

CONTRIBUTION N° 04

AN ACTUARIAL APPROACH TO THE ANALYSIS OF POST DEREGULATION THRIFT FAILURES IN THE USA

PAR / BY

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Etats Unis / Unites States

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L'ANALYSE DES FAILLITES DES
ORGANISMES D'EPARGNE AUX
ETATS UNIS A LA SUITE DE LA
DEREGLEMENTATION

36 **UNE APPROCHE ACTUARIELLE DE L'ANALYSE DES FAILLITES
DES ORGANISMES D'ÉPARGNE AUX ETATS - UNIS, A LA SUITE DE
LA DÉRÉGLEMENTATION**

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RESUME

Analyse selon le statut : fédéral ou étatique

Des modèles tabulaires non ordonnés ont été élaborés pour les deux domaines de comparaison suivants : (1) 53 organismes d'épargne à statut étatique faillis, comparés à 515 organismes d'épargne bien - portants ; et (2) 61 organismes d'épargne à statut fédéral faillis, comparés à 515 organismes d'épargne bien - portants. Ces deux modèles ont été élaborés en utilisant des données financières concernant les 115 organismes d'épargne faillis et les 515 organismes d'épargne bien - portants, durant la période de 1984 à 1985, et validés sur 97 organismes d'épargne faillis (40 à statut d'Etat et 57 à statut fédéral) et 352 organismes d'épargne bien - portants, au cours des trois premiers trimestres de l'année 1986. La validation est effectuée en utilisant les données financières de l'échantillon présenté (97 organismes d'épargne faillis et 352 bien-portants), durant trois périodes ayant précédé la faillite, à savoir le quatrième trimestre 1985, le deuxième trimestre 1985 et le quatrième trimestre 1984. Ceci permet une comparaison de la capacité de prédiction des modèles élaborés à partir de données financières antérieures à la faillite, pour un nombre croissant de périodes antérieures à la faillite.

A. Comparaison des organismes d'épargne faillis et bien - portants - statut étatique

Le Tableau 2 donne les coefficients des variables significatives aux niveaux 0,05, 0,1 et 0,15 dans la comparaison de 53 organismes d'épargne à statut étatique faillis avec 515 organismes d'épargne bien - portants. Le BDTL, le MFTA, le TA, le FHLBA, le DOETE et le terme d'interception sont des variables explicatives significatives. L'adaptation du modèle est hautement significative avec un coefficient statistique χ^2 de 326,59.

La signification du signe du coefficient des variables peut être expliquée comme suit. Comme "0" indique la faillite d'un organisme à statut étatique et "1" indique la non faillite, un coefficient positif (ou négatif) représente une corrélation négative (ou positive) avec la faillite et une corrélation positive (ou négative) avec la non faillite. Les résultats obtenus indiquent que la faillite des organismes d'épargne à statut étatique présente une corrélation négative avec TA, mais une corrélation positive avec BDTL, MFTA, FHLBA et DOETE. Ainsi, les organismes d'épargne à statut étatique faillis, dépendent plus de dépôts non traditionnels (par exemple des dépôts sur titres), ont plus de saisies hypothécaires classiques, sont plus obérées par des avances FHLB à payer à court terme, et dépensent plus en frais de gestion et de personnel, mais sont plus petites que les organismes d'épargne bien - portants.

Le Tableau 3 donne des détails sur les exactitudes de classement au cours de l'estimation (c'est-à-dire de 1984 à 1985) et pour les trois périodes d'étude (c'est-à-dire premier trimestre 1985, second trimestre 1985 et quatrième trimestre 1984), antérieures à la

faillite des organismes d'épargne durant les trois premiers trimestres de 1986. Les indices C et Dyx de Somer sont utilisés pour évaluer la capacité de prévision des modbles. Alors que l'indice C indique la fraction de l'ensemble des paires pour lesquelles les valeurs calculées et observées sont concordantes, et est utilisé pour tester les probabilités calculées pour le groupe négatifs vrais, le Dyx de Somer est un indice de corrélation de niveau entre les probabilités calculées et les résultats observés.

La Partie A du Tableau 3 indique que le taux global de classement correcte durant l'estimation est de 99,12% avec des valeurs de C et de Dyx très proches de 1.00, avec une légère décroissance durant la période d'observation.

Le modble a une exactitude globale de 96,77% durant le trimestre le plus proche des faillites en 1986 (c'est-à-dire le quatrième trimestre 1985) mais présente des exactitudes également impressionnantes de 95,04% et de 93,98%, quand la période précédant la faillite en 1986 augmente de trois (deuxième trimestre 1985) à cinq trimestres (quatrième trimestre 1984). Les paramètres statistiques C correspondant sont impressionnants, bien que présentant une décroissance jusqu'à 0,690, pour le trimestre le plus antérieur à la faillite en 1986 (quatrième trimestre 1984).

Dans les tableaux de classement, les faillites des organismes d'épargne à statut étatique sont prévues avec une exactitude de 96,23%, durant la période d'estimation, avec des exactitudes associées à chacune des périodes de mesure allant de 70 à 75% pour les trois périodes de mesure antérieures à la faillite.

B. Comparaison des organismes faillis et bien - portants - statut fédéral

Les résultats du classement de 61 organismes d'épargne à statut fédéral faillis, comparés à 515 organismes d'épargne bien - portants, sont donnés dans les Tableaux 2 et 3. Le Tableau 2 indique que les coefficients SLTA, MLTA et MFTA sont significatifs et que le modble élaboré présente un coefficient statistique khi carré hautement significatif de 331,94. La faillite des organismes d'épargne à statut fédéral est en corrélation positive avec les quantités de prêts hypothécaires faiblement évolutifs (SLTA) et les faillites hypothécaires classiques (MFTA), mais en corrélation négative avec le niveau de prêts hypothécaires à évaluation rapide (MLTA). Ainsi, des variables reflétant la qualité des actifs semblent être significatives pour expliquer les faillites d'organismes d'épargne à statut fédéral (en comparaison des organismes non faillis).

La Partie B du Tableau 3 montre que les taux de classements corrects du modèle durant les périodes d'estimation et de mesure sont très élevés, avec des exactitudes globales de classement de 98,61% durant l'estimation et des exactitudes pour les périodes de mesure allant de 94,54% pour le quatrième trimestre 1985 à 92,53% pour le quatrième trimestre 1984. L'indice des paires concordantes, C, est très élevé, et dépasse 0,9 durant les périodes d'estimation et de mesure. Ainsi, le modble élaboré donne des résultats très impressionnants en matière de classement des organismes d'épargne à statut fédéral faillis, par rapport aux organismes d'épargne bien - portants.

L'exactitude de classement des organismes d'épargne à statut fédéral faillis est très élevée, atteignant un taux de 93,44% durant l'estimation, et cohérent durant les périodes de mesure, c'est-à-dire que les exactitudes afférentes à ces périodes vont de 68,63% pour le quatrième trimestre 1985 à 66,63% pour le quatrième trimestre 1984.

