Commercial loans	0.0193	1.29	0.0343	2.37†
Consumer loans	0.0293	4.00*	0.0235	3.16*
Real estate held for investment	0.0032	2.26†	0.0028	1.70
Service corporation investment	−0.0035	−2.68*	−0.0033	−2.89*
Land loans	0.0125	2.44†	0.0175	3.59*
Brokered deposits	0.0018	4.80*	0.0017	4.02*
Manager type				
Salary expense	0.0037	1.36	0.0107	4.03*
Equipment expense	0.0534	10.29*	0.0430	5.15*
Mutual charter	0.4551	4.50*	0.3559	3.64*
Publicly traded stock	−0.3079	−1.96†	−0.1784	−1.15
Regulator-type				
Federal charter	0.0000	0.00	−0.1662	−2.00†
District 9 membership	0.2202	2.34†	−0.0570	−0.56
Correlation between errors	0.9946	62.85*		

†Indicates statistical significance at the 5 percent level.
*Indicates statistical significance at the 1 percent level.

insolvency. This result suggests that solvent institutions are more aggressive in using foreclosure actions to remedy delinquencies, while insolvent thrifts seek to avoid the accounting writedowns that accompany the reclassification of loans as real estate owned.

Eight of the nine owner-type agency risk variables have the expected signs. One- to four-family mortgages and mortgage-backed securities (both marked to market) are negatively related to insolvency, while nonresidential mortgages, commercial loans, consumer loans, real estate held for investment, land loans, and brokered deposits are positively related to insolvency. Of these eight variables, only the measure of commercial loans is not statistically significant at the 5 percent level.

The ninth owner-type agency risk variable—service corporation investment—is statistically significant at the 1 percent level but *negatively* related to insolvency. Consequently, the service corporation investment and real estate held for investment variables have opposite signs. This finding may reflect the fact that service corporation activities include mortgage servicing and other activities in addition to equity investments in real estate while real estate held for investment does not. Many previous studies analyzing thrift direct investments pool these two call report items. The opposite signs on their coefficients observed in this study suggest that pooling of these two asset classes may mask their true relationships with performance. The positive coefficient on service corporation investment also points out that, in the absence of moral hazard, expanded asset powers may allow depository institutions to reduce portfolio risk through diversification.

While these results are consistent with the hypothesis that deleterious effects of owner-type agency conflicts outweigh beneficial effects of portfolio diversification, they also are consistent with the hypothesis that thrift insolvencies were driven by the regional collapse of real estate values in the Southwest.[20] In an attempt to differentiate between these alternative explanations, I reestimate the bivariate probit model after deleting from the sample all thrifts located in the Ninth FHLB District (the "oil patch"). The results of this reestimation with regard to the owner-type agency conflict variables are not qualitatively different from those in table 4. (These results are available from the author.) Both show that nontraditional assets increase, while traditional assets decrease, the probability of insolvency. Hence, these results appear to support the moral hazard hypothesis independent of effects from the southwestern economy's 1980s collapse.

The results in table 4 also are consistent with the existence of agency conflicts between owners and managers. Both proxies for expense-preferent behavior—salary expense and equipment expense—are positively related to insolvency. The equipment expense measure is statistically significant at the 1 percent level, evidence of excessive perquisite consumption by the managers of insolvent thrifts.

Both of the organizational form variables are significant at the 5 percent level, but only the dummy variable for publicly traded firms has the hypothesized sign. Publicly traded stock thrifts are less likely to be insolvent than closely held stock thrifts, consistent with the hypothesis that managers attenuate portfolio risk relative to the optimum from the perspective of owners; however, mutual-charter thrifts are more likely to be insolvent than their closely held stock counterparts, conflicting with the agency-driven hypothesis that mutual-charter thrifts should be the least risky type of organization. This latter finding may be the result of the fact that mutual organizations cannot issue stock to raise capital in an effort to forestall insolvency. In addition, Mester (1991) and Cebenoyan et al. (1992) provide evidence that mutual thrifts are significantly less efficient than stock thrifts. This inefficiency also may contribute to the greater likelihood of insolvency. However, greater likelihood of insolvency for mutual thrifts also reflects organizational changes in the thrift industry, as hundreds of mutual thrifts converted to stock charters during the sample period. Unal (1992), for example, reports that the number of stock institutions jumped from 23 percent of all thrifts at the end of 1982 to 44 percent at the end

of 1988. Since almost two thirds of the insolvencies in the sample occurred prior to 1985, it is not surprising that mutual thrifts are overrepresented in the insolvent-only sample.

