1996 V24 2: pp. 195–218
REAL ESTATE
ECONOMICS

The Role of Principal-Agent Conflicts in the 1980s Thrift Crisis

Rebel A. Cole* and Robert A. Eisenbeis**

Agency theory suggests that many of the costs incurred by the taxpayer during the 1980s thrift crisis were the result of conflicts between principals and their agents. This study models the costs associated with three distinct types of agency conflicts involved in closing an insolvent thrift—conflicts between creditors and owners, between owners and managers, and between taxpayers and government officials. Using a model that controls for sample-selection bias, the study presents strong evidence that thrift owners effected wealth transfers from creditors by undertaking high-risk investments, and that government officials pursued policies that increased losses to the thrift deposit insurance fund which ultimately were funded by the taxpayer. The results do not show that managers effected wealth transfers from owners through expense-preference behavior, but rather that inefficient management increased the losses of the deposit insurance fund.

A review of the events surrounding the thrift crisis suggests that much of the approximately $150 billion present-value cost to taxpayers can be attributed to principal-agent conflicts within the thrift industry—conflicts between creditors and owners, between owners and managers, and between taxpayers and government officials.[1] In this study, implications of agency theory are used to specify testable hypotheses about the role of principal-agent conflicts in determining the failure costs of thrifts that failed during the 1980–1988 period.[2] These costs are equivalent to the losses incurred by taxpayers because tax revenues ultimately made up the difference between available deposit insurance funds and the costs incurred disposing of failed thrifts.

The empirical results provide strong evidence consistent with the implications of the agency-theoretic hypotheses proposed. This evidence suggests

*Board of Governors of the Federal Reserve System, Washington, DC 20551
**University of North Carolina, Chapel Hill, NC 27599-3490

[1] Kane (1985, 1989, 1992) has addressed many of these problems in previous work.

[2] Throughout this study, the term failure cost refers to the legal and administrative costs associated with closing failed thrifts as well as the imbedded negative market value net worth of these thrifts.

that owners undertook high-risk investments resulting in wealth transfers from creditors (including the deposit insurance fund and taxpayers) and that government officials took actions that increased thrift failure costs. While the results do not show that firm managers effected wealth transfers from owners and creditors, they do suggest that higher non-salary expenses are associated with higher failure costs.[3]

The next section describes how the three types of agency conflicts within the thrift industry can affect failure costs, motivating the specification of an empirical model to test the agency-theoretic hypotheses. The third section of the study describes the data and methodology used to test the hypotheses, while the fourth section presents the major empirical results. The final section provides a summary and conclusions.

Agency Conflicts and Thrift Failure Costs

Three distinct types of principal-agent conflicts can affect thrift failure costs—conflicts between creditors and owners, between owners and managers, and between taxpayers and regulators.[4]

Creditor-Owner Agency Conflicts

Merton (1977, 1978), Ronn and Verma (1986), Pennacchi (1987) and others have shown that owners of a federally insured depository institution hold the equivalent of a put option on the net worth of their institution, and that the value of this deposit insurance put option increases as the market value of net worth declines. Shareholders can increase the value of this option by making high-risk investments that increase the variance of return on assets. Moreover, because the government guarantees repayment of insured deposits, insured depositors have no incentive to monitor the firm's riskiness or to withdraw their funds as the institution's net worth falls. Consequently, failure costs should increase as net worth falls and owners and their manager-agents try to maximize the value of the deposit-insurance put option by investing in high-risk projects.

For thrift institutions, higher-risk assets are defined as nontraditional thrift investments authorized by the deregulation of thrift asset portfolios in the

[3] This is another form of the looting, or moral hazard behavior, noted by Akerlof and Romer (1993).

[4] Kane (1987) clearly stated this three-part view of the problem well before thrift crisis unraveled.

Garn-St Germain Depository Institutions Act of 1982. These investments include loans for the acquisition and development of land (land loans), nonresidential mortgages, commercial nonmortgage loans, consumer loans and direct equity investments in real estate and service corporations.[5] These asset classes are viewed as high-risk for two reasons relating to thrifts' lesser expertise than their competitors in assessing the creditworthiness of these types of investments (especially commercial real estate). First, thrifts were more likely to underprice credits relative to the credit risk involved. Second, thrifts' unfamiliarity with commercial real estate borrowers and underwriting procedures for such loans left them more vulnerable to adverse selection. Their lack of expertise in many of these product lines suggest vulnerability to demands for funds from the marginal credits and equity investment projects that could not obtain funds from traditional lenders with long-term relationships and better credit evaluation procedures. For both of these reasons, investments in these nontraditional assets are expected to increase failure costs. Many previous studies provide empirical evidence for this view.[6]

Conversely, traditional investments in which thrifts have long-term expertise should be negatively related to failure costs. The principal low-risk investments are one- to four-family mortgages and mortgage-backed securities. These relationships are not unambiguous, however, because of the interest-rate risk involved in funding long-term assets with short-term deposit liabilities. If either type of mortgage investment provides a thrift with returns less than the thrift's cost of funds from deposits or other sources, then these types of investments would be positively, rather than negatively related to failure costs. Certainly, this was true of low-rate, long-term mortgages booked in the late 1970s and funded by much higher-rate deposit liabilities during the early and mid–1980s.

---

[5] The Garn-St Germain Act allowed federal-charter thrifts, for the first time, to devote up to 10% of their assets to loans for commercial, corporate, business, and agricultural purposes, as well as loans secured by unimproved real estate. The 1982 Act loosened percentage-of-assets limitations on consumer loans (from 20% to 30%) and loans on nonresidential real estate (from 20% to 40%). It also eliminated numerous loan-to-value ratio limitations. Regulatory actions in April 1981 and March 1985 significantly loosened limits on direct equity investments (Kane 1989, pp. 38, 45). Investment limitations on state-charter thrifts varied from state to state, with California and Texas two of the least restrictive.

[6] McKenzie, Cole and Brown (1992) find that insolvent thrifts suffered heavy losses on their investments in each of these categories. Cole and McKenzie (1994) further report that none of these asset classes would have appeared in the *ex post* efficient portfolios of thrifts over the 1984–1989 period. Numerous other studies (*e.g.*, Benston 1985; Pantalone and Platt 1987; and Rudolph and Hamden 1988) have found these variables to be useful predictors of closure or failure costs.

On the liability side, deposit insurance enabled thrifts to acquire higher-risk assets with deposits obtained through brokers (brokered deposits). Brokered deposits enabled thrift executives to pursue policies of asset growth unchecked by traditional market forces because these certificates of deposit are insured up to $100,000 per account. Moreover, brokered deposits may proxy for degree of market-value insolvency since they enabled thrift executives to pay off funds lost in silent runs by traditional depositors. This enabled troubled thrifts to avoid selling off underwater assets and booking the losses from such sales. As a result, many regulators, practitioners and academics have viewed the degree of funding by brokered deposits in a thrift's liability structure as an indicator of riskiness. If this argument is correct, greater reliance on brokered deposits as a source of funding should be associated with higher failure costs.