Analyse selon le type de société : mutuelle ou société par actions

En un premier temps, **des statistiques résumées à une seule variable sont établies pour les deux groupes d'organismes d'épargne faillis** : à statut mutuel et à statut de **société** par actions (s.p.a.). **Des modèles tabulaires non ordonnés sont ensuite élaborés pour les deux domaines d'intérêt suivants** : (1) 60 organismes d'épargne à statut de **société mutuelle faillis**, en comparaison de 515 organismes bien - **portants** ; et (2) 55 **organismes d'épargne à statut de s.p.a. faillis**, en comparaison de 515 organismes **bien-portants**. **Ces modèles sont élaborés en utilisant des données financières concernant 115 organismes faillis et 515 organismes bien - portants durant la période 1884 - 1985 et validés sur 97 organismes d'épargne faillis (52 mutuelles et 45 sociétés par actions) et 352 organismes d'épargne bien - portants, durant les trois premiers trimestres de 1986.** La validation est effectuée en utilisant des **données financières concernant les 97 organismes faillis et les 352 organismes bien - portants (choisis durant les trois premiers trimestres de 1986), durant trois périodes antérieures à la faillite effective, à savoir le quatrième trimestre 1985, le deuxième trimestre 1985 et le quatrième trimestre 1984.**

A. Statistiques univariées

Les **moyennes variables pour les deux groupes d'organismes d'épargne à statut mutuel et à statut de s.p.a. faillis sont données dans le Tableau 4, avec leur coefficients statistiques t respectifs, les valeurs de t donnant les résultats du test t, effectué pour examiner l'hypothèse d'équilibre** correspondant à des moyennes de variables **homogènes pour les deux groupes** (en supposant des dispersions des **groupes inégales**). Le **Tableau 4** montre que **les deux groupes ont des moyennes de variables homogènes, pour les coefficients LACL, TETR, PROF, RNWTA, JCDTL, BDTL, SLTA, MLTA, ITA, ADLTA, DOETE, INTINC et DEFNI.**

Les organismes **d'épargne à statut mutuel faillis ont des disponibilités marginalement plus élevées (LACL plus élevé) et sont plus rentables (c'est-à-dire ont un PROF négatif inférieur et un TETR inférieur), que les organismes d'épargne à statut de s.p.a. faillis.** **Concernant les mesures portant sur la composition des dépôts, les organismes d'épargne à statut de s.p.a. faillis se sont plus reposés sur des dépôts non classiques, sensibles aux intérêts** tels que les **très gros certificats de dépôt** et les **dépôts sur titres**, que les organismes d'épargne à statut mutuel faillis. Une **analyse des mesures de la qualité des actifs** montre que **les organismes d'épargne à statut de s.p.a. faillis présentent un plus haut taux de prêts hypothécaires et commerciaux à évolution lente, par rapport aux dits prêts à évaluation rapide, ont des investissements directs et des participations dans des sociétés de services, et ont de plus hauts taux de prêts d'acquisition et de développement.** Enfin, alors que les **organismes d'épargne à statut mutuel faillis présentent un taux plus faible de situations nette RAP négatives et ont des frais de direction et de personnel plus faibles, se sont plus reposés sur les gains financiers (par rapport à l'ensemble des chiffres d'affaire générés) et ont encouru plus de pertes sur des ventes d'actifs, si on les compare aux organismes d'épargne à statut de s.p.a. faillis.**

Ainsi, des différences significatives se manifestent entre les organismes d'épargne faillis, relevant des deux types de statut de société, dans les ampleurs des disponibilités, la

rentabilité et de l'efficacité, la composition des dépôts, la qualité des actifs, l'adéquation des capitaux et de l'exposition aux risques des taux d'intérêt. Toutefois, les organismes d'épargne faillis, à statut mutuel et de s.p.a., sont d'importance similaire, celle-ci étant mesurée par leurs actifs totaux. Des publications antérieures ont suggéré que les organismes d'épargne de statut mutuel bien - portants sont moins rentables et performantes, disposent de capitaux moins adéquats et ont une plus faible tolérance au risque, en comparaison des organismes à statut de s.p.a également bien - portants.

B. Elaboration du modèle

Le Tableau 5 donne des coefficients des variables significatives (aux niveaux 0,01, 0,05 et 0,1) en comparant : (1) 60 organismes d'épargne faillis comparés 515 organismes bien - portants et (2) 55 organismes d'épargne à statut de société par action faillis comparés à 515 organismes bien - portants. La signification du signe du coefficient de la variable peut être expliquée comme suit : comme le groupe "0" signale les organismes d'épargne faillis (pour les deux premières comparaisons) et le groupe "1" indique les organismes bien - portants (pour les deux premières comparaisons), un coefficient positif (négatif) représente une corrélation négative (positive) avec la faillite et positive (négative) avec la non faillite.

Le premier modèle élaboré fait la distinction entre les organismes d'épargne à statut mutuel faillis et les organismes bien - portants. BDTL, MLTA, TA et DEFNI sont des variables significatives. L'adéquation du modèle a un coefficient statistique khi carré de 384,71, hautement significatif, au niveau 0,01. L'analyse des signes des coefficients des variables significatives indique que les DTL, MLTA et DEFNI sont en corrélation négative avec la probabilité de faillite, puisque la taille des organismes d'épargne (mesurée par ses actifs totaux) est en corrélation positive avec leur faillite.

La probabilité de faillite des organismes d'épargne à statut mutuel est d'autant plus basse que le niveau de leur dépôt en titres est élevé et que la qualité des prêts hypothécaires est bonne. Toutefois, lorsque la taille des mutuelles augmente, la probabilité de faillite augmente également. Seul le signe de DEFNI n'apparaît pas correspondre logiquement à la prédiction de faillite.

Le second modèle compare les organismes d'épargne à statut de s.p.a. faillis à des organismes bien - portants. Les variables explicatives significatives sont SLTA, ADLTA, FHLBA, COST et INTINC. Le modèle a un terme constant significatif et est hautement significatif au niveau 0,01 (avec un coefficient khi carré de 312,92). L'analyse des variables significatives indique que SLTA, ADLTA, FHLBA et COST sont en corrélation positive avec la probabilité de faillite, alors que INTINC est en corrélation positive avec l'absence de faillite.

La probabilité de faillite des organismes d'épargne à statut de s.p.a. est d'autant plus grande que les niveaux des prêts hypothécaires, ainsi que des prêts pour acquisition et au développement de mauvaise qualité (c'est-à-dire faiblement évolutif), sont élevés, que les avances FHLB dues à court terme sont importantes et que les coûts des capitaux empruntés sont élevés. Toutefois, les organismes d'épargne à statut de s.p.a. qui génère une proportion plus élevée de leur chiffre d'affaire à partir du revenu financiers paraissent avoir moins de chance de faire faillite.

