Working Paper Series

An Empirical Test of the Incentive Effects of Deposit Insurance: The Case of Junk Bonds at Savings and Loan Associations

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Working Papers Series
Issues in Financial Regulation
Research Department
Federal Reserve Bank of Chicago
September 1991 (WP-91-18)

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OF CHICAGO

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September 1991

We thank Herbert Baer, George Kaufman, Steven Strongin, Vefa Tarhan, and the participants of finance seminars at DePaul University and the University of Notre Dame for valuable comments and suggestions. The research assistance of Loretta Ardaugh, George Rodriguez, and Gary Sutkin is greatly appreciated. All views expressed here are those of the authors and are not necessarily those of the Federal Reserve Bank of Chicago or the Federal Reserve System.

An Empirical Test of the Incentive Effects of Deposit Insurance:

The Case of Junk Bonds at Savings and Loan Associations

Using data for the July 1985-December 1989 period, this paper analyzes how diversification into low-grade (junk) bonds affects a savings and loan association's (S&L) equity returns. First, we report, among other things, that diversification into junk bond investments appears to have increased the volatility of S&L equity returns. Moreover, an examination of the risk premium on large certificates of deposit (CDs) indicates a significantly positive relationship between the interest rate paid on uninsured CDs and the volume of junk bonds held. Next, we examine the impact of junk bonds on equity returns. For an institution with low net worth, greater risk-taking will increase the value of underpriced, fixed-rate deposit insurance to the S&L and its equity holder. This should lead to increases in the return on common stock. However, a well-capitalized institution that increases junk bond holdings should not experience stock price gains. We find that this is the case for the sample of S&Ls we studied.

An Empirical Test of the Incentive Effects of Deposit Insurance: The Case of Junk Bonds at Savings and Loan Associations

Much of the debate concerning the savings and loan (S&L) crisis has focused on questions regarding the various investments undertaken by S&Ls. The Financial Institutions Reform, Recovery and Enforcement Act (FIRREA) of 1989 requires, among other things, that S&Ls' existing holdings of corporate debt securities not of investment grade ("junk" bonds) be divested by July 1, 1994.[1] Proponents of this restriction believe that S&Ls should return to their original purpose and concentrate solely on providing credit to potential and existing homeowners. They argue that junk bonds are inappropriate investments for institutions with federal deposit insurance. On the other hand, others contend that investing in junk bonds may improve the diversification of an S&L's assets and therefore lead to less risky, healthier institutions. Has allowing investment in junk bonds contributed to the severity of the S&L crisis by permitting increased risk-taking by some institutions? Or did holdings of junk bonds actually reduce S&L portfolio risk through the benefits of diversification? This is an important empirical question because the FIRREA restrictions have adversely affected the low-grade bond market by eliminating a potential source of demand for these securities. It is also important because much of the large losses of the S&L industry in the 1980's was borne by the taxpayer.

It may be argued, however, that debates about which assets thrifts should be allowed to hold are focusing on the wrong questions. There are many types of risky assets that thrifts are still permitted to hold in their portfolios even after the passage of FIRREA, e.g., fixed-rate, 30-year mortgage loans. If an institution wishes to increase its risk exposure, prohibiting junk bond investment will not prevent it from doing so. Thus, a more relevant policy question is what factors induce thrifts to take on additional risk. We believe that by studying the effects of junk bond investment on S&Ls, we can better understand the motivation for greater S&L risk-taking in general. In the case of junk bonds, we find empirical support for the view that the existence of deposit insurance created a moral hazard situation which gave poorly capitalized institutions a greater incentive to increase their risk exposure.

Several recent studies suggest that poorly capitalized institutions have actively sought to take additional risk. Benston and Koehn (1989) reported that increased emphasis on riskier nontraditional activities resulted in greater stock return volatility for poorly capitalized S&Ls and lower volatility for healthier institutions. Brewer (1989) tested the hypothesis that federal deposit insurance distorts the risk/return trade-offs for seriously troubled institutions. He found that shifts in asset composition toward nontraditional activities resulted in increases in the return on equity for distressed institutions but had no effect on healthy institutions. This suggests that the shareholders rewarded risk-shifting actions that raise the value of the insurance subsidy.

This paper differs from the previous studies in that we analyze the impact of S&L junk bond exposure on market risk. Using a sample of 75 S&Ls from July 1985 to the end of 1989, we report that institutions with a larger share of junk bonds (as a proportion of their market value of net worth) also had greater stock market volatility, as measured by the standard deviation of their stock market returns. This suggests that these institutions did use junk bonds to increase rather than reduce their risk exposure.

Next, we examine whether S&Ls with larger shares of junk bonds in their portfolios paid higher interest rates to depositors. If institutions holding junk bonds are perceived by depositors to have a higher probability of failure, then uninsured depositors would demand a higher risk premium. We find a significantly positive relationship between junk bond investments and deposit interest rates for the 1987-1989 period. Thus, we conclude not only that junk bonds increased S&L market risk but also that institutions which held larger shares of junk bonds were perceived as more risky by uninsured depositors.