Because publicly traded stock thrifts tend to be larger than closely held stock thrifts and because mutual thrifts tend to be smaller than stock thrifts, the results regarding organizational form may be related to size. To investigate this possibility, the insolvency model is reestimated, specifying total assets as an additional explanatory variable. The results of these regressions (available from the author) indicate that size is not significant in explaining insolvency, nor does its inclusion in the analysis alter the findings reported here.

Finally, only one of the two regulator-type agency conflict variables has the hypothesized sign. District Nine membership is positive and significant at the 5 percent level, evidence that southwestern thrifts are more likely to be insolvent than thrifts located elsewhere in the nation. The federal charter variable has a zero coefficient rather than the hypothesized negative sign, failing to support the hypothesis that state thrift regulators were unduly lax in their supervision efforts.

5.2. *Closure*

Results of the closure equation generally are consistent with the those of the insolvency equation; however, some distinct differences do emerge. Of the regulator-type agency risk measures, the federal charter variable is negative and significant in the closure equation, yet has a coefficient of zero in the insolvency equation. Because portfolio variables already control for differences in asset powers, this result is consistent with the hypothesis that federal regulators focused closure efforts on state-chartered institutions in an effort to shift blame for the thrift crisis to their state regulatory counterparts; however, it also may reflect federal regulators' belief that they can better control the effects of moral hazard at institutions for which they are the primary regulator.

Additional evidence of regulator-type agency risk is the finding that the dummy variable for thrifts located in the Ninth FHLB District is positive and significant in the insolvency equation while negative (but not significant) in the closure equation. Thus, Ninth District thrifts are significantly more likely to be insolvent, but are *less* likely to be closed than are thrifts in the rest of the nation. These results are consistent with the hypothesis that political interests in the Southwest were successful in seeking capital forbearance for the region's troubled thrifts.

As with the analysis of insolvency, there is concern whether the results regarding organizational form may be related to size. In addition, many previous studies of depository institutions include a size variable in order to test for evidence of the "too big to fail" phenomenon, whereby regulators refrain from closing very large insolvent institutions because of concerns about the potential systemic risk associated with such closures. The closure model is reestimated specifying total assets as an additional explanatory variable. As was the case with the insolvency model, the results from these regressions (available from the author) indicate that size is not significant in explaining closure nor does its inclusion alter the findings regarding organizational form.

With the exception of service corporation investments, the nontraditional investment variables have the same positive signs observed in the insolvency results. This finding fails to support the hypothesis that regulators granted forbearance to thrifts that made such investments in the mid-1980s in an attempt to grow out of their interest-rate spread problems.

A direct test of why some insolvent thrifts were closed while others were not appears in the next section, where the analysis is confined to the 1,039 insolvent thrift institutions.