Les exactitudes de classement des **deux modèles** durant **les périodes d'élaboration** (à partir des données de la période 1984 - 1985) et des trois **périodes** de validation (c'est-à-dire **quatrième trimestre** 1985, **deuxième trimestre** 1985 et **quatrième trimestre** 1984) **antérieures** à la faillite effective au **cours** des trois premiers trimestres 1986 sont **données** dans le **Tableau 6**. Les deux indices **importants utilisés pour apprécier** la puissance de **prédiction** du **modèle** sont C et le Dyx de Somer. C indique la **fraction** de l'ensemble des **paires** pour lesquelles les valeurs **calculées** et observées sont **concordantes**, et est **utilisé** pour tester **si** les **probabilités calculées** pour le groupe **positifs vrais** (le groupe "1") sont **différentes des probabilités calculées** pour le groupe **negatifs vrais** (c'est-à-dire le groupe "0"). Le Dyx de Somer est un indice de **corrélation** de niveaux **entre les probabilités calculées** et les **résultats observés**. L'exactitude de **prédiction** du **modèle** est **d'autant meilleure** que les **niveaux** de C et de Dyx sont **élevés**.

Les deux **modèles** **présentent** des **taux d'exactitude** de classement et des valeurs C et Dyx **très élevées** durant la **période d'estimation** (1984 - 1985). Le premier **modèle** classe correctement 96,678 des organismes **d'épargne** à statut mutuel **faillis**, alors que le **deuxième modèle** classe **correctement 90,74%** des organismes **d'épargne** à statut de **s.p.a. faillis**. Toutes les valeurs de C **dépassent** largement **0,90**, ce qui indique une exactitude de **prédiction très élevés** pour les deux **modèles**.

Les **résultats** de la validation pour les trois premiers **trimestres** de 1986 sont **également donnés** dans le **Tableau 6**. Le premier **modèle** classe **correctement 76,19%** des **mutuelles faillies** durant les trois premiers **trimestres** de 1986, **à partir de données financières** du **quatrième trimestre** 1985. **Quand** la **période précédent** la faillite effective en 1986 augmente, l'**exactitude** de **prédiction** de faillite du **modèle décroît** à 63,93% si l'on utilise les **données** du **deuxième trimestre** 1985, et à **52,54%** en utilisant les **données** du **quatrième trimestre** 1984. Toutefois, les valeurs de C pour les trois **périodes d'observation** dépassent **0,90**, ce qui indique **clairement** que la **capacité** de **prédiction** du **modèle est impressionnante**, que les **données utilisées soient** celles de la période 1 à 9 mois (**quatrième trimestre** 1985), 7 à 15 mois (**deuxième trimestre** 1985) ou 13 à 21 mois (**quatrième trimestre** 1984) avant la faillite observée en 1986.

Des **résultats** de validation aussi **impressionnants** sont obtenus pour le **deuxième modèle**, qui **prédit** la faillite **des organismes d'épargne** à statut de **s.p.a.**, par rapport à la non faillite. L'exactitude de **prédiction** de faillite des **s.p.a. décroît** de **76,67%**, lorsque l'on **utilise les données** de la période de 1 à 9 mois avant les **faillites effectives** en 1986, à **54,24%**, **résultat obtenu en utilisant** les **données** des mois 13 à 21 avant la faillite. Là encore, les **valeurs** de C durant la **période** de validation sont **très élevées**, allant de 0,972, pour les **données** du **quatrième trimestre** 1985, à 0,899 pour les **données** du **quatrième trimestre** 1984.

AN ACTUARIAL APPROACH TO THE ANALYSIS OF POST 41 DEREGULATION THRIFT FAILURES IN THE U.S.A.

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I • INTRODUCTION

Financially distressed thrifts are deemed to be failures when they are liquidated or merged by the Federal Savings and Loan Insurance Corporation (FSLIC) (currently replaced by the Savings Association Insurance Fund (SAIF)). During the seven year period from 1980 to 1986, the thrift industry has experienced a large increase in the frequency and magnitude of losses in failed thrifts,¹ leading to considerable legislative action by the Congress and other regulatory bodies.²

A sufficient condition for insolvency of uninsured thrift institutions, with currently due obligations, is when the market value of the institution's assets falls below the present value of its contractual obligations (Brickley and James, 1986). However, insolvency for an insured thrift institution is determined by the insuring agent rather than economic forces?

Brickley and James (1986) show that modification of the meaning of the term "insolvency" during periods of financial distress helps avoid a significant number of

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institution failures, and also increases the value of future deposit guarantees. Smith (1986) shows that regulatory agencies may constrain the operations of financially distressed **institutions** prior to failure and insolvency. Hence, given that **the** regulator (insurer) decides when to **revoke** an institution's charter **and/or** deposit guarantees, **the** decision about whether an institution has failed or not is essentially a regulatory **one**.

The FSLIC has a limited number of **options** available to resolve failure of an institution. **The options are** liquidation, merger (with **a** without **significant** costs), **the provision of** financial assistance through FSLIC and the Bank Board system, or use of the Management **Consignment** Program (**MCP**).⁴

FSLIC failure cost estimates reveal **that** resolution **costs as** a percentage of total **assets** for failed **thrifts** requiring **FSLIC assistance increased** from 11.4% in 1980 to 14.2% in 1986. Further, **the** 600 odd thrift failures **between** 1980 and 1986 (with **assets** exceeding **\$120** billion) represent about 15% **of** all healthy thrifts in 1980. In comparison, about 300 commercial banks **insured** by the Federal Deposit Insurance **Corporation** (FDIC) and currently replaced by the **Bank Insurance Fund (BIF)** with **assets** of \$35 billion, failed **between** 1980 and 1985. **These** failed banks represent only about 2% of all active banks in 1980.

A substantial **amount** of literature on **the** failure of financial institutions is **devoted** to the **problem** of moral hazard associated with **governmental** deposit insurance (**Avery and Hanweck (1984)**, and **Benston (1984)**). According to the moral hazard problem, the managers of **some** **thrifts** take inordinately high **investment** risks with depositor monies **knowing** that **the government** will fully back deposits in the event of extreme losses. **This** is especially **true** in the case of state **chartered** **thrifts** which **assume** **greater** **risks** and are perhaps less well **supervised** by **regulatory** bodies.

It has **been** argued (refer **Carroll, Kalambokidis and Kise (1986)**) that the imposition of higher capital **requirements** on **thrifts** may **reduce** the moral hazard problem **with** respect to **the** **frequency** and severity of failures. During **the** period from 1933 to 1980 (**i.e.**, prior to deregulation **of** the thrift industry), **the** majority of **thrifts** **operating** under **FSLIC** coverage were run under a mutual form of organization. However, since 1980, an increasing number of **FSLIC insured** **S&Ls** have sought additional capital by converting to a stock **form** of organization. **This** investigation **considers** the mode of charter as an **explanatory** variable to explain how **differences** in risks **assumed** and capital structures might impact on **the** survival of **thrifts**.

The **FHLBB** has **attempted** to strengthen **the** capital adequacy of **S&Ls** by liberalizing its **regulations** regarding **the** conversion of federally chartered **thrifts** **from** **the** mutual to stock **type of** ownership in April 1981, and later permitting state chartered mutually owned **institutions** to convert to federally chartered stock owned **thrifts**. **Since** such conversions can potentially alter **the** nature of the thrift industry, this has generated considerable **argument**. While **some** **researchers** (**Scott and Hester (1987)**) argue that such conversions **would** eliminate the current benefits derived from the mutual **form** of organization by **disrupting** the **industry's** stability and increasing costs to **borrowers**, others (refer **Brigham and Pettit**) **state** **that** the stock **form** of organization **would** offer **more** incentives for greater **profitability**, **cost** **efficiencies**, rapid growth and higher risk tolerance.