If holding junk bonds increases risk for S&Ls, then (1) why would S&Ls invest in these assets and (2) why were almost all junk bond investments concentrated in a small number of institutions? An S&L should increase its investment in junk bonds (or any asset) if the expected marginal benefit of doing so is greater than its expected marginal cost. If the stock market is operating efficiently, then this should be reflected in stock returns. However, the existence of deposit insurance alters the risk-return trade-off for some institutions. If S&Ls with large junk bond holdings were also less capitalized and had a higher probability of failure than other S&Ls, the deposit insurance option becomes more valuable and the expected gain of larger junk bond investments would exceed *the S&L's* expected loss. Thus, the stock market should reward these S&Ls with higher returns for increasing their riskiness. However, a well-capitalized institution that increased its holdings of junk bonds would experience a decline in stock returns, because the expected gain to the institution would not exceed its expected loss. We test this hypothesis by dividing our sample of 75 S&Ls into 18 "high" junk bondholders and 57 "low" junk bondholders. We find a significantly positive relation between junk bond holdings and stock returns for the "high" junk bond S&Ls and a significantly negative relation for the "low" junk bondholders. These empirical results support the theory that the existence of deposit insurance provides incentives for some institutions to shift their asset compusition toward riskier activities.

This paper is divided into five sections. Section one describes the regulations concerning S&L junk bond investment and presents descriptive data on the extent of S&L holdings over the sample period. Section two develops the method used to test the effects of junk bond holdings on stock market risk. Section three analyzes the effects of S&L junk bond holdings on the cost of deposit funds. Section four tests the impact of junk bond investment on S&L stock returns. Section five concludes.

I. Background

Allowing S&Ls to invest in junk bonds changes the efficient risk/return frontier available to the S&L. The exact shape of the new frontier depends both on how junk bonds mix with other assets and how an S&L chooses to manage these investments. The Garn-St Germain Depository Institutions Act of 1982 allowed federally chartered S&Ls to invest up to 11 percent of their assets in junk bonds. In the May 1983 regulation implementing the act, the Federal Home Loan Bank Board (FHLBB) authorized federally chartered S&Ls to invest up to (1) 1 percent of their assets in commercial paper and corporate debt securities and (2) 10 percent of their assets in commercial loans. The FHLBB classified junk bonds under the category of commercial loans. At the same time, many state governments enacted statutes that broadened asset powers for their state-chartered S&Ls. State-chartered S&Ls were permitted by several states to invest almost unlimited amounts directly in junk bonds.[2] Recently, these junk bond investments have been associated with some of the largest S&L failures.

Table 1 reports S&L holdings of junk bonds by different classifications from 1985 to 1989. Several points are worth noting. First, from the end of 1985 to the end of 1988, total holdings of junk bonds by all S&Ls grew from $6.02 billion to $15.34 billion, an increase of over 150 percent in three years. After 1988, however, S&Ls began to reduce and/or write down their holdings of junk bonds, so that by yearend 1989, the amount held had declined to $10.68 billion. Second, the vast majority of these securities were held by a small number of institutions. Throughout the sample period, the top 50 holders had over 95 percent of all S&L junk bond holdings. Third, even though these investments were concentrated in a small number of institutions, these investments still represented a substantial amount relative to regulatory capital. For the 50 largest holders as a group, the dollar value of junk bonds exceeded their regulatory capital since the end of 1986.

Junk bond investments are frequently perceived as relatively risky assets in the sense that the distribution of returns associated with a single asset of this kind or even a group of such assets has a large variance: some institutions will earn generous returns on these investments while others will suffer low or negative returns. Recent studies of the junk bond market have verified that, other things equal, junk bonds are more risky than investment-grade bonds but less risky than equity. For example, Perry and Taggart (1990) found that the standard deviation of monthly junk bond returns was greater than that of investment-grade bonds but less than that of equities. Blume, Keim, and Patel (1991), found that, from 1977 to 1989, low-grade bonds exhibited more volatility than equivalent government bonds. They also report that there was no indication that junk bonds are either overpriced or underpriced, and this corroborates the findings of a 1988 General Accounting Office study. In general, junk bonds are less liquid than either Treasury or investment grade bonds and more liquid than consumer and commercial loans.

The hypothesis that junk bonds cause failure is related to this perceived riskiness. Given the large variance in returns, institutions which have high levels of junk bond investments have a higher probability of failure if they experience an unfavorable series of "draws" from the distribution of returns. However, this argument does not distinguish between the risk associated with a junk bond and the risk associated with a portfolio of assets. The riskiness of a portfolio--that is, the variance in the return on the entire set of assets held by an S&L--may decrease when junk bonds are added. Portfolio riskiness also depends on the covariance among assets. For example, if the returns on a junk bond tend to be high when the returns on other assets are low (i.e., negative covariance), adding the junk bond will reduce the overall riskiness of a portfolio.

II. The Relation between Junk Bonds and S&L Market Risk

A. Theoretical Considerations

Do changes in S&L holdings of junk bonds significantly influence S&L riskiness? We address this question by examining the relation between the volatility of S&L stock returns and holdings of junk bonds. The first step in the development of the model, following Black and Scholes (1973) and Galai and Masulis (1976), is to relate the volatility of the market return on S&L equity, σ_{MV}, to the volatility of the return on S&L assets, σ_A:

$$\sigma_{MV} = \sigma_A \left[\left(\frac{\partial MV}{\partial A} \right) \left(\frac{A}{MV} \right) \right] \tag{1}$$

where $(\partial MV/\partial A)/(A/MV)$ is the elasticity of market value of equity with respect to the value of total assets of a representative S&L. Equation (1) indicates that the volatility of S&L equity returns is a function of: the volatility of the asset returns, σ_A; the change in market value capital with respect to the change in total assets, $\partial MV/\partial A$; and the asset-to-capital ratio, A/MV.