5.3. When are insolvent thrifts closed?

Table 5 presents univariate statistics (means and standard errors) for the insolvent subsample along with the results of *t*-tests to determine if the mean values for the insolvent nonclosed and closed groups are statistically different. These statistics show that nonclosed thrifts report a positive 8 basis point net interest margin while closed thrifts report a negative margin of 14 basis points. Nonclosed thrifts have significantly lower discounts on residential mortgages, but this could reflect that, on average, data for nonclosed thrifts come from later periods in the sample when interest rates were lower while data for closed thrifts come from earlier periods in the sample when rates were higher. Nonclosed thrifts report portfolio proportions of real estate owned, delinquent loans, valuation allowances (loan loss reserves), nonresidential mortgages, commercial loans, and land loans that are significantly higher and a proportion of residential mortgages that is significantly lower than the corresponding proportions reported by closed thrifts. These differences are consistent with a policy of forbearance toward troubled institutions that are expected by regulators to impose the largest losses (as a percentage of liabilities) on the thrift deposit insurance fund. Nonclosed thrifts report significantly higher equipment expense, suggesting that the policy of forbearance hinders regulators from preventing excessive perquisite consumption by the management of these thrifts. Nonclosed thrifts are significantly more likely to be stock rather than mutual charter. This finding might be expected if mutual thrifts are less well connected politically than their stock counterparts so that closure of mutual thrifts imposes lower political costs on regulators; however, as explained previously, it may simply reflect organizational changes in the thrift industry occurring during the sample period. Nonclosed thrifts are significantly more likely than closed thrifts to be located in FHLB District Nine, consistent with the hypothesized policy of forbearance toward thrifts located in that region. Finally, one additional variable is included in explaining the closure of insolvent thrifts—length of insolvency. Nonclosed thrifts were insolvent twice as long as closed thrifts—34 months versus 17 months. Because nonclosed thrifts first report insolvency, on average, two and a half years later than closed thrifts, this implies that insolvencies occurring later in the sample period were closed much more slowly than those occurring earlier in the sample period, providing evidence that forbearance was more often granted to the credit-quality-induced insolvencies occurring during the mid- and late-1980s than to the interest-rate-induced insolvencies occurring during the late 1980s.

Table 5. Univariate statistics for insolvent thrifts that were nonclosed/closed.

Variable	Nonclosed	Closed	*t*-statistic
Net interest margin	0.081	−0.141	10.03*
	(0.018)	(0.013)	
Discount on residential mortgages	3.689	5.907	−12.58*
	(0.140)	(0.107)	
Discount on mortgage securities	0.657	0.701	−0.76
	(0.050)	(0.040)	
Real estate owned	3.420	1.484	7.48*
	(0.234)	(0.111)	
Delinquent loans	7.187	4.368	4.84*
	(0.521)	(0.259)	
Valuation allowances	0.974	0.681	2.99*
	(0.078)	(0.059)	
One- to Four-family mortgages	40.797	50.056	−7.31*
	(1.065)	(0.685)	
Mortgage-backed securities	7.393	6.225	1.87
	(0.528)	(0.336)	
Nonresidential mortgages	9.487	7.856	3.24*
	(0.425)	(0.270)	
Commercial loans	1.317	0.939	2.01†
	(0.163)	(0.093)	
Consumer loans	4.548	4.022	1.52
	(0.304)	(0.163)	
Real estate held for investment	6.186	6.227	−0.03
	(1.036)	(0.934)	
Service corp. investment	1.458	1.513	−0.21
	(0.205)	(0.148)	
Land loans	5.041	3.707	2.22†
	(0.515)	(0.312)	
Brokered deposits	3.059	3.327	−0.48
	(0.420)	(0.376)	
Salary expense	0.009	0.008	0.58
	(0.0006)	(0.0005)	
Equipment expense	0.059	0.048	3.92*
	(0.002)	(0.002)	
Mutual charter	52.222	65.020	−3.66*
	(3.045)	(1.721)	
Publicly traded stock	3.704	2.731	0.75
	(1.151)	(0.588)	
Federal charter	56.296	51.625	1.33
	(3.024)	(1.803)	
District 9 membership	39.630	23.537	4.80*
	(2.982)	(1.531)	
Months of insolvency	33.9	17.0	10.68*
	(1.45)	(0.65)	
Number of thrifts	270	769	—

*Indicates that means of the two groups of thrifts are statistically different at the 1 percent level.
†Indicates that means of the two groups of thrifts are statistically different at the 5 percent level.
Note: For each variable, the first row is the mean and the second row is the standard error.

As a multivariate statistical test of why some insolvent thrifts were closed while others were not, I reestimate the probit closure model using a sample restricted to the 1,039 insolvent thrifts. The results of this test appear in table 6.

Three of the operating risk variables—net interest margin, discount of residential mortgages, and real estate owned—are statistically significant. Net interest margin is positive, indicating that insolvent institutions with higher margins were less likely to be closed. The discount on residential mortgages is positive, indicating that thrifts with

Table 6. Probability of closure for insolvent thrifts: probit estimates.