Owner-Manager Agency Conflicts

Jensen and Meckling (1976, p. 313) point out that "as the owner-manager's fraction of the equity falls, his fractional claim on the outcomes falls and this will tend to encourage him to appropriate larger amounts of the corporate resources in the form of perquisites." Owner-managers can expropriate corporate funds through expense-preference behavior, which also enables them to avoid double taxation of dividend income by extracting profits through salary and perquisites. They accomplish this through higher levels of direct or indirect compensation.[7]

Creditors and nonmanagerial shareholders can offset this tendency through incentive contracting, monitoring and the imposition of bonding costs or restrictive covenants. Also, offsetting the tendency of management towards expense preference is that, regardless of ownership share, firm managers still bear significant failure costs through the damage to their reputation or human capital from association with a failed institution. Consequently, they have strong incentives to avoid expropriating corporate funds in amounts that would threaten the firm with regulatory seizure. Moreover, the incentives of managers should be most compatible with the incentives of owners when a thrift is in violation of capital standards because both groups should favor high-risk, high-return investments to increase the chance that their thrift

[7] Managers (and owners) can consume a thrift's assets through illegal, as well as legal, means. Self-dealings, insider loans in excess of regulatory limits, payment of exorbitant dividends, payment of consulting fees to insiders, use of insiders' companies for thrift business, kickbacks received on "sweetheart" loans and embezzlement are among the illegal means that thrift regulators have documented as contributing to thrift failures.

would climb back into regulatory compliance and forestall seizure by regulators. The degree to which these offsetting incentives affected thrift failure costs is an empirical question.

For thrift institutions, three measures of direct and indirect compensation are available from the thrift call report: (1) salary expense (direct compensation); (2) director, officer and employee expenses (direct and indirect compensation); and (3) equipment expense, which encompasses expenses for office furnishings, corporate cars and executive aircraft (indirect compensation). Each of these forms of compensation represents an avenue by which managers can expropriate firm resources. As noted above, because of the offsetting incentives facing thrift managers, the effect of these variables on failure costs is indeterminate. Moreover, a positive relationship between expenses and failure costs may indicate inefficient management rather than intentional expropriation of firm resources by management. Even so, inefficient management is also evidence of agency conflicts between managers and owners.

Because the manager's equity stake depends on how a thrift is organized, the effects of owner-manager agency conflicts on thrift failure costs should vary across the three distinct organizational forms. Each type of firm operates with different governance and control mechanisms that magnify or attenuate agency conflicts between owners and managers. Dummy variables for mutual and publicly-traded thrifts are included in the model to test for such differences. As the following discussion indicates, the expected relationships between organizational type and thrift failure costs are ambiguous because numerous opposing forces are involved.

At publicly traded stock-charter thrifts where management typically holds little or no equity, outside shareholders monitor the actions of management (Schleifer and Vishny 1986). This oversight provides an additional mechanism for ensuring that management maximizes shareholder value, a mechanism that does not operate at mutual or closely held stock thrifts.

At closely held stock thrifts, managers hold enough stock to control the firm but usually not all outstanding shares. According to Fama and Jensen (1983a, b), agency conflicts between the owner-managers and other owners should be most severe as the owner-managers become entrenched and insulated from the market for corporate control. Agency conflicts between the owner-managers and outside creditors also should be worse than the manager-creditor conflicts in other organizational forms. Offsetting this tendency is the fact that the owner-managers have both large amounts of undiversified human capital invested in the firm, and large equity stakes at risk.

Consequently, they have strong incentives to avoid extracting sufficient firm resources to threaten the firm with regulatory seizure.

At mutual-charter thrifts, managers serve as the *de facto* owners of the firm because of the long term nature of their employment and their ability to maintain positions of power. Consequently, mutual managers are similar to managers of a closely held stock firm, but with two important distinctions. First, unlike the owner-manager of a closely-held-stock firm, a mutual manager does not have a large equity stake at risk. Second, the manager of a mutual thrift can only recognize increases in firm value by converting to a stock charter and purchasing a significant ownership stake in the converted firm. Since thrift regulatory anti-takeover restrictions limit any person or group acting in concert from owning more than 10% of the outstanding shares of a converting mutual for a period of at least three years, even the manager of a converting thrift would only be able to recognize a fraction of any increase in firm value. Thus, the manager has less incentive to undertake high-risk, high-return investments that maximize the value of the firm and more incentive to engage in excess perquisite consumption than the manager of a closely held stock firm.[8] Moreover, Masulis (1987) argues that mutual managers' compensation can be viewed as a fixed-rate liability whose value falls as firm risk increases, providing further incentive for the manager of a mutual-charter thrift to invest in lower-risk portfolios than their closely held stock-charter counterparts.

Taxpayer-Government Official Agency Conflicts

Kane (1988, 1989) theorizes that government officials receive a two-part compensation package consisting of explicit compensation in the form of a government salary below comparable private-sector wages, and implicit compensation in the form of a deferred increment in wages from post-government private-sector employment. To maximize this two-part return, government officials compete for constituents by providing accommodating regulatory treatment and delaying closure of financially troubled institutions. Such delays postpone the booking of insurance fund losses that accompany closures, thus protecting the government officials from the negative publicity that surrounds such events and allowing more time for the troubled institutions to attempt to return to financial health.

This theory regarding agency conflicts between government officials and taxpayers has a number of implications, three of which this paper explicitly

[8] See Cordell, MacDonald and Wohar (1993) for evidence on the high-risk investments of mutual thrifts that converted to stock charter.

tests. The first implication is that, when possible during the 1980s, thrift regulators systematically shifted costs from the thrift deposit insurance fund to the Treasury. To compensate acquirers of insolvent thrifts, the Federal Home Loan Bank Board (FHLBB) routinely used federal tax deductions and credits as an alternative to deposit insurance funds (Kormendi, Bernard, Pirrong and Snyder 1989; and Cole, Eisenbeis and McKenzie 1994). Because these tax benefits did not appear on the FHLBB balance sheet, their full cost to the taxpayer was not considered when evaluating assistance packages. When many of these tax breaks were scheduled to be cut in half after December 31, 1988, the FHLBB rushed to complete as many assisted transactions as possible before that date, and sold 72 insolvent thrifts to acquirers during December 1988. Many in Congress charged that, in its haste to complete these transactions, the FHLBB accepted more costly bids than it had previously. If these charges are true, then December 1988 transactions should be more costly than transactions occurring during other time periods. To test this hypothesis a dummy variable indicating thrifts sold during that month is included in the model. This variable should be positively related to failure costs if the FHLBB's critics were correct.