Because we cannot observe all the right hand side variables in equation (1), a simplified econometric specification of equation (1), following Christie (1982), can be written as equation (2):

$$\sigma_{i,t} = s_0 + s_1 LEV_{i,t} + \varepsilon_{i,t} \tag{2}$$

where $\sigma_{i,t}$ is the equity return volatility (σ_{MV}) of the ith S&L in period t; $LEV_{i,t}$ is the total asset-to-market value capital ratio of the ith S&L in period t; $\varepsilon_{i,t}$ is a stochastic error term; and the coefficients s_0 and s_1 are parameters to be estimated. Since greater leverage increases S&L riskiness, we predict that $s_1 > 0$.

Christie (1982) indicates that the volatility of equity returns is affected by a number of other variables in addition to the asset-capital ratio. One possible source of influence may be junk bonds. To test the effect of junk bonds on S&L market risk, define $JUNK_{i,t}$ to be the ratio of junk bonds to market value of capital of the ith S&L in period t, so equation (2) becomes:[3]

$$\sigma_{i,t} = s_0 + s_1 LEV_{i,t} + s_2 JUNK_{i,t} + \varepsilon_{i,t} \tag{3}$$

The estimated coefficient, s_2, would be positive if a higher proportion of junk bonds in an S&L's portfolio increased its riskiness. However, this specification does not control for asset mix. For example, if an S&L increased holdings of junk bonds by selling off Treasury bills, it would be unclear whether risk increased because of an increase in junk bonds or a decrease in less risky Treasury bills. To address the effect of asset mix, we added several other variables to the model, which is now rewritten as equation (4):

$$\begin{aligned}\sigma_{i,t} = {} & s_0 + s_1 LEV_{i,t} + s_2 JUNK_{i,t} + s_3 RMORT_{i,t} \\ & + s_4 OMORT_{i,t} + s_5 CMORT_{i,t} + s_6 ADL_{i,t} \\ & + s_7 DIRECT_{i,t} + s_8 NONMORT_{i,t} + \varepsilon_{i,t}\end{aligned} \tag{4}$$

In equation (4), we have included residential mortgage loans (RMORT), commercial mortgage loans (CMORT), other mortgage loans (OMORT), acquisition and development loans (ADL), real estate direct investment (DIRECT), non-mortgage loans (NONMORT), and junk bonds (JUNK). To avoid perfect multicollinearity, one asset category, comprised of cash, deposits, investment securities and other assets not specified in the equation, was excluded. All asset variables are divided by market value of capital and are measured for the ith S&L at the end of period t.

Conceptually, if an S&L holds a portfolio of mortgage and non-mortgage assets of differing degrees of risk, then, as the relative investment in the different assets changes, the return volatility of the S&L must change.[4] The precise behavior of $\sigma_{i,t}$ as a function of the asset mix will depend on the variance/covariance structure of the S&L asset returns; changes in asset mix can either increase or decrease the volatility of equity returns. Three potentially important sources of risky non-mortgage assets are real estate direct investments (DIRECT), non-mortgage loans (NONMORT), and junk bonds (JUNK). Changes in the relative investment in these different assets might affect the volatility of S&L equity returns.

An S&L's riskiness is also influenced by the composition of its mortgage loan portfolio. During the early 1980s, S&Ls were given broader powers to hold commercial mortgage loans. If S&Ls altered the composition of their mortgage portfolios (moving, for example, from residential mortgage loans to commercial mortgage loans), this might have a similar impact on S&L stock return volatility as would shifts from traditional mortgage assets to nontraditional non-mortgage assets. Barth and Bradley (1989) find that, within the mortgage category, insolvent institutions have rapidly increased their commercial mortgage lending. Barth, Bartholomew, and Labich (1989) present evidence indicating that acquisition and development loans, which are loans to finance the purchase of land and the accomplishment of all improvements required to convert it to developed building lots, have a positive and statistically significant effect on resolution costs. In our empirical analysis, four mortgage loan categories are examined: residential mortgage loans (RMORT), commercial mortgage loans (CMORT), acquisition and development loans (ADL), and other mortgage assets (OMORT). We expect that returns on commercial mortgage loans and acquisition and development loans would be more volatile than returns on residential mortgage loans.

B. Data Sources and Estimation Procedure

The data used in this paper are for 75 S&L organizations whose stocks were traded on the New York Stock Exchange, American Stock Exchange, or over the counter and who filed Federal Home Loan Bank Board (now the Office of Thrift Supervision) Report of Condition data for each quarter from July, 1985 to December, 1989. A few of the 75 S&Ls were resolved by thrift regulators prior to the end of the sample period. These failed institutions are included in the sample period for the quarters before resolution, and are excluded from the sample for the time period after resolution. Stock market data are from Interactive Data Services, Inc. For multiple S&L holding companies, the assets of individual S&L subsidiaries are consolidated to construct the balance sheet variables discussed below.[5]

To obtain our measure of risk, we use the daily stock market data. For each quarter in the sample period, estimates of the daily average rate of return and standard deviation of the returns on S&L's equity, $\sigma_{i,t}$, were computed using data covering the three month period ending with the last month of the quarter. The market value of equity is calculated by multiplying the number of shares outstanding at the end of each quarter by the price of the S&L's equity at the end of the quarter.