There is limited evidence regarding whether **differences** exist between the mutual and stock forms of organization. **Simpson** and **Kohers** (1979) indicate that stock owned thrifts are more aggressively managed, while **Smith** and **Kaplan** (1977) provide **considerable** evidence supporting **conversion** to the stock form. **The effect of** converting a thrift from **the** mutual to stock form has been investigated by **Masulis** (1987). and **Jordan**, **Verbrugge** and **Bums** (1988), among others. **There** is conclusive evidence that conversions yield significant abnormal returns to the common stockholders of converting thrifts. However, since no research has been done **on the impact** of the form of organization **on the** failure **or** survival **of** thrifts, this study **provide** evidence on **the role** played by the form of organization (**i.e.**, mutual vs. stock) in determining the failure of **FSLIC** insured **thrifts** in the **post** deregulation era.

Given **the** increase in the magnitude and severity of **FSLIC** losses during **the** last few years, several research issues arise. First, this paper **considers** the elements of a **graded** premium structure that may be used to cover thrift institutions with different risk characteristics. **Second**, **logit** analysis is **conducted** on **S&L** data during 1984 - 1986 to identify the financial characteristics that could be used to **define** risk - adjusted deposit **insurance** premiums. Third, this study determines whether failed thrifts by the **modes** of charter (**i.e.**, state vs. federal) and ownership (**i.e.**, mutual vs. stock) **are** different in their risk characteristics. **Logit models** **are** developed f a failed federally chartered vs. failed state chartered thrifts and for failed mutually owned vs. failed stock owned thrifts. Finally, this study examines the predictive **capability** of **the logit** models developed **an** failure data for the **first** three **quarters** of 1986.

This paper is organized as follows. Section **II** briefly reviews important empirical **contributions** in the area of **bank** and thrift failures. Development of a graded premium structure for thrift **deposit** insurance is discussed in Section **III**. **The** data collection, variable selection and **methodology** processes are covered in Section **IV**. Development of **logit** models and testing of the **predictive** capabilities of various models **are** discussed in Section **V**. Finally, this paper concludes with a review of the significance of the empirical **results** of this investigation.

II - REVIEW OF PRIOR LITERATURE

Previous studies in the area of failure of financial **institutions** concentrate on identifying the determinants of closure using a test sample of failed institution and a matched sample of **non - failed** (**i.e.**, healthy) **institutions**. Numerous studies attempt to develop early **warning** systems of failure of commercial banks (**e.g.**, **Avery** and **Hanweck** (1984), **Martin** (1977), and **Sinkey** (1978)). However, there are a limited number of studies focusing on the determinants of failure of savings and loan associations (**Altman** (1977), **Block** (1969), **Barth**, **Brumbaugh**, and **Sauerhaft** (1986), **Barth**, **Brunbaugh**, **Sauerhaft** and **Wang** (1985), **Benston** (1985), **Pantalone** and **Platt** (1987), and **Rudolph** and **Hamdan** (1988)). Further, to the knowledge of the authors, there is only one significant study dealing with closure of credit unions (**Kharandía** and **Colins** (1983)).

Studies dealing with failure of thrifts and commercial **banks** are aimed at identifying the underlying determinants of failures and developing failure prediction models. These

studies use ratios which can be accessed promptly from information contained in reported financial statements. Such financial ratios are developed to represent profitability, capital **adequacy** (i.e., net worth **sufficiency**), and various types of **risks** such as credit, interest-rate and liquidity **risks**. Capital adequacy is **considered** to be very **important** as it **provides** a **buffer** against future losses and also **helps** offset the problem of moral hazard caused by **fixed** rate deposit insurance.⁵

Earlier studies in thrift failure (e. g., Altman (1977)), predict thrift failures **significantly**. However, such studies use data from the **1960's and 1970's** (i.e., **prior** to deregulation of thrifts), **unlike** the **economically** turbulent **1980's** of the thrift industry. Altman (1977) uses multiple **discriminant** analysis (**MDA**) to classify serious problem v. temporary **problem** S&Ls for the period from 1966 to 1973. His **results** show efficiency (i.e., the ratio of net to **gross** operating income), capital adequacy (i.e., the ratio of surplus to net worth, change in net worth to **total assets**) and financial risk (i.e., borrowed **funds** to **total** savings) to be the important explanatory **dimensions** of failure.

Barth, Brumbaugh, Sauerharft and Wang (BBSW) (1985) **consider** the causes of thrift failures and develop **models** to estimate the regulator's closure **rule** for insolvent thrifts. They use **multinomial logit** analysis to examine the failure of 318 insolvent thrifts **during** 1981 - 1983. Their analysis uses net worth, **profitability**, interest rate risk, credit risk, and liquidity variables to explain failure. Their best **logit** model, specified six **months prior** to failure, relies on capital adequacy (ratio of **net** worth to **total assets**), net profit **margin**, liquidity ratio, and ratios of interest sensitive deposits to **total assets** and slow **moving** loans to total assets. However, their study is **confined** to semiannually reported thrift data for 1981 - 83.

Benston (1985) uses **logit** analysis to compare 178 closed v. 712 non - closed institutions for the period January 1981 - June 1985. **Thus**, his analysis considers both semiannually and quarterly reported thrift data. He uses 28 variables to conduct **univariate** and multivariate analysis, but his results show only capital adequacy and **profitability** (i.e., net income to **total assets**, interest and dividends to earning assets, and interest and fee income to **earning** assets) to be statistically **significant**.

More recently, Pantalone and Platt (1987), and Rudolph and Hamdan (1988) attempt to predict thrift failure. Pantalone and Platt (1987) use **15** failed S&Ls in the Boston district between 1981 - 84 to **develop** a regional early **warning** model. Their study uses **MDA** to distinguish between failed (15) and healthy (29) S&Ls in the Boston FHLB district and relies on 29 variables specifying leverage, liquidity, profitability, management efficiency, diversification and risk. Pantalone and Platt suggest leverage, liquidity, **efficiency** and deposit composition to be significant explanatory dimensions.

Rudolph and Hamdan (1988) use **logit** methodology to classify 26 failed thrifts during the **period second** quarter of 1984 to the first quarter of 1985. Thus, unlike the Pantalone and Platt study, their analysis uses quarterly **reported** thrift data. Similar to BBSW (1985), and Benston (1985), Rudolph and Hamdan use 18 financial variables specifying liquidity, profitability, capital adequacy, deposit composition and asset quality. They test the predictive accuracy of their **logit** models on 22 failed thrifts during the second quarter of 1985. Their results show capital adequacy, deposit **composition** and credit risk variables to be **significant** predictors of thrift failure.

In a very recent study, Elmer and **Borowski (1988)** utilize the CAEL (a framework employing capital, assets, earnings and liquidity characteristics) expert system to predict **S&L failures** and also to **provide** comparative evidence vis-à-vis earlier bankruptcy models developed using standard statistical analysis. Elmer and **Borowski** indicate that, during model development, the **logit** models used by **BBSW (1985)** for both the matched **S&Ls** sample and a sample consisting of the universe of **S&Ls** outperformed the expert system used for both samples. However, during validation on failure data for the first half of **1987**, the expert system **consistently** outperforms the **logit** models used by **BBSW**.