Log-likelihood		−393
Restricted (slopes = 0) log-likelihood		−595
Pseudo *R*-square		0.21
Variable	Coefficient	*T*-stat
Operating risk		
Net interest margin	−0.0905	−4.68*
Discount on residential mortgages	0.0334	5.49*
Discount on mortgage securities	0.0435	1.76
Real estate owned	−0.0072	−4.36*
Delinquent loans	−0.0013	−1.49
Valuation allowances	0.0058	1.42
Agency risk		
Owner-type		
One- to four-family mortgages	−0.2373	−2.92*
Mortgage-backed securities	−0.4255	−1.75
Nonresidential mortgages	−0.0007	−0.89
Commercial loans	0.0267	1.29
Consumer loans	0.0147	1.32
Real estate held for investment	0.0033	1.47
Service corporation investment	−0.0006	−0.39
Land loans	0.0188	2.36†
Brokered deposits	0.0015	2.46†
Manager type		
Salary expense	0.0047	1.12
Equipment expense	0.0025	0.21
Mutual charter	0.3121	2.09†
Publicly traded stock	0.0323	0.12
Regulator-type		
Federal charter	−0.1974	−1.62
District 9 membership	−0.3022	−2.26†
Months of insolvency	−0.0319	−10.67*

†Indicates statistical significance at the 5 percent level.
*Indicates statistical significance at the 1 percent level.

larger interest-rate-induced losses were more likely to be closed. This finding conflicts with the hypothesized policy of capital forbearance for insolvencies induced by interest-rate spread problems. Real estate owned is negative, indicating that insolvent institutions with higher levels of foreclosed real estate are less likely to be closed. While this counterintuitive sign on real estate owned is consistent with the existence of regulatory forbearance toward institutions that would impose the largest losses (as a percentage of liabilities) on the thrift deposit insurance fund, it also may indicate forbearance toward the institutions that work most forcefully to resolve their problem loans by aggressively pursuing foreclosure actions against delinquent borrowers.

Of the owner-type agency-risk variables, only one- to four-family mortgages, land loans, and brokered deposits are statistically significant, indicating that insolvent thrifts with higher levels of residential mortgages and lower levels of land loans and brokered deposits are less likely to be closed. These findings suggest that the FHLBB treated insolvent thrifts funding traditional investments with nonvolatile liabilities less severely than insolvent thrifts funding nontraditional investments with volatile liabilities.

Of the manager-type agency-risk variables, the dummy for mutual charter is positive and significant, indicating that insolvent mutuals are more likely to be closed. This finding is consistent with the view that closure of a mutual thrift, which has no shareholders, imposes lower political costs on regulators than does closure of a stock thrift, but more likely reflects organizational changes in the thrift industry during the sample period as hundreds of mutuals converted to stock charters.

Strong differences in nonclosed and closed thrifts are found with respect to regulator–taxpayer-agency conflicts. All three measures are negative and two are statistically significant. First, the length of insolvency is negatively related to closure. As noted previously, because nonclosed thrifts first report insolvency two and a half years later, on average, than closed thrifts, this implies that forbearance was granted, not to the interest-rate-spread-induced insolvencies occurring during the early 1980s, but rather to credit-quality-induced insolvencies occurring during the mid- and late-1980s. Second, insolvent thrifts located in FHLB District Nine are less likely to be closed than are insolvent thrifts located in the rest of the country, consistent with the hypothesis that thrift closure efforts were influenced by political pressure to grant capital forbearance to insolvent thrifts located in the Southwest; however, this conclusion must be tempered by the possibility that the Ninth FHLB District, seriously understaffed during the mid-1980s following its move from Little Rock, simply was overwhelmed by the magnitude and concentration of insolvencies in the Southwest.

Finally, insolvent thrifts with federal charters are less likely to be closed than are their state-charter counterparts, even after controlling for portfolio differences, but this variable is only significant at slightly greater than a 10 percent level. Without inclusion of the length of insolvency variable, the dummy for federal charter is significant at the 5 percent level, evidence that federally chartered thrifts were, on average, insolvent for longer periods than were state chartered thrifts. These results provide weak evidence in favor of

the hypothesis that federal regulators were attempting either to shift responsibility for the thrift crisis to state regulators or to consolidate their regulatory control over the thrift industry.