The asset-to capital ratio (LEV) is calculated as the ratio of total book value assets to the market value of capital. All asset variables are from the Quarterly Reports of Condition filed by all insured savings and loan associations. The variable RMORT is computed by dividing residential mortgage loans by the market value of capital. CMORT is the ratio of commercial mortgage loans to the market value of capital. ADL represents total acquisition and development loans divided by the market value of capital. The other mortgage asset variable (OMORT) is the sum of multifamily mortgage loans and mortgage-backed securities divided by the market value of capital. The real estate direct investment variable (DIRECT) is calculated by taking the sum of equity securities (except Federal Home Loan Bank Stock), real estate investments, and investments in service corporations or subsidiaries and dividing by the market value of capital. The non-mortgage loan ratio (NONMORT) is the sum of total business and consumer loans divided by the market value of capital. Finally, JUNK is measured by taking the amount of S&L junk bonds in each quarter and dividing by the market value of capital.

Equations (3) and (4) are estimated for a pooled cross-section, time series sample of S&Ls from 1985:3 to 1989:4 to test the relationship between asset mix and S&L market risk as reflected in the volatility of S&L equity returns. To control for possible correlation either across institutions or across time, we included both cross-sectional and time dummy variables in the specifications of equations (3) and (4), rewritten here as equations (5) and (6):

$$\sigma_{i,t} = s_0 + \sum_{t=2}^{T} s_{0,t} W_t + \sum_{i=2}^{N} c_{0,i} Z_i + s_1 LEV_{i,t} + s_2 JUNK_{i,t} + \varepsilon_{i,t} \tag{5}$$

and

$$\sigma_{i,t} = s_0 + \sum_{t=2}^{T} s_{0,t} W_t + \sum_{i=2}^{N} c_{0,i} Z_i + s_1 LEV_{i,t} + s_2 JUNK_{i,t} + s_3 RMORT_{i,t} + s_4 OMORT_{i,t} + s_5 CMORT_{i,t} + s_6 ADL_{i,t} + s_7 DIRECT_{i,t} + s_8 NONMORT_{i,t} + \varepsilon_{i,t} \tag{6}$$

where W_t=1 for quarter t (t=2,...,T) and 0 otherwise, and Z_i=1 for the ith S&L (i=2,...,N) and zero otherwise. The model is also estimated quarterly from the beginning of 1987 to the end of 1989 to provide comparisons to tests conducted later in the paper covering a similar period.

C. Empirical Results

Results from estimating equations (5) and (6) using ordinary least squares are reported in Table 2. The estimated values of the parameters represent their cross-sectional average values.[6] The results from equation (5) show a significant positive relationship between S&L return volatility and junk bond holdings. This supports the claim that S&Ls with larger proportion of junk bonds in their portfolios also exhibited higher volatility of stock returns. As expected, the coefficient on LEV is statistically significant and positively signed. This finding is consistent with the hypothesis that greater financial leverage is associated with more risk-taking.

The second column presents the results from estimating equation (6). Again, the coefficient on junk bonds is significantly positive at the one percent level. One other asset category--acquisition and development loans (ADL)--has a positive and statistically significant coefficient, while the OMORT, NONMORT, and DIRECT variables have significantly negative coefficients. The result for ADL is consistent with previous studies which find that acquisition and development loans have a positive and statistically significant effect on riskiness. It is also worth noting that the coefficient on junk bonds is significantly larger than any other asset coefficient except the coefficient for ADL. What this implies is that, holding market value and total assets constant, a portfolio shift from any asset except ADL into junk bonds would increase stock return volatility. Thus, we conclude from these results that holdings of junk bonds increased the volatility of S&L stock returns for our sample of institutions over the 1985:3-1989:4 period.

The third and fourth columns of Table 2 report the results from estimating equations (5) and (6) over the period 1987:1 through 1989:4. These results are similar to those over the entire sample period. In particular, the results indicate that stock return volatility is positively correlated with JUNK and ADL. The coefficients on NONMORT and DIRECT are negative and significant. Overall, we find that increased emphasis on junk bonds resulted in greater stock return volatility.

One additional test was conducted to examine whether more liberal regulations on junk bond investment available to some state chartered institutions may have resulted in their incurring greater risks than federally chartered S&Ls. These liberal guidelines have been blamed by federal regulators for some of the large losses of failed state chartered S&Ls. Thus, it is hypothesized that changes in junk bond holdings should have a greater impact on the stock return volatility of state chartered S&Ls than federally chartered firms. We test this prediction by estimating the following equation:

$$\sigma_{i,t} = s_0 + \sum_{t=2}^{T} s_{0,t} W_t + \sum_{i=2}^{N} c_{0,i} Z_i + s_1 LEV_{i,t} + s_2 JUNK_{i,t}$$

$$+ s_{2,1} (JUNK_{i,t})(DUM) + \varepsilon_{i,t} \qquad (7)$$

where DUM is a binary variable that has a value of one when the observation corresponds to federally chartered S&Ls and zero otherwise. The coefficient on the multiplicative dummy variable, ($JUNK_{i,t}$)(DUM), measures the increase (or decrease) in the impact of junk bonds on the stock return volatility of federally chartered S&Ls relative to state chartered S&Ls. The results are presented in Table 3. The negative coefficient on the multiplicative dummy variable indicates that junk bonds have less of an impact on the stock return volatility of federally chartered S&Ls than state chartered institutions.[7] The greater range of junk bond authority available to state chartered institutions may have resulted in their incurring greater risks than federally chartered associations.