III - A GRADED MANUAL PREMIUM STRUCTURE FOR DEPOSIT INSURANCE

Graded deposit insurance premiums are based on actual loss experience incurred in covering **S&Ls**. The graded premium approach is **self-correcting** in that, this year's assessment is a function of last year's loss experience. The model presented here makes the following assumptions: (1) all institutions have met a minimal capital requirement of **1.5%** of assets (2) an initial funding reserve of **\$10 billion** is available to the insurer (3) all elements of the **S&L** rescue plan remain in effect, however, premiums are increased by **1/4 of 1%** of insured deposits to cover prospective **loss experience** and (4) no new **S&L** activities **will be** approved unless an actuarial study is made to determine **their** impact on insurer reserves. The third assumption is necessary to replenish **FSLIC** reserves lost **from 1980 to 1984** and to **develop** a surplus to **meet** future loss experience. **The** fourth assumption is required in **order** to allow the experiential nature of the graded premium structure to work. An insurer **cannot** afford to relax underwriting standards to permit new **S&L** activities that **impose** additional loss exposure on reserve funds.

On the basis of the level of capital divide insured institutions into three risk premium classifications: (1) standard (2) **25%** extra and (3) **50%** substandard. Continued assignment of **S&Ls** into these classifications would depend upon risk factors identified by using **logit** analysis on prior loss experience. A **substandard** debit point system would be used by assigning points to **S&Ls** determined from the **riskiness** of their capital structure, management quality, mix of business, and size of loan **write-downs**. The deposit insurer would calculate a standard manual rate and then apply a **25% a 50%** increased loading for substandard **S&L** risks. Premiums and risk classifications are revised every **year** as a result of new experience. The standard rate is calculated using the following aggregate reserve formulation:

D = a moving average of **FSLIC's** loss rate on all claims using current year's experience excluding **S&L** failure data from **1980** through **1989**. Each successive year's data would be **added** to the moving average until **10** years of information **was** included.

(VI) t = actual reserves on hand at the beginning of year t .

I = the net yield on insurer reserves during year t , using the weighted investment yield on assets.

$(VT)_{t+1}$ = a target reserve for the beginning of year $t+1$.

rf_t = a risk - adjustment factor loading for year t , that alters premiums in relation to economic conditions.

$(Dep)_k$ = Amount of insured S & L deposits in premium class k , $k = 1, 2, 3$ or year t , in millions.

$(Dep)_1$ = amount of insured deposits in standard rated S & Ls.

$(Dep)_2$ = amount of insured deposits in 25% substandard rated S & Ls.

$(Dep)_3$ = amount of insured deposits in 50% substandard rated S & Ls.

P = the net premium per \$ millions of insured deposits for S & Ls classed as standard

If claims and premium income are uniformly distributed throughout the year, the present value of premium income to the deposit insurer is :

$$P\{(Dep)_1 + 1.25(Dep)_2 + 1.5(Dep)_3\} \quad (1)$$

the graded premium for each risk category multiplied by the dollars of insured deposits. The present value of future benefits has two components : (1) an amount covering actual incurred claims for the current year and (2) a reserve set aside to meet unexpected claims experience in the future. Actual claims are equal to the loss rate D , multiplied by insured deposits within each risk classification, $(Dep)_k$, adjusted by $(1+i)^{-1/2}$ assuming claims occur on average during the middle of the year :

$$\text{Actual Claims} = \{D[(Dep)_1 + (Dep)_2 + (Dep)_3]\} (1+i)^{-1/2} \quad (2)$$

The reserve is developed under the assumption that FSLIC starts with an initial reserve position of \$10 billion (i.e., $(VI)_t = 10$), and desires a terminal yearend reserve position of $(VT)_{t+1}$. The beginning reserve $(VI)_t$ in any given year accumulates to $(1+i)(VI)_t$ at the end of the year. The difference between (VT) and $(1+i)(VI)$ represents the amount of premium funding necessary to reach FSLIC's reserve objective $(VT)_{t+1}$. The difference, adjusted for macroeconomic changes and the middle of the year premium income assumption provides an estimate of required reserve funding for the year :

$$(1/rf_t) (1+i)^{-1/2} \{ (VT)_{t+1} - (VI)_t(1+i) \} \quad (3)$$

Equating the present value of premium income (1) with the present value of actual plus anticipated claim experience (i.e. (1) + (2)) :

$$P\{(Dep)_1 + 1.25(Dep)_2 + 1.5(Dep)_3\} = \{D[(Dep)_1 + (Dep)_2 + (Dep)_3] + (1/rf_t) [(VT)_{t+1} - (VI)_t(1+i)^{-1/2}]\} \quad (4)$$

The reserve variable $(VT)_{t+1}$ is exogenous to the model. The insurer selects the terminal reserve it wants at the end of each year. Premiums are calculated in an effort to reach the final reserve position. The credibility of insurance premiums depends on the accuracy of claims and exposure information. This is an area where the FSLIC has been deficient in terms of developing a consistent method for recording, costing and assigning S&L failures to a particular year. Any premium formulation for deposit

insurance would need to **include** the following elements : (1) withdrawals from the **system** caused by merger, **supervisory or otherwise**, (2) **withdrawals** caused by failure (3) entrants **of new** associations either **de novo** or by state **charter**, and (4) the **present** value of **the** cost of **S&L** losses assigned to the year **when** the failures occurred. The graded premium **structure** also utilizes a risk factor loading that relates to **the** loss characteristics **of insured institutions**. The next section **shows** how these risk factors may be determined **on** the basis of loss **experience** between **1984** to 1986.

IV - DATA, VARIABLES AND METHODOLOGY

Data Collection

Data on thrift institutions for the eleven quarters' period from January 1984 to **September** 1986 have **been** compiled from information **provided** by the Federal Home Loan Bank board (**i.e.**, Analysis and Evaluation Division, Mergers and Acquisition Division, and the Office of **Regulatory** Policy, Oversight and **Supervision**). After accounting for missing observations the final test sample **consists** of 212 failed thrift institutions and over 3000 non - **failed** thrifts.

The number of failures show a dramatic **increase** from 33 in 1984 to 97 in the **frist** three quarters of 1986. Federally chartered failed thrifts are 119 in total (**i.e.**, approximately 56% of all failed thrifts), while state chartered failed thrifts are 93 in total. Failed thrifts, whether state or federally chartered, show a steady increase over the test period. Mutually **owned** failed thrifts are 112 in total (**i.e.**, approximately 53% of all failed thrifts), while stock owned failed thrifts total 100. Similar to state and federally chartered failed thrifts, mutually **and** stock owned failed thrifts show a steady increase over the study period.