6. Conclusions

Using a bivariate probit model, this study provides support for agency-theoretic models of insolvency and closure. The analysis provides evidence consistent with the existence of owner-type and manager-type agency conflicts, supporting the hypothesized existence both of moral hazard by owners of troubled thrifts and of expense-preferent behavior by managers of troubled thrifts. The analysis also provides support for the hypothesized principal-agent conflict between government regulators and the public interest.

Evidence regarding differences in the determinants of insolvency and closure strongly suggests that factors determining insolvency carry far different weight in determining regulatory closure. A direct test of why some insolvent thrifts were closed while others were not confirms this hypothesis, revealing that insolvent thrifts funding traditional assets with traditional liabilities and insolvent thrifts located in the Ninth FHLB District were less likely to be closed than other thrifts. In addition, the evidence indicates that forbearance was far more prevalent for insolvencies occurring during the late 1980s than for insolvencies occurring during the early 1980s.

With respect to the issue of expanded asset powers *under the existing system of deposit insurance*, evidence from this study suggests that such powers had a negative impact on safety and soundness of depository institutions by increasing the likelihood of insolvency. One exception is the finding that direct equity investment through service corporations is statistically significant and inversely related to insolvency. This suggests that expanded asset powers are not inherently bad and may result in beneficial portfolio diversification. Also of interest is the finding that service corporation and real estate direct investment variables have the opposite effects on insolvency and closure. Most previous work on direct investment has pooled the two asset categories together. These results suggest that such pooling may be inappropriate.

Overall, the results of this study may have significant policy implications. Given the unprecedented costs associated with resolving troubled FSLIC-insured institutions, it is imperative to understand both why so many institutions became insolvent during the 1980s and why regulators failed to act quickly to stem mounting losses through prompt closure efforts. The evidence from this study is consistent with Kane (1989), who asserts that the existing incentives facing owners and managers of thrifts encourage excessive risk taking while, at the same time, the incentives facing regulators encourage forbearance and delay. If costs of resolving the growing problems in other sectors of the financial services industry are to be attenuated, then the incentives facing regulators must be brought into congruence with the taxpayers' best interests.

Appendix: Data variables and sources: *FHLBB Thrift Quarterly Report (TQR)* and *Semi-Annual Report (SAR)* data

	TQR	SAR
Regulatory accounting principal net worth	C800, K995, B900, − A570	C108, − C117, − A173
Generally accepted accounting principal net worth	C800, − C014, − C050, − C060, − C070, − C080, − C090, − A520, − A530, − A570	C108, − C117, − C124, − C125, − C126, − A161, − A173
Tangible net worth	GNW, − A544	GNW, − A174
Real estate owned	A310, − A330	A134, A135
Delinquent loans	FDQML	F114, F115
Valuation allowances and reserves	AVAL	A122, A178
Interest income	DTII	D100, D101, D102, D103, D104, D121
Mortgages for acquisition & development of land	A050	A115, A116, A117
Investment in service corporations	A352, A354, A500	A140
Real estate held for investment	A342, A344, A350	A139
Nonresidential mortgages	A026, A036	A106, A114
Commercial loans	A150, A160, A250	A126, A127, A131
Mortgages on one- to four-family dwellings	A022, A032S	A100, A101, A102, A103, A104, A105, A106, A108, A110, A111
Mortgage-backed securities	AMBS	A171, A120, A143, A144, A145
Consumer loans	ATCL	A123, A124, A125, A128, A167, A168, A169
Legal expenses	E030	E104
Fee income	D080, D090, D100, D110	D105, D106, D107, D122
Brokered deposits	F473	G127
FHLB advances, dollars outstanding	B020	B106, B107
Interest expense	ETIC	ETDIC, E109
Directors' fees	E010	E100
Officers' and employees' compensation	E020	E101, E102, E103
Director's, officers', and employee expense	E040	E105
Furniture, fixture, equipment, and auto expense	E060	E107
Liquid assets	ATCDIS, − A400	A143, A144, A145, A146, A147, A148, − A150
Total liabilities	B800	B136
Total assets	A800	A164
FHLB district		

Charter type	
FSLIC analysis and evaluation division data	
List of closed institutions	
Federal Reserve bulletin data	
Treasury yield data, various maturities	

Notes

1. This number does not include "stabilization" efforts such as Management Consignment Program thrifts, which routinely were reported as "resolutions" by the FHLBB.