III. The Relationship between Deposit Interest Rates and Junk Bond Investments

In this section, we explore the relationship between the interest rate paid on large, partially insured certificates of deposit (deposits in excess of $100,000), the amount of junk bonds relative to market value of S&L net worth, and a set of variables designed to proxy for factors affecting the risk premiums on S&L deposits. Following Baer and Brewer (1986), we specify the following empirical model as equation (8):

$$RCD_{i,t} = \delta_0 + \delta_1 RTB_t + \delta_2 CAP_{i,t} + \delta_3 RISK_{i,t}$$

$$+ \delta_4 SIZE_{i,t} + \delta_5 JUNK_{i,t} + \delta_6 AGROWTH_{i,t} + \upsilon_{i,t}, \qquad (8)$$

$RCD_{i,t}$ represents the interest rate paid by the ith S&L in period t on certificates of deposit with a maturity of six to twelve months and was obtained from the Quarterly Report of Condition. S&Ls were not required to submit deposit interest rate data to regulators prior to 1987; hence, our sample period in this section is from the beginning of 1987 to the third quarter of 1989.[8] RTB_t is the interest rate on 182 day Treasury bills, measured by the average yield over each quarter. The $RISK_{i,t}$ variable is obtained by multiplying the variance in stock returns in a quarter by the square of the market value of equity to total assets.[9] The variable $CAP_{i,t}$ is the ratio of the market value of common stock to total assets of the ith S&L at the end of quarter t; $SIZE_{i,t}$ represents the natural logarithm of total assets; $JUNK_{i,t}$ is the S&L holdings of junk bonds as defined earlier; $AGROWTH_{i,t}$ is the percentage change in total assets over quarter t for the ith S&L; and $\upsilon_{i,t}$ is a stochastic error term.

Since CDs and Treasury bills are close but not perfect substitutes, we expect the coefficient on RTB to be positive but less than one. S&Ls do not adjust their CD rates as rapidly as market interest rates change. We predict the coefficient on CAP should be negative because a higher capital-asset ratio implies a lower probability that depositors would suffer a loss.[10] The coefficient on RISK should be positive because an increase in stock market risk implies that there is a greater chance that the value of an S&L's assets will fall below the level needed to repay all depositors. We include an asset size measure as an additional explanatory variable to account for the possibilities that either purchasers of negotiable CDs view larger S&Ls as having greater implicit federal deposit insurance than smaller institutions or that the CDs of larger S&Ls are more liquid. We hypothesize that the coefficient on the ratio of junk bonds to market value should be positive. If larger S&L holdings of junk bonds increase the probability of failure, then uninsured depositors would demand a higher risk premium. Rapid asset growth was linked by the now-defunct Federal Home Loan Bank Board both to high likelihoods of failure and to high costs to the deposit insurance fund to resolve those failures. According to our hypothesis, the greater is the growth in assets, the more a S&L would have to pay on CDs to attract funds and to compensate uninsured depositors for increased exposure to risk of failure.

The results from estimating equation (8) are presented in Table 4. The results indicate that all the coefficients are significantly different from zero. As expected, the CD rate is positively related to the Treasury bill rate and negatively related to both the capital-asset ratio and asset size. Both coefficients on the RISK and JUNK variables are significantly positive, indicating that depositors demanded higher interest premiums to compensate for bearing additional risk. Moreover, institutions which had larger holdings of junk bonds paid an additional risk premium over institutions with the same market risk but smaller holdings of junk bonds. Finally, the results show a significant positive relationship between S&L CD rates and asset growth, supporting the concerns of many that institutions growing rapidly are paying higher rates to increase their deposits. These results are consistent with previous studies that found a risk premium in interest rates paid on large CDs [see, for example, Baer and Brewer (1986), Hannan and Hanweck (1987), and James (1990)]. Thus, we conclude that institutions which had larger shares of junk bonds in their portfolios were perceived as more risky by uninsured depositors.