Since **one** stage of empirical testing involves classifying failed thrifts vs. healthy thrifts, a **control** sample of healthy thrifts is developed by selecting non - failed institutions from the **database provided** by the FHLB Board (**i.e.**, institutions that are not part of the **FSLIC's** failed institution case bank from 1984 to 1986). The matching healthy institutions are selected randomly **from** data in the same fiscal time **period** (**i.e.**, same quarter during **1984 - 86**) and district as **the** failed thrift. However, no **further** criterion, (**e.g.**, size) is used to select matching healthy **thrifts**.⁶ It **should** be noted that all healthy **institutions** for a particular district and time **period** (**corresponding** to the failed thrift's district and time period of closure) are retained in the control sample, subject to elimination of healthy thrifts which are duplicated or have missing data. Thus, **the** control sample of 867 healthy thrifts exceeds **the** test sample of 212 failed thrifts.

The resulting sample of failed and healthy thrifts include 115 failed thrifts (by both modes of charter) **and** 515 healthy thrifts (having **positive** net worth measured using GAAP **and** RAP net worth) during 1984 - 1985 (**i.e.**, estimation) and 97 failed **thrifts** (by both modes of charter) and 352 healthy thrifts during **the first** three **quarters** of 1986 (**i.e.**, holdout).

Variable Selection

Examination and regulation of **FSLIC** insured **S&Ls** is the major **factor** in determining **the data** available for analyzing thrift institutions. The data collected by **the FSLIC** and the Federal Home Loan Bank Board (FHLBB) are **directly** related to their **responsibility** to **provide** a safe and sound savings system. In keeping with the data available for analyzing **S&L** failure, **information** used in past studies of institutional bankruptcy (**Avery** and Hanweck (1984), Barth, **Brumbaugh**, **Sauerhaft**, and Wang (1985), and Benston (1984)) and underwriting **considerations** for measuring S&L risk exposure, variables have been selected to conform with data available to supervisory agents working for the **FHLBB** over the period **from** 1980 to 1986. The process of selecting variables is also **constrained** by the fact that (1) the Bank Board went in March 1984 **from** collecting data on a semiannual to quarterly basis, (2) upon revising **the** frequency of data collection a number of variables obtained on a semiannual basis were eliminated, and (3) new sets of variables, such as, Schedule H items were refined and added over the period **from** 1980 to 1986.

Selection of variables followed the same general format as the financial literature on bank failure (Altman (1977), Barth, Brumbaugh, **Sauerhaft**, and Wang (1985), Benston (1984), Rudolph and Hamdan (1988) and **Sinkey** (1978)). **i.e.**, dividing them into **categories** related to liquidity, profitability, capital adequacy, deposit composition, asset quality and other ratios. Other ratios refer to a number of financial variables related to specific **financing** and **investment activities** **S&Ls** engaged in over the period from 1980 to 1986. Table 2 provides a list of variables used in this investigation.

Methodology

This study uses unordered logistic regression analysis (multinomial **logit**) as the methodology to classify failed v. non - failed thrift institutions based on a set of independent transformed variables and thus, develops prediction models for FSLIC insured thrift failures. **Logit** analysis is a widely used parametric classification procedure in finance and economics. **Logit** analysis involves far fewer **restrictive** distributional assumptions than other parametric classification procedures such as multiple discriminant analysis (**i.e.**, logistic regression does not require multivariate normality of independent variables). Even where all of **MDA's** restrictive **assumptions** are **met**, **logit** analysis provides equally efficient parameter estimates and **predictive** accuracies. The unordered **logit** model allows the relative importance of different **independent** variables to vary across classifications?

If Y_i denoted the independent variable of the i^{th} observation, then a vector of **independent** variables of **the i^{th} observation** is denoted by $(X_{i1}, X_{i2}, \dots, X_{ip})$, where p is the number of **predictor** variables.

$$X_{ij}b = X_{i1} * b_1 + X_{i2} * b_2 + X_{ip}b_p \quad (5)$$

Further, where $b = (b_1, b_2, \dots, b_p)$ denotes the vector of regression parameters. **Logistic** regression analysis assumes that the **probability** of Y_i , the dependent variable being equal to 1 is given by

$$1/(1 + \exp(-a - X_{ij}b))$$

where a is the intercept term of the model. If the dependent variable is binary with a range of values of $i = 0, 1, 2, \dots, K$, then the model assumes that the probability that $Y_i \geq j$ is as shown in equation (5), for $j = 1, 2, \dots, K$. The logit model may be viewed as

$$Y_i = a + X_i b + u_i \quad (6)$$

for each classification i . Then observation j belongs to classification i , if and only if $Y_{ji} > Y_{jk}$ for all $i \neq k$. Thus unordered logit model requires u_i to have a weibull distribution.

EMPIRICAL RESULTS

Logit models are developed for the following constraints of interest : (1) failed thrifts vs. healthy thrifts, (2) failed state chartered thrifts vs. failed federally chartered thrifts and (3) failed mutually owned thrifts vs. failed stock owned thrifts.

Financial ratio data (listed in table 2) is generated for 115 thrifts which failed during 1984 and 1985 and 515 thrifts which did not fail during 1984 - 1985. Further, the 515 non-failed thrifts have positive GAAP (generally accepted accounting practices) net worth and RAP (regulatory accounting practice) net worth. This ensured that the sample of non-failed thrifts used to develop logit models did not include any "living dead zombies", but included only healthy thrifts with positive net worth.

The coefficients of the variables, used to develop logit models for 1984 - 1985, are then used to explain thrift failures in general and by the various modes of charter and ownership during the first three quarters of 1986. The models developed for 1984-1985 are used to generate probabilities of failure of thrifts for three periods (i.e., fourth quarter of 1984, second quarter of 1985, and the fourth quarter of 1985) prior to actual failure during the first three quarters of 1986. Thus, the three sets of probabilities assess the likelihood of failure and insolvency occurring an average of 1 - 9 months, 7 - 15 months and 13 - 21 months before actual failure, where such probabilities are considered to be independent variables in logit analysis during validation

A. Failed vs. Healthy Thrifts : Table 3 provides the coefficients for the logit model contrasting 115 failed thrifts during 1984 - 85 with 515 healthy thrifts with positive GAAP net worth during 1984 - 85.

The significance of the sign of the independent variables' coefficient may be explained as follows. Since "0" denotes failure and "1" denotes non-failure, a positive (negative) coefficient represents negative (positive) correlation with failure and a positive (negative) correlation with non-failure. An analysis of the coefficients of the significant variables listed in Table 3 reveals that failure of thrifts are positively correlated with COST, MFTA and FHLBA, and negatively correlated with MLTA and TA.

This implication that may be drawn from the above is higher the cost of borrowed capital, greater the levels of conventional mortgage foreclosures and short-term FHLB Board advances due, the higher is the probability of thrift failure. Conversely, higher the level of readily appraised mortgage loans and greater the magnitude of total assets, the probability of thrift failure is lower.

Details of **classification** results during **model development** and during **model validation** in the **three** periods (*i.e.*, 1985 IV quarter, 1985 II quarter and 1984 IV quarter) prior to **actual failures** in the first 3 quarters of 1986 are **provided** in **Table 4 Panel A, C** and **Somer's Dyx** are the two **relevant** indices **used** to **assess** the **predictive capability** of the **logit** model developed and validated.