The second implication is that the FHLBB engaged in a policy of capital forbearance during the 1980s without regard to that policy's effect on failure costs. Forbearance enabled regulators to delay closures and the accompanying public recognition of the magnitude of the thrift crisis. Critics have charged that these delays increased the ultimate costs of resolving the thrift crisis, while enabling many senior regulators to move to the private sector and avoid the onus for problems that developed during their tenure. If this regulatory policy of capital forbearance increased the ultimate costs of closing insolvent thrifts, then the length of time a thrift was allowed to operate while reporting insolvency should be positively related to closure cost. The number of months that a thrift reported GAAP insolvency on its call reports is used to test this hypothesis.

The third implication of Kane's theory is that competition for clients between state and federal regulators increased thrift failure costs. Many states, such as California, Florida, and Texas, granted more permissive portfolio powers to thrifts chartered within their borders than were available to federal-charter thrifts (Strunk and Case 1988). Moreover, some charge that state-charter thrifts faced less stringent supervision. If so, federal-charter thrifts should be less costly to close than state-charter thrifts. While differences in the expansiveness of powers should be captured in the model by explicit inclusion of portfolio variables, the effect of the relative laxity in supervision by state versus federal regulators can be tested by including in the model a dummy variable indicating federal-charter thrifts. If state-administered supervision

was lax relative federally-administered supervision, and if lax supervision increased failure costs, this variable should be inversely related to failure costs.[9]

Data and Methodology

Data

The data derive from two basic sources—FHLBB semi-annual and quarterly Call Reports filed by each FSLIC-insured institution, and failure costs calculated by the FSLIC's Analysis and Evaluation Division (AED). The Call Reports include balance-sheet data detailing portfolio composition, income-statement data on revenues and expenses and structure data documenting organizational charter type and location. The FSLIC failure costs are estimates of the net-present-value cost of liquidation, assisted merger or sale for each of the failed thrift institutions, including imbedded negative market-value net worth. While imperfect, these are the best cost data available because the FSLIC did not have a cost-accounting system to track expenditures, and did not track costs on an institution-by-institution basis. Moreover, the FSLIC used these cost data to choose between available resolution alternatives.

The sample consists of 769 institutions that were liquidated, merged or sold by FSLIC during the period from January 1980 through December 1988, and 2,783 institutions that were operating at the end of this period and filed a September 1988 quarterly thrift call report.[10] Data are taken from the last period in which an institution reported positive GAAP net worth on its FHLBB semi-annual or quarterly call report.[11] From a theoretical standpoint,

---

[9] This variable is imprecise because states differ in the degree of permissiveness concerning thrift powers and regulatory environment, but there is not a readily available index of state laxity.

[10] During this period, 31 additional thrifts were closed by the FHLBB, but each reported GAAP insolvency on every call report available for this study. These institutions are deleted from the database. In addition, "stabilizations" carried out under the Management Consignment Program (MCP), Oklahoma and Southwest plans are not treated as independent resolutions. Such treatment would result in double counting the resolution of stabilized institutions that were later merged or liquidated. For example, Barth, Bartholomew and Bradley (1990) count eight MCPs as resolutions both when they entered the MCP and again when they were merged, liquidated or sold. Such double counting biases cost estimates downward by spreading costs across additional observations and by attributing costs to nonrepresentative portfolios.

[11] Because of this sampling procedure, data for all solvent thrifts are taken from the September 1988 thrift call report. One shortcoming of this approach is that any industry-wide trends in portfolio allocation, such as a move to increase holdings of mortgage-backed securities, would proxy for survivorship because all data for closed institutions are taken at earlier points in time.

this is the last period in which creditors would allow a traditional nondepository firm to operate prior to bankruptcy. From an empirical standpoint, this approximates the last period before a thrift would be placed under increased supervision that might affect its preferred portfolio choices, such as making high-risk investments in the hope of avoiding the imminent increase in regulatory supervision and the increasing probability of closure.

Previous thrift cost-of-failure studies such as Benston (1985) and Barth, Bartholomew and Bradley (1990) measure portfolio and other independent variables either as of the last call report prior to failure or one year prior to failure. Because the failed institutions reported GAAP insolvency, on average, for seventeen months prior to closure, the data used in these prior studies reflect portfolio compositions *after* the thrifts had written down assets well in excess of net worth and *after* regulators had restricted portfolio choices. As a result, the portfolios no longer reflect the compositions that *led* to the write-downs and insolvencies. In addition, troubled thrifts would be expected to sell off assets that had appreciated over time to boost capital. For both of these reasons, the portfolio data used as independent variables in previous studies are biased relative to those leading to the insolvencies. In this study, *ex ante* portfolio and performance data are measured as of the last call report on which each thrift reported positive GAAP net worth to capture the expected influence that the various types of agency conflicts had on subsequent failure costs.

In addition, previous researchers in this area have expressed call report data as percentages of book-value assets. Because failing thrifts were allowed to continue operating while insolvent, assets invariably were less than liabilities, often by substantial amounts. Consequently, the proportions of failed thrifts' portfolios accounted for by individual asset classes are biased upward from those of solvent institutions; hence, inferences from these studies are misleading. In this study, balance-sheet, income-statement and failure cost data are expressed as percentages of total liabilities. Because failure costs are incurred in retiring liabilities, cost per dollar of liability is a more meaningful metric.

Methodology

In examining the determinants of failure costs, ordinary least squares regression (OLS) has two desirable properties. First, OLS yields unbiased and consistent parameter estimates, and second, it provides acceptable inferences about the institutions that failed. To use these parameter estimates to make out-of-sample inferences about the determinants of closure and expected failure costs for surviving firms, however, one must control for the possibility

of sample-selection bias (Heckman 1979). That is, unless the sample of thrifts for which costs are available constitutes a random sample of both failing and surviving thrifts, OLS coefficients will be biased, especially if closure policies changed over time (as they almost certainly did). A sample of thrifts that are closed is not representative of the general population of thrifts. Therefore, this study uses a variation of the Heckman (1979) selection (Heckit) model. This model involves the simultaneous estimation of a probit probability-of-closure equation, which is the basis for selection, and an OLS cost-of-closure equation.[12] This two-equation methodology is superior to the more restrictive single-equation tobit procedure used by Barth, Bartholomew and Bradley (1990) because it allows parameter estimates and regressors to vary between the probability-of-closure and the cost-of-closure equations (Kennedy 1992, p. 240).[13]

A second potential methodological problem arises because the selection equation is estimated using the probit methodology. If closed thrifts are oversampled relative to nonclosed thrifts, the estimated probabilities will be biased estimates of the population probabilities since they will reflect the proportions of failed versus healthy institutions within the nonrandom sample rather than the proportions of the population from which the sample was drawn. Drawing inferences from these biased sample estimates to the probabilities of failure within the true population would be misleading. A common solution is to use a weighted estimation procedure. When feasible, however, it is best to eliminate the potential for bias by analyzing the entire population of closed and nonclosed thrifts. Because the number of thrifts is

[12] Heckman (1979) provides the original derivation of the selection model, which is estimated in two stages. Lee (1983) presents a generalized model allowing for the simultaneous estimation of the probit selection equation and OLS regression equation. Maddala (1986) provides a discussion of many of the econometric issues related to the closure cost estimation problem.