IV. The Impact of Junk Bond Investments on S&L Stock Returns

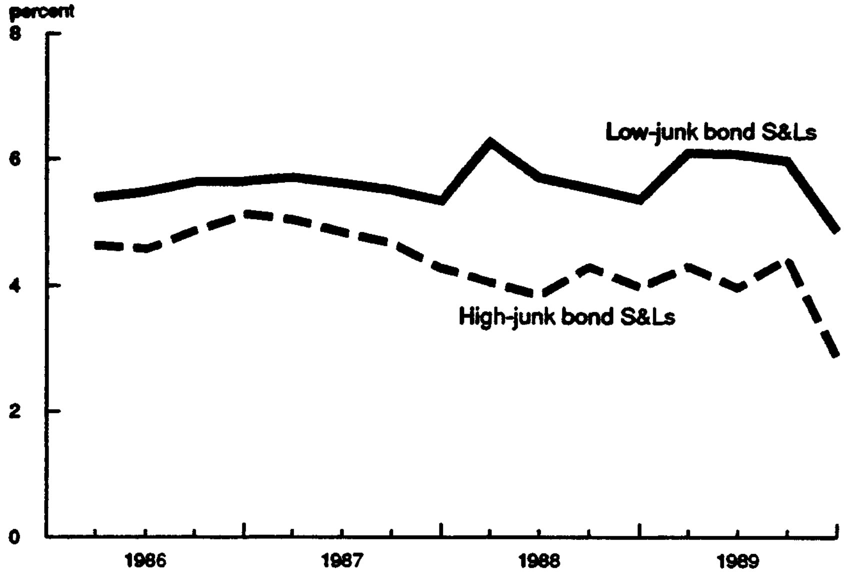
A. Theoretical Considerations

In this section, we examine the effects of junk bond holdings on the stock returns of savings and loan associations. We have already shown that S&Ls with higher proportions of junk bonds were perceived as riskier by both stockholders and depositors. S&Ls with large holdings of junk bonds were also less capitalized than those with small holdings were. Figure 1 compares the aggregate generally accepted accounting principles (GAAP) capital-to-asset ratios for the 18 S&Ls in the sample classified as "high" junk bondholders with those for the 57 S&Ls classified as "low" junk bondholders. To be considered a "high" junk bondholder, an S&L must have ranked among the top 50 junk bondholders at the beginning of the sample period. For every quarter between 1986 and 1989, the capital-asset ratio for the "high" junk bond group was lower than the "low" junk bond group.[11]

The impact of junk bond investments on S&L stock returns may differ across firms because underpriced deposit insurance may be more valuable to poorly capitalized S&Ls than to others. Merton (1977) and Buser, Chen and Kane (1981) show that providing deposit guarantees at less than their market value subsidizes S&Ls. The value of this subsidy equals the difference between the

Figure 1

GAAP net worth ratios



cost of risky and riskless (guaranteed) deposit claims less the premium charged for insurance. Access to future deposit guarantees, under these circumstances, is an asset of the S&L. The value of this asset is equal to the present value of the stream of subsidies the S&L expects to receive. It increases in value, ceteris paribus, when either the S&L's leverage and/or the volatility of the returns on its underlying assets (and $\sigma_{i,t}$) increase. Thus, because insurance premiums are not a function of risk exposure, the shareholders of S&Ls with the largest exposure to the junk bond market, ceteris paribus, obtain more net benefits from deposit insurance than those with the smallest exposure to the junk bond market.

Increased risk taking, however, may adversely affect S&L stock returns of well-capitalized institutions. First, regulators are highly concerned about maintaining S&L safety and soundness. Consequently, regulators impose solvency standards on S&Ls by setting capital adequacy requirements and implicitly defining upper bounds on acceptable probabilities of ruin. Such policies effectively impose a (risk of ruin) constraint on an S&L's portfolio choice in return-risk space. Assuming that this constraint is viewed as binding, an increase in volatility due to larger junk bond holdings serves to reduce the opportunity set of acceptable S&L portfolios, forces it away from its optimal unregulated portfolio, and lowers the market value of the S&L. Alternatively, an S&L may stay with higher risk portfolios only by improving its capital adequacy. However, increasing capital through cutting dividends, retaining earnings, or issuing new stock may be costly to existing stockholders. As noted by Buser, Chen and Kane (1981), capital requirements, S&L activity/portfolio restrictions, as well as S&L examinations, can be thought of as taxes imposed by regulators which create deadweight losses to the value of the S&L. Moreover, to the extent that an S&L has a valuable charter, the value of the firm will fall with an increase in volatility.

To examine the impact of junk bonds on S&L stock returns, we estimated the following pooled cross-section, time series regression, based on James (1990), which is derived in the appendix:

$$RET_{i,t} = \alpha_0 + \sum_{i=2}^{N} \alpha_i Z_i + \sum_{i=1}^{N} \beta_i Z_i MRET_t$$

$$+ \theta_1 \left[\frac{Junk_{i,t}}{MV_{i,t}}\right] RHYBOND_t + \theta_2 \left[\frac{Junk_{i,t}}{TA_{i,t}}\right] RHYBOND_t + \omega_{i,t}, \qquad (9)$$

where β_i is the stock market beta coefficient of the ith S&L (i = 1,...,N), $MRET_t$ is the return on the market portfolio, $Junk_{i,t}$ is the ith S&L's holdings of junk bonds in period t, $MV_{i,t}$ is the market value of capital of the ith S&L in period t, $TA_{i,t}$ is the book value of total assets of the ith S&L in period t, and $\omega_{i,t}$ is a stochastic error term. To control for the possible impact of other S&L-specific factors on stock returns, individual S&L dummy variables, Z_i's, are included in the regression equation. In addition, individual S&L dummy variables multiplied by the return on the value-weighted market portfolio, $Z_i MRET_t$, are included to allow the market betas to vary cross-sectionally.