C denotes the **fraction** of the **total** pairs of a which **predicted** and observed values are **concordant** and is used to test whether predicted **probabilities** for the group of **true positives** are different from the **predicted probabilities** for the group of true negatives. **Somer's Dyx** is an index of rank correlation between predicted probabilities and observed **outcomes**.

Table 4 shows that the **logit** model developed during 1984 - 1985 has an overall predictive **accuracy** of **97.77%**, with a Type I error (error in **misclassifying a failure** as a **non-failure**) of 7.02% and a Type II error (error in **misclassifying a non-failure** as a failure) of 1.16%. **Failed** thrifts during 1984 - 1985 are **correctly** classified with 92.98% **accuracy**. This failure **classification accuracy** is superior to the **failure accuracy** achieved by Elmer and Borowski (1988) using the CAEL expert system **framework** and by **replicating** the **logit** models used by **Altman** (1977) and **BBSW** (1986). **Further**, this **investigation's failure accuracy** is **higher** than the **failure accuracies** obtained by Elmer and Borowski (1988) by using a matched healthy **S&Ls sample** or the universe of **healthy S&Ls**.

The **logit** model outlined in **Table 3** is then **validated on financial** data of 1985 IV quarter, 1985 II quarter and 1984 IV quarter for **thrifts** which **failed** during the first three quarters of 1986. The C indices are **very high** at 0.962 for 1985 IV quarter, 0.945 for 1985 II quarter and 0.940 for 1984 IV quarter. This indicates that the predictive **capability** of the **logit** model declines very marginally as the periods prior to **actual failure** in 1986 increase (*i.e.*, 1985 IV quarter to 1984 IV quarter).

The **overall accuracy** of the model declines **from 93.30%** in 1985 IV quarter to 88.96% in 1984 IV quarter, with non-failure **accuracies** being in excess of 95% for 1985 IV quarter and 1985 II quarter and **declining** to 94.87% for 1984 IV quarter. **Classification accuracies** for 1986 failed thrifts is at 83.78% for 1985 IV quarter data, 76.58% for 1985 II quarter data and **70.27%** for 1984 IV quarter data. **Thus**, the **logit** model developed in this study **correctly classifies** over 70% of **all failures** during 1986 I - III, using **financial data 13 - 21 months prior** to **actual failure**.

B. Failed State Chartered Thrifts vs. Failed Federally Chartered Thrifts : **Table 3** shows that variables representing liquidity (*i.e.*, LATA and LACL), deposit composition (JCDTL), **asset quality (RATA and ITA)** and other **dimensions** (*i.e.*, COST, DOËTE and DEFNI) have significant **coefficients**. While **failure** of **state chartered** thrifts is **positively correlated** with current **ratio** (LACL), amount of **jumbo CD's** in deposits received, levels of **repossessed assets** and total investments **made** (including direct investments and equity investments in **service corporations**), **amount** of expenditure incurred **on** directors and other employees, and **amount** of losses incurred on sale of **assets**, failure of **federally chartered** thrifts is **positively associated** with the percent of **assets** which are liquid or **short-term** in nature (*i.e.*, LATA), and the **cost** of **borrowed capital (COST)**.

Classification accuracies during estimation and holdout are provided in Panel B of Table 4. While classification of failed thrifts by the modes of charter is high during examination with an overall classification accuracy of **80.70** percent and individual accuracies for failed state chartered and federally chartered thrifts of **71.69** percent and **88.52** percent, respectively, **the corresponding** accuracies during holdout decline as the holdout period recedes **from 1985 IV quarter to 1984 IV quarter**. During **1985 IV quarter**, failed thrifts **on** an overall basis and individually are classified correctly for more than **60%** of actual failures in the first three quarters of **1986**. However, **1986** failures are classified less accurately using failure **data** for **1985 II quarter** (overall accuracy of **54.95** percent) and **1984 IV quarter** (overall rate of **52.25** percent). However, the C statistic which is generally a better measure of a model's predictive ability, (since the prediction of failure for either group depends **on** relatively arbitrary cutoffs of **the** continuous predicted probability) is significant for all three holdout periods, ranging **from 0.782** in **1985 N quarter** to **0.650** in **1984 IV quarter**.

C. Failed **Mutually Owned** vs. Failed **Stock Owned** Thrifts : Finally, the third **logit** model developed compares failed thrifts by their modes of ownership (**i.e., group "0"** represents mutuals while group "1" represents stock thrifts). JCDTL, MFTA, TA and DOETE are the significant variables and the model fit is highly **significant with** a chi-square statistic of **78.01**.

Failure of mutual thrifts is positively **correlated** with the size of **the** thrifts, while failure of stock owned thrifts is positively correlated with the amounts of jumbo **CD's**, acquisition and development loans, and level of expenditure incurred **on** directors and other employees.

Thus, reliance on non-traditional deposits, quality of assets (**i.e., mortgage loans**) acquired, size of the thrifts, credit risk (**i.e., FHLBA**) and interest - rate risk (**i.e. INFINC**) help in explaining the probability of failure of mutual and stock owned thrifts.

The classification accuracies of the three **logit** models during development (using **1984-1985** data) and validation in three periods (**i.e., 1985 IV quarter, 1985 II quarter and 1984 IV quarter**) prior to actual failure during the first three quarters of **1986** are provided in **Table 4**.

The **logit** model has very high classification rates and values for C and Dyx during estimation (**i.e., 1984 - 1985**). The model has an overall correct rate of **81.58%**, correctly classifying **83.33%** of failed mutuals and **79.63%** of failed stock thrifts. **The** C value is well in excess of **0.90** indicating very high prediction accuracy for the model.

The validation results for the first three quarters of **1986** are also given in **Table 4**. However, the validation results for **the** model are less impressive **13 - 21 months before** failure in **1986**. While **1985 N quarter** financial data (for **1986** failures) is used by the model to **correctly** predict **70.00%** of failed mutuals and **62.75%** of failed stock thrifts, with a high C value of **0.748**, **corresponding** validation accuracies obtained using **1984 IV quarter financial** data are less impressive with failure accuracies of **52.54%** and **54.90%** for a failed mutual and stock thrifts, respectively.

VI - CONCLUSION

This investigation considers the failure of 212 thrift institutions during the post **deregulation period** of 1984 - 1986. This sample **includes** failed thrifts by **the** modes of charter (state vs. federal) **and** ownership (mutual vs. stock). A graded **premium** structure which can be used to cover **S&Ls** with varying risk characteristics is developed in Section III. Failed thrifts are compared with 867 healthy thrifts to **develop** a risk - factor **logit** model which can help in predicting thrift failure. Additionally, the modes of charter and ownership are **considered** as explanatory variables to help explain the incidence of failure among thrifts. **Logit** models are developed to identify the risk characteristics which help distinguish between failure of state chartered versus federally chartered thrifts, and also **the** failure of mutually owned versus stockowned thrifts. Finally, such models are used to predict actual thrift failures during 1986.

More research is **proposed** to develop graded premium structures to cover **S&Ls** based on **the modes** of charter and ownership. Further, it is **proposed** to empirically test the efficacy of such graded **premium structures** using data on failed and healthy thrifts.