[13] In theory, the probability of closure depends upon economic insolvency. Measures of net worth, which are measures of insolvency, are (according to Maddala 1986) endogenous. The endogeneity of net worth is not a problem for this study because no measures of net worth appear in the closure equation.

Maddala also suggests a simultaneous-equations model of net worth and closure that would allow study of both the determinants of financial condition and the regulatory response to financial condition. Thomson (1992) uses this model to analyze the closure of commercial banks. Cole (1993) takes another approach, using a bivariate-probit model of book-value insolvency and closure. These studies suggest that a superior approach to the one chosen here would be to use a three-equation model that first, models market-value insolvency; second, models closure contingent upon insolvency; and, third, models failure cost contingent upon closure. As the econometrics of this approach are considerably more complicated than those used here, this approach is left as an area for future research.

not large and data are readily available for each thrift, this study uses the latter solution.

The Heckit procedure requires the estimation of two disturbance-related equations—a probability-of-closure equation and a cost-of-closure equation. The probability-of-closure equation is:

$$P^*_i = \gamma' z_i + \epsilon_i \tag{1}$$

where P^*_i is an unobservable index of the probability of closure, z_i is a vector of individual thrift institution characteristics developed in the previous sections (nine *creditor-owner* agency-conflict variables, five *owner-manager* agency-conflict variables and one *taxpayer-government official* agency-conflict variable firm charter type);[14] γ is a vector of parameter estimeates for the independent variables; ϵ_i is a normally distributed random disturbance term with zero mean and unknown constant variance σ_ϵ^2; and $i = 1, 2, \ldots, N$; where N is the total number of closed and nonclosed thrifts.

Let I_i be an observable variable that is equal to one if $P^*_i > 0$ and zero if $P^*_i < 0$. In this particular application, I_i is equal to one when a thrift is closed and equal to zero when a thrift is not closed. Since P^*_i is equal to $\gamma' z_i + \epsilon_i$, the probability that $P^*_i > 0$ is equal to the probability that $(\gamma' z_i + \epsilon_i) > 0$, or equivalently, the probability that $(\epsilon_i > -\gamma' z_i)$. Therefore, one can write the probability that I_i is equal to one as the probability that $(\epsilon_i > -\gamma' z_i)$, or, equivalently, $\text{Prob}(I_i = 1) = 1 - \phi(-\gamma' z_i)$, where ϕ is the cumulative distribution function of ϵ, here assumed to be normal. The probability that I_i is equal to zero is then simply one minus the probability that I_i is equal to one, or $\phi(-\gamma' z_i)$.

The cost-of-closure equation is:

$$C_j = \beta' x_j + \mu_j \tag{2}$$

where C_j is the closure cost as a percentage of total liabilities (observed only when $P^*_i > 0$); x_j is a vector of the nine *creditor-owner* agency-conflict variables, five *owner-manager* agency-conflict variables and three *taxpayer-government official* agency-conflict variables; β is a vector of parameter estimates for the independent variables; μ_j is a normally distributed random

[14] The two additional regulator-taxpayer agency variables—length of insolvency and dummy variable indicating December 1988 resolutions—are omitted from the probit model because each is a strong proxy for failure. Approximately three-fourths of the insolvent thrifts and all of the December 1988 resolutions are classified as closed.

disturbance term with zero mean and unknown constant variance σ_μ^2; and $j = 1, 2, \ldots, M$; where M is the number of thrifts in the closed sample and $M < N$. All dollar denominated variables from the balance sheet and income statement are expressed as percentages of total liabilities.

If one can control for the nonrandom nature of the closed sample by a complete specification (*i.e.*, x_j represents a complete set) of all the variables that determine the cost of closure, OLS regression will produce unbiased and consistent parameter estimates. If there are unobserved variables that affect whether or not a thrift is closed and affect the cost of closure, the error terms ϵ_i in equation (1) and μ_j in equation (2) will be correlated because the equations omit the same variables. Estimation procedures that ignore this correlation will produce biased coefficients for equation (2). To compensate for this correlation, the efficient procedure is the joint estimation of equation (1) and equation (2) by the method of full-information maximum-likelihood, assuming that ϵ and μ come from a bivariate normal distribution with correlation coefficient ρ. Because σ_ϵ cannot be estimated within this framework, it is normalized to one. The log likelihood for this model is:

$$\begin{aligned} ln\ L_i = {} & [ln\ \Phi(-\gamma' z_i)]_{I=0} \\ & + [-1/2 ln(2\pi) - ln\sigma_\mu - 1/2[(y_i - \beta' x_i)/\sigma_\mu]^2 \\ & + ln\ \Phi[\gamma' z_i + (\rho/\sigma_\mu)(y_i - \beta' x_i)/(1 - \rho^2)^{1/2}]_{I=1} \end{aligned}$$

where Φ is the standard normal distribution function, and ρ is the coefficient of correlation between ϵ_i and μ_j. This methodology produces unbiased and asymptotically efficient parameter estimates.[15]

Results

Univariate Results

Table 1 presents univariate statistics (means and standard errors) for the nine *creditor-owner* agency-conflict variables, five *owner-manager* variables and three *taxpayer-government official* agency-risk variables introduced in section 2. Statistics are presented separately for the closed and nonclosed

[15] Estimation was carried out using version 6.0 of the LIMDEP statistical package developed by Greene (1991). The particular estimator used here first calculates maximum-likelihood probit estimates and OLS cost estimates for use as starting values, and then uses a modification of the Davidon, Fletcher and Powell algorithm (see Fletcher 1980) to obtain the final parameter estimates.

Table 1 ■ Univariate statistics for variables used to explain the role of principal-agent conflicts in the 1980s thrift crisis.