Much of the concern about S&L junk bond holdings has to do with S&Ls gambling the institutions' assets on investments with large but high-risk payoffs. In order to examine this issue, the S&Ls in this study are divided into two groups according to their junk bond exposure. Those stock associations that are among the top 50 junk bondholders are classified as high-junk bond holders. Out of our sample of 75 S&L holding companies, 18 were among the top 50 junk bondholders. The remaining 57 S&L holding companies in the sample are classified as low-junk bondholders. Equation (9) is estimated separately for each group of S&Ls. Table 5 shows the average total assets for the S&Ls in each group over the sample period 1985:3-1989:4. Average total assets for the low-junk bond group of S&Ls is $4,700 million and the high-junk bond group is $7,048 million.

The fact that institutions with large holdings of junk bonds also had lower than average capital might explain the rapid growth of junk bond holdings from 1986 to 1988. Theory suggests that an S&L would increase holdings of junk bonds if the expected marginal benefit to the institution of doing so exceeds its expected marginal cost. If stock markets are operating efficiently, then such institutions should receive higher stock returns. However, the existence of deposit insurance alters the risk-return trade-off for some institutions. Shareholders of S&Ls with high capital-asset ratios would be bearing all of the risk of junk bond investments, but shareholders of S&Ls with low capital-asset ratios would share the risk with the deposit insurer. In the extreme case of an institution that is market value insolvent but kept open by regulatory forbearance, the shareholders are bearing no additional risk from increased S&L risk-taking. Thus, stock returns of such institutions should actually increase as these institutions acquire more risky assets.

If, in the absence of deposit insurance, the expected marginal benefit of increased junk bond holdings is less than expected marginal cost, then we should observe a negative relationship between the stock returns of well-capitalized, "low" junk bond institutions and their junk bond holdings. However, because the "high" junk bondholders also have less capital, we expect the stock market returns of these institutions to be higher if they acquire more junk bonds since the value of the deposit insurance option, which is capitalized into the market value of the stock, increases with additional risk-taking. By dividing the sample into "high" and "low" junk bond S&Ls, we can test this "forbearance" hypothesis. Thus, in equation (9) we expect the sign of θ_1 to be positive for "high" junk bondholders and negative for "low junk bondholders." If returns are inversely related to the capital-asset ratio, then the sign of θ_2, by construction, should have the opposite sign of θ_1.

B. Data Sources and Empirical Procedure

The data sources for the stock prices, market values, total book value of assets, and junk bond holdings are described in section II. The common stock returns over a quarter are calculated by compounding weekly common stock returns within a quarter. The stock market portfolio used to compute MRET in this study is the value-weighted portfolio (NYSE and AMEX) obtained from the Center for Research in Security Prices (CRSP) data base. A measure of the total returns on junk bonds is constructed from a high yield bond index obtained from Merrill-Lynch.[12] Our methodology involves first estimating, for each group of S&Ls over the period 1987:1 through 1989:4, the relationship between an S&L's stock return ($R_{i,t}$) and the market return ($MRET_t$) and the return on the high yield bond index ($RHYBOND_t$). Second, equation (9) is estimated for each group of S&Ls using ordinary least squares.

C. Empirical Results

Table 6 contains the results from the estimation of the stock return equations. Part A shows estimates of a two-factor market model which relates the return on S&L stock to the market returns on both common stocks and high yield bonds. The results in Part A of Table 6 indicate that stock returns of both high- and low-junk bondholders are sensitive to changes in junk bond returns. Junk bond returns are shown to be positively related to S&L stock returns; however, the coefficient difference between high- and low-junk bond S&Ls is not statistically significant.

As discussed earlier, an increase in junk bond holdings can either increase or decrease S&L stock returns, depending on the value of the deposit insurance option relative to the value of the S&L charter. An S&L's charter value can be divided into three categories. The first is the value of business relationships built over time. Kane and Malkiel (1965) argue that longstanding customer banking relationships have value because they lower the information and contracting costs associated with doing business. The reduction in the cost of servicing longstanding customers is available only to the servicing S&L and is a source of profitable future business opportunities. The second source is monopoly rents that may accrue to S&Ls from branching laws and other regulations that restrict competition. The third source of the charter's value is the ability of depository institutions to borrow on a collateralized basis from the Federal Home Loan Banks. These factors taken together could cause S&L stock returns to decrease with an increase in the volume of junk bonds.

Part B of Table 6 presents the results of estimating equation (9). The first column of results indicates, for high-junk bond institutions, a statistically significant and positive relationship between stock returns and changes in junk bond investments, controlling for movements in the returns on junk bonds. The second column shows, for the sample of S&Ls with small junk bond holdings, a statistically significant but negative relationship between S&L stock returns and changes in junk bond investments relative to market capital. This is consistent with the notion that deposit insurance is more valuable to institutions with large junk bond exposure relative to capital, but less valuable to institutions with low junk bond exposure. In the latter case, capital adequacy considerations and other charter value concerns impose costs on S&Ls that lower their market value.

Finally, ϕ_1 (= θ_2/θ_1 as defined in the appendix) is negative and statistically significant only for the sample of S&Ls with low exposure to the junk bond market. This result is consistent with the work of Galai and Masulis (1976) which predicts that the sensitivity of common stock returns with respect to the return on the underlying assets of the firm varies inversely with the firm's capital-to-asset ratio. However, Brickley and James (1986) argue that common stock returns of distressed financial institutions do not necessarily vary inversely with a firm's capital-to-asset ratio because decreases in this ratio increase the risk borne by the federal deposit insurer, raising the value of access to insurance. The insignificant ϕ_1 coefficient for the S&Ls with the largest exposure to the junk bond market is consistent with the latter prediction.