FOOTNOTES

1. Approximately 600 of the 700 plus thrift failures since 1934, when **FSLIC** was incorporated, occurred during 1980 to 1986. Given the financially distressed condition of several hundred more **significant supervisory** and management consignment cases, **the** Federal Home Loan Bank Board (**See** Gray, 1986) **predicts** additional **S&L** closures in the later part of **1980s** with losses concentrated in the states of Arkansas, **California**, **Florida**, Louisiana, Oklahoma, Texas **and** **Washington**.
2. Congressional action includes the passage of **the Depository Institutions Deregulation and Monetary Control Act** in 1980, **the Garn St. German Depository Institutions Act** in 1982, and the 1987 Competitive Equality **Banking Act**. **The** 1987 recapitalization act authorizes the Bank Board to create a separate financing corporation to raise approximately \$10.8 **billion** over the next three years. **The financing** corporation will act as a **conduit** to provide funds to **FSLIC** for resolving **S&L** failures. The FHLBB as the main regulator of the thrift industry has **modified** regulations over **the** last five years with respect to net **worth** requirements, level of direct and equity investment, **brokered** deposits, and commercial real estate lending.
3. Although several insolvent **thrift** institutions **were** closed by **FSLIC** in the 1980 to 1986 period, over 200 **S&Ls** have been permitted to continue operations due to **insufficient** reserve funds needed to cover losses, **see** Gray (1986).
4. **The** Management Consignment Program (MCP) **involves** hiring outside management to manage the distressed thrift institution with the objective of (1) obtaining better **accounting information** on losses within **the institution**, (2) developing an independent **business plan** outlining **the** alternatives available for resolving **the institution's problems** and (3) **seeking** information on **the possibilities** of **merging**, rather than **liquidating** the institution. Currently, there are over 50 **S&Ls** under the management consignment program. **See** Gray (1986).

5. **The** moral hazard issue (refer Benston (1984)) provides an incentive to thrifts to undertake more risk, subject to the supervision of the regulator of thrifts.

6. Various other criteria, **i.e.**, size, are not considered in selecting the **control** sample as the process may limit the **generalizability** of inferences which can be drawn from the results. For example, if size is **used as the** matching criterion, then the empirical results of this study may be valid only for healthy thrifts which are similar in size to the failed thrifts.

7. **For** a complete discussion of the **properties** of **logit** models, **see** Amemiya (1981). Further, **Maddala** (1986) provides a comparative analysis of the problems involved in using different parametric **procedures** in examining thrift failures.

Table 1

Annual Classification of Failed Institutions

Year	Number of Failures	Mode of Charter		Mode of Ownership	
		State	Federal	Mutual	Stock
1984	33	15	18	17	16
1985	82	38	44	43	39
1986	97	40	57	52	45
	212	93	119	112	100

Table 2

List of Variables (=20)

Variable	Abbreviation
LIQUIDITY	
1. Ratio of liquid assets to total assets	LATA
2. Current Ratio (i.e. , ratio of liquid assets to short-term liabilities)	LACL
PROFITABILITY	
1. Ratio of total expenses to total revenue	TETR
2. Return (i.e. , net operating income) on total assets	PROF
3. Ratio of interest expenses (i.e. , costs of various borrowed funds) to total assets	COST
CAPITAL ADEQUACY	
1. Ratio of Regulatory Net Worth to total assets	RNWT
DEPOSIT COMPOSITION	
1. Ratio of Jumbo CDs to total liabilities	JCDTL
2. Ratio of Brokered Deposits to total liabilities	BDTL
ASSET QUALITY	
1. Ratio of Repossessed Assets to total assets	RATA
2. Ratio of Slow loans & other items to total assets	SLTA
3. Ratio of readily appraised mortgage loans to total assets	MLTA
4. Ratio of conventional mortgage foreclosures to total assets	MFTA
5. Ratio of investments to total assets	ITA
6. Ratio of non-conforming loans made to total assets	NCLTA
OTHERS	
1. Ratio of FHLB advances due in <1 year to total assets	FHLBA
2. Ratio of acquisition & development loans to total assets	ADLTA
3. Ratio of director & other employee expenses to total expenses	DOETE
4. Total Assets	TA
5. Ratio of interest on mortgage loans to total revenue	INTINC
6. Ratio of loans incurred on sale of assets to net income	DEFNI

Table 3

Various **Logit** Specifications **Explaining** 1984-85 **S&L** Failures

Variable	Failed vs. Healthy Thrifts	Failed State Chartered vs. Failed Federally Chartered Thrifts	Failed Mutually Owned vs. Failed Stock Owned Thrifts
LIQUIDITY			
LATA		0.312**	
LACL		-0.286**	
DEPOSIT COMPOSITION			
JCDTL		-0.474**	0.549*
ASSET QUALITY			
RATA		-0.277**	
MLTA	1.060*		
MFTA	-0.694***		0.303***
ITA		-2.337*	
SIZE			
TA	0.001**		
OTHERS			
FHLBA	-2.59*		
COST	-0.206***	0.218***	
DOETE		-0.137***	0.164***
DEFNI		-0.256***	
CONSTANT	0.468*		
SUMMARY STATISTICS			
CHI-SQUARE	511.63*	67.31*	78.01*

* Significant at 0.01 level
 ** Significant at 0.05 level
 *** Significant at 0.10 level

Table 4

Details of Classification Accuracies

	ESTIMATION (1984-85)	HOLDOUT#1 (1985IV)	HOLDOUT#2 (1985II)	HOLDOUT#3 (1984IV)
A. Failed Thrifts vs. Healthy Thrifts				
Failure Accuracy (%)	92.98	83.78	76.58	70.27
Non-Failure Accuracy (%)	98.84	96.31	95.42	94.87
Type I Error (%)	7.02	16.22	23.42	29.73
Type II Error (%)	1.16	3.69	4.58	5.13
Overall Accuracy (%)	97.77	93.30	90.87	88.96
C	0.991	0.962	0.945	0.940
Somer Dyx	0.983	0.924	0.889	0.880
B. Failed State Chartered Thrifts vs. Failed Federally Chartered Thrifts				
State Chartered				
Failure Accuracy (%)	71.69	64.58	52.00	44.23
Federally Chartered				
Failure Accuracy (%)	88.52	66.67	57.38	59.32
Type I Error (%)	28.31	35.42	48.00	55.77
Type II Error (%)	11.40	33.33	42.62	40.68
Overall Accuracy (%)	80.70	65.77	54.95	52.25
C	0.902	0.782	0.787	0.650
Somer Dyx	0.803	0.764	0.773	0.699
C. Failed Mutually Owned Thrifts vs. Failed Stock Owned Thrifts				
Mutually Owned				
Failure Accuracy (%)	83.33	70.00	54.24	52.54
Stock Owned Failure				
Accuracy (%)	79.63	62.75	50.00	54.90
Type I Error (%)	16.67	30.00	45.76	47.76
Type II Error (%)	20.37	37.25	50.00	45.10
Overall Accuracy (%)	81.58	66.67	52.25	53.15
C	0.917	0.748	0.685	0.417
Somer Dyx	0.833	0.596	0.469	0.367

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