Variable	Nonclosed	Closed	*t*-Stat
Panel A: Creditor-Owner Agency Conflicts			
One- to four-family mortgages	48.38	50.06	−2.2*
	(.35)	(.68)	
Mortgage-backed securities	9.20	6.22	7.5**
	(.21)	(.34)	
Nonresidential mortgages	7.21	7.86	−2.2*
	(.12)	(.27)	
Commercial loans	1.21	.94	2.5*
	(.05)	(.09)	
Consumer loans	4.70	4.02	3.5**
	(.10)	(.16)	
Real estate equity investment	2.82	6.23	−3.5**
	(.24)	(.93)	
Service corporation investment	.77	1.51	−4.8**
	(.04)	(.15)	
Land loans	1.87	3.71	−5.7**
	(.09)	(.31)	
Brokered deposits	1.39	3.33	−5.0**
	(.97)	(.38)	
Panel B: Owner-Manager Agency Conflicts			
Salary expense	.96	.78	8.4**
	(.01)	(.02)	
Director, officer and employee expense	.35	.32	1.2
	(.01)	(.002)	
Equipment expense	.23	.19	6.4**
	(.003)	(.006)	
Mutual charter***	58.46	65.02	−3.4**
	(.93)	(1.72)	
Publicly traded stock***	10.24	2.73	9.1**
	(.58)	(.59)	
Panel C: Taxpayer-Government Official Agency Conflicts			
Federal charter***	56.56	51.62	2.4*
	(.94)	(1.80)	
Tax-driven 1988 transaction***	.00	9.49	−9.0**
	(.00)	(1.06)	
Months of GAAP insolvency	3.79	16.98	−18.9**
	(.26)	(.65)	
Number of thrifts	2,783	769	

For each variable, the mean appears in the first row and the standard error appears in parentheses in the second row. Results for nonclosed thrifts appear in column 2 and results for closed thrifts appear in column 3. Column 4 presents the results of *t*-test for differences in the means of the non-closed and closed thrifts. All dollar denominated variables are expressed as percentages of total liabilities and are taken from the last call report on which each institution reported GAAP solvency.

*Indicates that the difference in the means of the two groups of thrifts is significant at the .05 level.

**Indicates that the difference in the means of the two groups of thrifts is significant at the .01 level.

***Indicates dummy variables.

samples. Also in Table 1 are the results of *t*-tests to determine whether the mean values for the two groups of thrifts are statistically different. In general, these results provide strong evidence of significant differences in the closed and nonclosed samples. For sixteen of the seventeen variables analyzed (all but *Director, officer and employee expense*), the *t*-statistic indicates that the means of the two groups are significantly different at least at the .05 level, and, for 12 of the variables, at the .01 level. These differences underscore the importance of using a methodology, like Heckit, that corrects for sample-selection bias when estimating the failure cost equation.

Table 2 presents univariate regression results from estimating the cost of closure as a function of each agency-conflict variable. These results are presented primarily for their intuitive clarity, and do not account for the effects of any other variables or for sample-selection bias. Overall, these results are striking. Each of the nine *creditor-owner* agency-conflict variables has the expected sign and is significant at least at the .05 level, with eight of the nine significant at the .01 level. Higher portfolio allocations of one- to four-family mortgages and mortgage-backed securities are associated with lower failure costs, whereas higher allocations of nonresidential mortgages, commercial loans, consumer loans, real estate equity investments, service corporation investment, land loans and brokered deposits are associated with higher failure costs.

Only two of the five *owner-manager* agency-conflict variables are statistically significant at least at the .05 level, although each of the five has the expected sign. Of the two significant variables, the *Director, officer and employee expense* is positively related to failure costs, whereas *Mutual charter* is negatively related to failure costs. The positive relationship between expenses and failure costs provides evidence that inefficient management increased failure costs. The negative relationship between mutual charter and failure costs suggests that mutual managers invested in lower risk portfolios than stock managers, consistent with the findings of Masulis (1987). The coefficients on *Salary expense*, *Equipment expense* and the dummy variable for publicly-traded stock charter thrifts are not significantly different from zero.

Each of the three *taxpayer-government official* agency-conflict variables has the expected sign and is significant at least at the .01 level. Federal-charter thrifts were less costly to resolve than state-charter thrifts, consistent with the hypothesis that more liberal asset powers at state-charter thrifts increased failure costs. Thrifts resolved during December 1988 were more costly to resolve than thrifts failing in other months, consistent with the hypothesis that regulators used these transactions to shift failure costs from the FSLIC

Table 2 ■ Univariate regression results for variables used to explain the role of principal-agent conflicts in the 1980s thrift crisis.

Variable	Intercept	Coef	Adjusted-R^2
Panel A: Creditor-Owner Agency Conflicts			
One- to four-family mortgages	46.75**	−.66**	.29
	(23.5)	(−17.7)	
Mortgage-backed securities	15.02**	−.19**	.01
	(15.0)	(−2.1)	
Nonresidential mortgages	8.98**	.61**	.03
	(7.2)	(5.1)	
Commercial loans	11.20**	2.81**	.10
	(13.2)	(9.2)	
Consumer loans	11.28**	.64**	.01
	(10.2)	(3.5)	
Real estate equity investment	12.46**	2.21**	.06
	(14.9)	(7.1)	
Service corporation investment	10.84**	1.99**	.12
	(13.0)	(10.4)	
Land loans	8.34**	1.48**	.30
	(11.0)	(18.4)	
Brokered deposits	11.75**	.63**	.08
	(13.9)	(8.1)	
Panel B: Owner-Manager Agency Conflicts			
Salary expense	12.84**	1.29	.00
	(9.0)	(.9)	
Director, officer and employee expense	10.87**	92.05**	.05
	(11.5)	(6.2)	
Equipment expense	12.43**	7.34	.00
	(9.7)	(1.5)	
Mutual charter	25.69**	−18.22**	.14
	(19.6)	(−11.2)	
Publicly traded stock	13.86**	−0.60	.00
	(16.3)	(−.1)	
Panel C: Taxpayer-Government Official Agency Conflicts			
Federal charter	17.95**	−7.96**	.03
	(15.1)	(−4.8)	
Tax-driven 1988 transaction	11.74**	22.17**	.08
	(13.9)	(8.1)	
Months of GAAP insolvency	5.73**	0.48**	.14
	(5.4)	(11.0)	

Each variable in column 1 was used as the single explanatory variable in an ordinary least squares regression to explain the failure cost as a percentage of total liabilities for 769 thrifts that were resolved by the Federal Home Loan Bank Board during 1980–1988. The intercept and coefficient estimates appear in columns 2 and 3, respectively. For each variable, the first row presents the coefficient estimate and the second row its associated t-statistic. Each regression's adjusted-R^2 appears in column 4. All dollar denominated variables are expressed as percentages of total liabilities and are taken from the last call report on which each institution reported GAAP solvency.

*Indicates statistical significance at the .05 level.
**Indicates statistical significance at the .01 level.

deposit insurance fund to the Treasury. Failure costs are a positive function of the number of months a thrift continued to operate while GAAP insolvent, consistent with the hypothesis that regulators increased failure costs by failing to close insolvent thrifts promptly.

Multivariate Results

The Heckit results from jointly estimating equation (1) and equation (2) appear in Table 3, respectively.[16] For this particular specification of the Heckit model, the correlation between the error terms in the two equations is negative ($\rho = -.12$) but not statistically significant ($t = -1.5$, p-value = .13). Since this finding may not generalize to other specifications or samples, joint estimation remains the appropriate statistical procedure for estimating failure costs. Indeed, other specifications of this model *do* yield statistically significant correlations (see footnote 16, for example).