   After the passage of FIRREA, the Office of Thrift Supervision (OTS), successor to the FHLBB, was charged with responsibility for resolving all thrift institutions that were insolvent according to Regulatory Accounting Principles. From August 1989 through September 1992, the OTS closed 643 thrifts institutions and placed an additional 72 into conservatorship awaiting final resolution. The present-value cost to the U.S. Treasury of these resolutions has been estimated by the General Accounting Office (GAO) to be more than $100 billion.
2. A thrift institution is defined to be insolvent when its equity capital is negative. Throughout this article, insolvency refers to negative GAAP capital rather than negative capital measured according to Regulatory Accounting Principles (RAP), according to tangible net worth, or according to market value net worth.
3. Altman (1977), Pantalone and Platt (1987), Rudolph and Hamden (1988), Barth et al. (1989), and Benston (1985) use discriminant analysis or logistic regression to explain whether or not a thrift institution is closed by regulators. Five additional studies examine the costs of thrift closure. Barth, Brumbaugh, and Saurhaft (1985) and Barth, Bartholomew, and Bradley (1990) use a tobit model, while Benston (1985) uses ordinary least squares regression and both Cole (1990b) and Cole, McKenzie, and White (1990) use a probit-regression selection model to examine the determinants of resolution costs.
4. Gajewski (1989), Demirguc-Kunt (1990), and Thomson (1992) model capital ratios and the closure decision using an approach first suggested by Maddala (1986), while Lane, Looney, and Wansley (1986) and Whalen (1991) model the time to closure using hazard models. James (1991) analyzes the cost of bank failures to the FDIC insurance fund.
5. Cook and Spellmen (1990) provide some evidence that, in 1987–1988, depositors began to price the probability that the government would repudiate its deposit insurance guarantee. This type of market discipline can be expected to increase as regulators impose losses on large uninsured deposits in accordance with provisions of the FDIC Improvement Act of 1991 that limit the FDIC's ability to protect such deposits. The FDIC's October 1992 decision not to fully protect uninsured depositors when it closed the 20 subsidiary banks of $9-billion First City Corp demonstrates that even depositors of relatively large institutions now are at risk.
6. Kane (1983) estimates that FSLIC-insured thrifts, in aggregate, were approximately $118 billion insolvent on a "mark-to-market" basis as early as 1981, largely due to interest-rate-induced losses in their mortgage portfolios. The FHLBB did not begin to collect maturity gap and other interest-rate data until the March 1984 expansion of the thrift call report's Section H. A further expansion of the call report implemented in June 1989 dealt more thoroughly with off-balance-sheet activities that could profoundly affect an institution's interest-rate-risk profile.
7. Institutions frequently recognize problem assets on their books only long after the institution has suffered a market value loss. The adoption of market-value accounting principles would ameliorate this problem.

8. McKenzie, Cole and Brown (1992) provide empirical evidence that thrifts earned returns on nontraditional assets inferior to those earned on traditional assets. They report that this disparity was even more pronounced for poorly capitalized thrifts, which earned negative returns on land loans, service corporation investments, and direct real estate investments.
9. Mutual-charter thrift managers can recognize increases in firm value in the event of a mutual-to-stock conversion, but must share these increases in value with other subscribers. See Masulis (1987) for a thorough discussion of these issues.
10. For example, California removed virtually all asset restrictions from its state-chartered thrifts in 1980 to keep them from converting to federal charter in response to a state supreme court decision forcing them to make mortgage loans assumable. At this time, rates on most of these mortgages were substantially below market rates, so that the effect of this decision was to inflict heavy losses on state-chartered thrifts. Federally chartered thrifts were not bound by the state court decision.