Because the probit probability-of-closure equation is included only as a control for sample-selection bias, the results from estimating this equation are not discussed in detail. It is interesting, however, that two of the variables significant in explaining failure costs (*service corporation investment* and *director, officer and employee expense*) are *not* significant in explaining the probability of closure, and five of the variables significant in determining the probability of closure (*nonresidential mortgages, commercial loans, consumer loans, equipment expense* and *mutual charter*) are *not* significant in determining the cost of closure. This evidence suggests that thrift regulators during the 1980s chose a closure rule that omitted important factors related to the cost of failure while including unrelated factors.

The estimates of the Heckit cost-of-closure equation appearing in Table 3 show that all nine portfolio categories included to capture the effects of *creditor-owner* agency-conflict risk on the cost of thrift failure have the expected signs, and only three—*nonresidential mortgages, commercial loans* and *consumer loans*—are not statistically significant at least at the .05 level. Higher values of *land loans, real estate equity investment, service corpo-*

[16] The Heckit model also was estimated excluding 312 supervisory mergers for which the dependent variable takes on a value of zero. Results from this estimation are not qualitatively different from those obtained using the entire sample, although significance levels of many variables are lower when the supervisory mergers are excluded. When the supervisory mergers are excluded, however, the correlation between the closure and cost equations is statistically significant at the .05 level, indicating that OLS would yield biased and inconsistent results. This underscores the importance of using the Heckit procedure to correct for sample selection bias.

Table 3 ■ Multivariate regression results for variables used to explain the role of principal-agent conflicts in the 1980s thrift crisis.

	Probability of Closure		Cost of Closure	
Variable	Coef	*t*-Stat	Coef	*t*-Stat
Intercept	−1.30**	−5.3	17.07**	3.5
Panel A: Creditor-Owner Agency Conflicts				
One- to four-family mortgages	−.03**	−5.3	−.26**	−4.2
Mortgage-backed securities	−.4*	−2.7	−.23*	−2.5
Nonresidential mortgages	.1*	2.2	.01	.1
Commercial loans	.5**	3.8	.37	1.4
Consumer loans	.2**	3.3	.15	1.1
Real estate equity investment	.4*	2.4	.61**	2.8
Service corporation investment	−.1	−.9	.69**	4.3
Land loans	.02**	4.0	.81**	10.8
Brokered deposits	.01**	3.5	.17**	3.6
Panel B: Owner-Manager Agency Conflicts				
Salary expense	.03	−.4	1.26	.6
Director, officer and employee expense	.15	2.0	2.86*	2.5
Equipment expense	1.02**	3.7	−7.15	−.9
Mutual charter	.37**	3.6	−2.56	−1.1
Publicly traded stock	−.13	−.9	−1.06	−.2
Panel C: Taxpayer-Government Official Agency Conflicts				
Federal charter	−.17	−1.9	1.95	1.0
Tax-driven 1988 transaction	n/a	n/a	5.31**	2.7
Months of GAAP insolvency	n/a	n/a	.34**	9.6

Table 3 presents results from jointly estimating the probability of closure and failure cost as a percentage of total liabilities for a sample of 769 thrifts that thrift regulators closed during 1980–1988 and 2,783 thrifts that remained operating at the end of 1988 using a variation of the "Heckit" methodology developed by Heckman (1979). All dollar denominated variables are expressed as percentages of total liabilities and are taken from the last call report on which each institution reported GAAP solvency.

*Indicates statistical significance at the .05 level.
**Indicates statistical significance at the .01 level.
n/a Indicates the variable is not applicable to the probability of closure.

ration investment and *brokered deposits* are associated with higher failure costs, and higher values of *one- to four-family mortgages* and *mortgage-backed securities* are associated with lower failure costs.

These results strongly support the hypothesized role of *creditor-owner* agency conflicts in determining thrift failure costs. Moreover, they point to the importance of both market-value accounting and prompt supervisory action to identify and monitor nontraditional and speculative investments by federally insured depository institutions.

Because these explanatory variables are measured as percentages of total liabilities, their coefficients can be interpreted as the loss rates for each asset or liability class. Thus, for each additional percentage point of one- to four-family mortgages and mortgage-backed securities, failure costs decrease by .3% and .2%, respectively. For each additional percentage point of real estate equity investment, service corporation investment, and land loans, the failure costs increase by .6%, .7% and .8%, respectively. For each additional percentage point of brokered deposits, resolution costs increase by .2%. The average closure cost as a percentage of total liabilities for all 769 thrifts in the closed sample is 13.8%.

Three expense variables and two organizational form variables help assess whether *owner-manager* agency conflicts increase failure costs. Coefficients on four of the five—the ratios of salary expense and equipment expense to total liabilities and dummy variables indicating mutual-charter thrifts and publicly-traded stock-charter thrifts—are not significantly different from zero. The coefficient on the fifth, the ratio of director, officer and employee expense to total liabilities, is positive and statistically significant at the .01 level. This coefficient implies that each additional percentage point of total liabilities accounted for by such expenses increased failure costs by 2.9%. This evidence, while weak, is consistent with the hypothesis that thrift managers did not maximize firm value.

Three variables are examined for evidence that *taxpayer-government official* agency conflicts increased thrift failure costs. Each has the expected sign, and two are statistically significant. Both *months of GAAP insolvency* and *tax-driven 1988 transaction* are positively related to failure costs and significant at least at the .01 level. The coefficient of the insolvency variable indicates that for each month of GAAP insolvency, failure costs increased by .3% of assets, or more than four percentage points for each year of GAAP insolvency. As the average failure cost for the 769 failed thrifts analyzed is 13.8% of assets, this implies that for each year of GAAP insolvency failure costs increase by approximately 30%. The coefficient of the tax-deal dummy

indicates that failure costs for December 1988 transactions were 5.3 percentage points higher than those for transactions occurring in other months during the 1980–1988 sample period. This implies that these deals were almost 40% more costly than the average failure cost of 13.8% of assets.

These results provide strong evidence in favor of the hypothesis that *taxpayer-government official* agency conflicts significantly increased thrift failure costs. December 1988 transactions were more expensive because the FHLBB hastened to complete them before tax breaks expired. In so doing, the FHLBB appears to have negotiated transactions that were less cost-efficient than other transactions that were not time-constrained. These findings would appear at odds with those presented by Kormendi, Bernard, Pirrong and Snyder (1989), who report that 1988 transactions were not more costly that other transactions, and Cole, Eisenbeis and McKenzie (1994), who do not find excess stock returns in response to the announcement of the assisted mergers completed during 1988. In those studies, however, failures occurring during *all* of 1988 were analyzed together, whereas, in this study, December 1988 transactions were analyzed separately from those occurring earlier in that year. The strong positive influence of the length of insolvency on failure costs indicates that the FHLBB's policy of forbearance significantly increased the costs of resolving the thrift crisis, as insolvent thrifts continued to hemorrhage the taxpayers' funds until closure. These results are strongly supportive of Kane (1988, 1989) and indicate the appropriateness of the prompt corrective action provisions imposed by the Federal Deposit Insurance Corporation Improvement Act of 1991 (FDICIA). Moreover, they point to the importance of adequately capitalizing the FDIC's Bank and Savings Association Insurance Funds.

The coefficient on the final regulatory agency-conflict variable, *federal-charter,* is not significantly different from zero. There is thus no support for the hypothesis that federal-charter thrifts were less costly to resolve than state-charter thrifts because of inadequate supervision and examination by state regulatory personnel. To further investigate this issue, separate dummy variables indicating state-charter thrifts in California, Florida and Texas were constructed and included in the model. Only the Texas-state-charter dummy was statistically significant, suggesting that any laxity of state supervisory personnel was confined to that one state. In fact, the federal-charter dummy is positive and significant at the 5% level when the Texas state-charter dummy variable is included in the model, evidence that failure costs were *lower* for state-charter thrifts in the rest of the country.

For the sake of completeness, Table 4 presents the results from estimating equation (1) and equation (2) independently. The probability-of-closure

Table 4 ■ Multivariate regression results for variables used to explain the role of principal-agent conflicts in the 1980s thrift crisis.

	Probability of Closure (Probit)		Cost of Closure (OLS)	
Variable	Coef (1)	*t*-Stat (2)	Coef (3)	*t*-Stat (4)
Intercept	−1.30**	−5.1	14.97**	3.1
Panel A: Creditor-Owner Agency Conflicts				
One- to four-family mortgages	−.03**	−5.5	−.23**	−3.7
Mortgage-backed securities	−.04*	−2.4	−.23*	−2.5
Nonresidential mortgages	.01*	2.1	.03	.3
Commercial loans	.05**	3.6	.33	1.2
Consumer loans	.02**	3.4	.14	1.0
Real estate equity investment	.04*	2.3	.64**	2.6
Service corporation investment	−.01	−.9	.72**	4.3
Land loans	.02**	3.3	.83**	8.7
Brokered deposits	.01**	3.4	.18**	2.8
Panel B: Owner-Manager Agency Conflicts				
Salary expense	−.03	−.3	.63	.3
Director, officer and employee expense	.15*	2.2	3.08*	2.4
Equipment expense	1.01**	3.3	−6.84	−1.2
Mutual charter	.37**	3.9	−2.32	−1.1
Publicly traded stock	−.14	−.9	−1.95	−.5
Panel C: Taxpayer-Government Official Agency Conflicts				
Federal charter	−0.17*	−2.2	1.76	1.2
Tax-driven 1988 transaction	n/a	n/a	4.79*	2.2
Months of GAAP insolvency	n/a	n/a	0.33**	9.6
	pseudo-R^2 = .57		Adjusted−R^2 = .51	

Columns 1 and 2 present the results from a probit model used to estimate the probability of closure for a sample of 769 thrifts that thrift regulators closed during 1980–1988 and 2,783 thrifts that remained operating at the end of 1988. Columns 3 and 4 presents the results from and ordinary-least-squares regression model used to estimate the failure cost for the 769 failed thrifts. For each variable in each panel, the first column presents the coefficient estimate and the second column presents its *t*-statistic. All dollar denominated variables are expressed as percentages of total liabilities and are taken from the last call report on which each institution reported GAAP solvency.

*Indicates statistical significance at the .05 level.
**Indicates statistical significance at the .01 level.
n/a Indicates the variable is not applicable to the probability of closure model.

equation is estimated using the probit methodology, and the cost-of-closure equation is estimated by OLS.[17] Because the results of the single-equation and the Heckit procedures are qualitatively and quantitatively similar, the single-equation results in Table 4 are not discussed in detail. It is of interest, however, to note that the pseudo-R^2 for the probability-of-closure equation (.57) and the adjusted-R^2 for the cost-of-closure equation (.51) indicate that each is fairly well specified. This may explain why the estimated correlation between error terms in the Heckit model is not statistically significant.

To ensure that the evidence presented thus far is not driven by outliers in the data, regression diagnostics suggested by Belsey, Kuh and Welsh (1980) were used to identify observations for which the absolute values of their studentized residuals (the residuals divided by the standard error of the residuals) from the OLS cost-of-closure model are greater than 2.0. Both the OLS and Heckit models were re-estimated without these observations. In both cases, the results are qualitatively unchanged. No variables significant when all observations are used lose significance when the outliers are deleted, and no variables that are not significant when all observations are used gain significance when the outliers are deleted.

Summary and Conclusions

This study draws upon agency theory to develop testable hypotheses about the role of principal-agent conflicts in determining the costs of closing thrift institutions that failed during the 1980s. These hypotheses are tested using a model that jointly estimates the probability of closure and the costs to the FSLIC when a closure occurs. The results from this model provide strong support for the existence of three types of agency conflicts at work within the thrift industry. The evidence suggests that thrift owners undertook high-risk, nontraditional investments in order to effect wealth transfers from thrift creditors, and that thrift managers increased failure costs by engaging in expense-preference behavior.

Perhaps the strongest results from the study are those relating to agency conflicts between taxpayers and government officials. The evidence indicates

[17] Because closure cost is a function of size, the presence of heteroskedasticity becomes a concern. Deflation of all dollar-denominated variables (including failure cost) by total liabilities should mitigate this problem. Formal tests confirm this. Specifically, the procedure suggested by Breusch and Pagan (1979) was performed on the OLS failure cost model. Based upon the resulting test statistic, one cannot reject the null hypothesis of a homoskedastic error term at the standard levels of significance. Therefore, further corrections are unnecessary.

that the FHLBB's policy of capital forbearance was a costly exercise for the taxpayer, and primarily benefited the owners of insolvent thrifts.

This analysis also demonstrates that some of the factors significant in explaining the cost of closure are not significant in explaining the probability of closure and visa versa. This finding has important implications for regulators, who need to formulate closure rules that incorporate factors most closely related to failure costs.

The evidence from this study suggests several general policy recommendations. First and foremost, the results favor continuing reform of the deposit insurance system, which still provides incentives for the owners and managers of institutions issuing federally insured deposit liabilities to undertake investments that are excessively risky to the taxpayer. When deposit insurance is not priced according to actuarial risk or capital requirements are not enforced, these incentives will remain. Regulatory changes tying deposit insurance assessment rates to capitalization and supervisory ratings are an important step in this direction, but the small differences in the assessment rates for the best and worst rated institutions limit the effect of these changes.

Second, the results of this study are consistent with Kane (1989), who asserts that the institutional arrangements in place during the 1980s increased the costs associated with failing depository institutions by encouraging regulators to grant them forbearance. Institutional reforms such as those found in FDICIA, however, now serve to bring the incentives of regulators into closer congruence with the taxpayers' best interest. Key among FDICIA's reforms are its provisions mandating increasingly stringent supervisory actions as net worth declines, with a focus on demanding recapitalization prior to insolvency. The evidence presented here demonstrates that deposit insurance fund losses increase as long as insolvent insured depositories are allowed to continue operation under the management that guided them into insolvency.