    Texas, Florida, Ohio, and Illinois were other states with significantly fewer restrictions on their state-chartered thrifts than on their federally chartered counterparts. Kane (1983) discusses the incentives for regulators to compete for clients.
11. Until his resignation, former House Speaker Jim Wright was a powerful advocate for a policy of forbearance toward Texas thrifts. Several other Texas congressmen were and are members of the two congressional banking committees. According to Common Cause, most of these legislators were among the recipients of more than $500,000 in S&L political contributions to Texas congressmen during the 1980s. While politicians had legitimate interests in protecting the interests of their thrifts constituents, their actions may have increased the ultimate costs of resolving the thrift crisis. In its seven-part series on the thrift crisis, the *Washington Post* details congressional intervention in the regulatory process on behalf of Texas thrifts.
12. Within some sectors of the industry, there has been an attempt to attribute thrifts' financial problems solely to distressed regional economic conditions. Specifically, the problems of thrifts in FHLB District Nine (Arkansas, Louisiana, Mississippi, New Mexico, and Texas) have been attributed to the collapse of the oil industry and its associated effect on real estate prices as the price of oil fell sharply in 1986.

    A complementary explanation is that regional problems were compounded by the failure of Ninth District supervisory personnel to adequately monitor the high-risk behavior of their member thrifts during the period immediately following deregulation. In 1982, the Ninth FHLB District moved from Little Rock to Dallas. As a result of this decision, all but 11 of its 48 supervisory personnel resigned rather than relocate. Of these 11, only 2 were field supervisors. These last two supervisors were left responsible for overseeing 480 thrifts. As a result, the Ninth District's supervisory capabilities were critically weakened just at the time when they were most needed. Consequently, many thrifts avoided supervisory attention for two to three years, during which they grew exponentially by making high-risk loans funded with brokered deposits. By the time supervision caught up with deregulation, literally hundreds of thrifts had been managed into costly insolvencies. See the *Washington Post*'s June 11-17, 1989, seven-part series on the thrift crisis for a detailed description of the consequences of this move.
13. It should be noted that state-chartered S&Ls, which constituted the majority of Texas thrifts, already had been granted by state authorities most of the powers later granted to federal-charter thrifts by the Garn-St. Germain Act. However, their ability to exploit these new powers was limited by their ability to raise new funds. With the removal of interest-rate ceilings on deposits in the early 1980s coupled with an increase in the level of insured deposits from $40,000 to $100,000 per account, constraints on growth were lifted. Thrifts were able to attract seemingly limitless amounts of deposits in the brokered CD market and use these deposits to fund growth in high-risk commercial real estate assets.
14. Thirty-one additional institutions failed during this period, but were GAAP insolvent in each reporting period for which data were available. These institutions were deleted from the database. In addition, stabilizations were not treated as independent resolutions. Such treatment would result in double counting the resolution of stabilized institutions that were later merged or liquidated, biasing parameter estimates obtained from the probit model.
15. This sampling procedure means that data for all solvent thrifts are taken from the September 1988 thrift call report. As an anonymous referee pointed out, one shortcoming of this approach is that any industrywide

trends in portfolio reallocation, such as the general increase in holdings of mortgage-backed securities that occurred during the 1980s, may proxy for survivorship because data for all closed thrifts are taken at earlier points in time than are corresponding data for surviving thrifts.

16. The net worth and asset balances of a failing depository institution usually register their greatest declines during the period just after insolvency. In large part, these declines are the result of asset writedowns required by regulators following an one-site examination of the institution. Hence, the portfolio composition of an institution six months after insolvency can differ greatly from the composition just prior to insolvency.
17. Computations were carried out using the LIMDEP statistical package developed by Greene (1989). Starting values for the maximum-likelihood probit models are obtained from least squares estimates. Newton's method of estimation is then used to obtain final parameter estimates. See Maddala (1983).
18. For the bivariate probit model, estimation is carried out using the Davidon/Fletcher/Powell algorithm. Starting values are the single-equation probit estimates. See Amemiya (1981) and Greene (1984).
19. This characteristic of the methodology was pointed out by an anonymous referee.
20. The collapse of real estate values in the Southwest led to the closure of numerous commercial banks as well as thrifts, and subsequently spread to the Northeast, Southeast, and West regions of the country; however, real estate values in other regions of the country did not collapse until after 1988, the end of the sample period examined in this study.

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