Third, the evidence presented in this and related studies of financial institution failures suggests that government regulators should implement similar early-warning models as cost-effective off-site tools for monitoring the financial condition of depository institutions. Such tools hold promise for reducing the likelihood that a crisis of this magnitude could recur. By providing early warning and identification of systemic problems, they also can guide regulators in allocating limited examination and supervisory resources to emerging problem areas.

The authors appreciate the comments of Michael Abramowicz, George Benston, George Fenn, David Jones, Joseph McKenzie, Genie Short, Kerry Vandell (the editor), two anonymous referees and many others. An earlier version of this paper was presented at the 1990 Annual Meeting of the American Real Estate and Urban Economics Association. Any remaining errors are solely the responsibility of the authors. The views reflected in this article are those of the authors and do not represent the policies of the Board of Governors or the Federal Reserve System.

References

Akerlof, G. and P. Romer. 1993. Looting: The Economic Underworld of Bankruptcy for Profit. *Brookings Papers on Economic Activity* 2: 1–73.

Barth, J., P. Bartholomew and M. Bradley. 1990. Determinants of Thrift Resolution Costs. *Journal of Finance* 45: 731–745.

Belsey, D., E. Kuh and R. Welsh. 1980. *Regression Diagnostics.* Wiley: New York, NY.

Benston, G. 1985. *An Analysis of the Causes of Savings and Loan Association Failures.* Monograph Series in Finance and Economics, Salomon Brothers Center for the Study of Financial Institutions.

Breusch, T.S. and A.R. Pagan. 1979. A Simple Test for Heteroscedasticity and Random Coefficient Variation. *Econometrica* 47: 1287–1294.

Cole, R. 1993. When Are Thrifts Closed? An Agency-Theoretic Model. *Journal of Financial Services Research* 7: 283–307.

Cole, R. and J. McKenzie. 1994. Thrift Asset-Class Returns and the Efficient Diversification of Thrift Institution Portfolios. *Journal of the American Real Estate and Urban Economics Association* 22: 95–116.

Cole, R., Eisenbeis and J. McKenzie. 1994. Asymmetric-Information and Principal-Agent Problems as Sources of Value in FSLIC-Assisted Acquisitions of Insolvent Thrifts. *Journal of Financial Services Research* 8: 5–28.

Cordell, L., G. MacDonald and M. Wohar. 1993. Corporate Ownership and the Thrift Crisis. *Journal of Law and Economics* 36: 719–756.

Fama, E. and M. Jensen. 1983a. Separation of Ownership and Control. *Journal of Law and Economics* 26: 301–325.

———. 1983b. Agency Problems and Residual Claims. *Journal of Law and Economics* 26: 327–349.

Fletcher, R. 1980. *Practical Methods of Optimization.* John Wiley and Sons, New York.

Greene, W. 1991. *LIMDEP Version 6.0: User's Manual and Reference Guide.* Econometric Software, Inc.: Bellport, New York.

Heckman, J. 1979. Sample Selection Bias as Specification Error. *Econometrica* 47: 153–161.

Jensen, M. and W. Meckling. 1976. Theory of the Firm: Managerial Behavior, Agency Costs, and Ownership Structure. *Journal of Financial Economics* 3: 305–360.

Jensen, M. and R. Ruback. 1983. The Market for Corporate Control. *Journal of Financial Economics* 11: 5–50.

Kane, E. 1985. *The Gathering Crisis in Federal Deposit Insurance.* MIT Press: Cambridge, MA.

———. 1987. No Room for Weak Links in the Chain of Deposit Insurance Reform. *Journal of Financial Services Research* 1: 77–111.

———. 1988. The Looting of FSLIC: What Went Wrong? in *The Future of the Thrift Industry*. Federal Home Loan Bank of San Francisco.

———. 1989. *The S&L Insurance Mess: How Did It Happen?* The Urban Institute Press: Washington, DC.

———. 1992. Taxpayer Losses in the Deposit-Insurance Mess: An Agency-Cost and Bonding Perspective. Mimeo. Boston College: Chestnut Hill, MA.

Kennedy, P. 1992. *A Guide to Econometrics* - 3rd ed. The MIT Press: Cambridge, MA.

Kormendi, R., V. Bernard, C. Pirrong and E. Snyder. 1989. Crisis Resolution in the Thrift Industry: Beyond the December Deals. *Report of the Mid-America Institute Task Force on the Thrift Crisis.*

Lee, L. 1983. Notes and Comments: Generalized Econometric Models with Selectivity. *Econometrica* 51: 507–512.

Maddala, G. 1986. Econometric Issues in the Empirical Analysis of Thrift Institutions' Insolvency and Failure. Federal Home Loan Bank Board, Office of Policy and Economic Research. Invited Research Working Paper No. 56.

Masulis, R. 1987. Changes in Ownership Structure: Conversions of Mutual Savings and Loans to Stock Charter. *Journal of Financial Economics* 18:29–60.

McKenzie, J., R. Cole and R. Brown. 1992. Moral Hazard, Portfolio Allocation, and Asset Returns for the Thrift Industry. *Journal of Financial Services Research* 5: 315–339.

Merton, R. 1977. An Analytic Derivation of the Cost of Deposit Insurance and Loan Guarantees: An Application of Modern Option Pricing Theory. *Journal of Banking and Finance* 1: 3–11.

———. 1978. On the Cost of Deposit Insurance When There Are Surveillance Costs. *Journal of Business* 51: 439–452.

Pantalone, C. and M. Platt. 1987. Predicting Failures of Savings and Loan Associations. *Journal of the American Real Estate and Urban Economics Association* 15: 46–64.

Pennacchi, G. 1987. Alternative Forms of Deposit Insurance: Pricing and Bank Incentive Issues. *Journal of Banking and Finance* 11: 291–312.

Ronn, E. and A. Verma. 1986. Pricing Risk-Adjusted Deposit Insurance: An Option Based Model. *Journal of Finance* 41: 871–895.

Rudolph, P. and B. Hamden. 1988. An Analysis of Post-Deregulation Savings-and-Loan Failures. *Journal of the American Real Estate and Urban Economics Association* 16: 17–33.

Schleifer, A. and R. Vishny. 1986. Greenmail, White Knights, and Shareholders' Interest. *Rand Journal of Economics* 17: 293–309.

Strunk, N. and F. Case. 1988. *Where Deregulation Went Wrong: A Look at Causes of Savings and Loan Failures During the 1980s.* U.S. League of Savings Institutions: Washington, DC.

Thomson, J. 1992. Modelling the Bank Regulator's Closure Option: A Two-step Logit Approach. *Journal of Financial Services Research* 6: 5–23.