V. Summary

In this paper, we first examine whether the financial markets view S&Ls with relatively large exposure to junk bonds as more risky than S&Ls with smaller exposure to junk bonds. We test this hypothesis using data on S&L stock returns and interest rates paid on large CDs. We find that equity return volatility appears to be positively related to the proportion of junk bonds held in S&L portfolio. In addition, we find evidence that CD holders demand higher rates when junk bond holdings increase relative to market value of equity.

Given that larger junk bond holdings increase S&L risk, we attempt to explain why junk bond holdings are concentrated among a small number of institutions and why these holdings grew so rapidly in the 1986-1988 period.

Because of the low capital-asset ratios of the large junk bondholders, we test the "forbearance" hypothesis by dividing the sample of institutions into two groups based on their junk bond holdings, and examine the relation between their stock returns and their holdings of junk bonds. We find that the stock returns of S&Ls who have relatively large junk bond portfolios are positively related to changes in junk bond holdings. The stock returns of other S&Ls, however, are negatively related to changes in junk bond holdings relative to their capital. These results support the notion that the stock returns of S&Ls on the "edge" respond to volatility increases as if deposit insurance is a valuable subsidy. Access to deposit insurance is not as valuable for other types of S&Ls (that is, those with little, if any, exposure to the junk bond market).

The results of this study should not be construed as support for the decision by Congress to force S&Ls to exit the junk bond market by 1994. Rather, we argue that regulatory forbearance allowed S&Ls to take on excessive risk in many ways, including the purchase of junk bonds. Forbearance, in effect, rewards S&Ls for taking additional risks, since it induces a positive correlation between stock market returns and holdings of risky assets. Closing the junk bond market to S&Ls will not prevent S&Ls from taking more risk because there are many ways for depository institutions to acquire assets which are at least as risky as junk bonds. Legislative action which attacks excessive risk-taking by prohibiting institutions from acquiring particular classes of risky assets is attacking the symptoms of the disease instead of its causes and is doomed to fail. If the incentives to increase risk are there, then value-maximizing institutions will find a way to circumvent regulations and increase risk. The solution is to adopt policies that eliminate incentives for institutions with low capital to increase their risk exposure.

Appendix

This appendix presents a formal derivation of equation (9) in the text by modelling changes in market value of equity. We adapt the procedure used by James (1990) to analyze the effect of LDC debt on bank stock returns. Define the market value of equity of the ith S&L as MV_i and the market value of the ith S&L's total assets as A_i. Assume that the returns on S&L assets are lognormally distributed with a constant instantaneous variance of σ^2_i. In addition, assume that the S&L pays no dividends and that S&L deposits have promised payments of X_i due in τ periods. Then the change in the value of total assets through time can be described by the following stochastic differential equation:

$$\frac{dA_i}{A_i} = \alpha_i dt + \sigma_i dz, \qquad (A.1)$$

where α_i is the instantaneous expected return on the assets and dz is a standard Gauss-Wiener process.

The market value of equity of the ith S&L reflects the value of the asset and of time. That is,

$$MV_i = F(A_i, t). \qquad (A.2)$$

Given the distributional assumption on A_i, we have, by Ito's Lemma, that the change in the market value of equity over time satisfies the stochastic differential equation:

$$dMV_i = F_1 dA_i + \frac{1}{2} F_{11} (dA_i)^2 + F_2 dt, \qquad (A.3)$$

where

$$\left(dA_i\right)^2 = A_i^2 \sigma_i^2 dt. \qquad (A.4)$$

Substituting (A.4) into (A.3) and dividing by MV_i results in

$$\frac{dMV_i}{MV_i} = F_1\left[\frac{dA_i}{MV_i}\right] + \frac{1}{2}F_{11}\left[\frac{\sigma_i^2 A_i^2}{MV_i}\right]dt + F_2\left[\frac{1}{MV_i}\right]dt. \qquad (A.5)$$

Assuming the last two terms in equation (A.5) can be captured by a constant λ_i, the rate of return on the equity can be written as

$$RET_i = \lambda_i + F_1\left[\frac{A_i}{MV_i}\right]\left[\frac{dA_i}{A_i}\right]. \qquad (A.6)$$

Next, partition S&L total assets into two categories: junk bonds and "other assets". Let,

$$A_i = V_i + Junk_i, \qquad (A.7)$$

where V_i the market value of the S&L's other assets and $Junk_i$ is the market value of the S&L's junk bond portfolio. Substituting into equation (A.6) yields the following expression:

$$RET_i = \lambda_i + F_1\left[\frac{V_i}{MV_i}\right]\left[\frac{dV_i}{V_i}\right] + F_1\left[\frac{Junk_i}{MV_i}\right]\left[\frac{d(Junk_i)}{Junk_i}\right]. \qquad (A.8)$$

The expression $d(Junk_i)/Junk_i$ represents the total return on the ith S&L's junk bond portfolio. Since we do not know the composition of each S&L's junk bond portfolio, we assume the total returns for the portfolio can be approximated using the total returns for an index of junk bonds. Also let MORET approximate dV_i/V_i. Then equation (A.9) becomes:

$$RET_i = \lambda_i + F_1\left[\frac{V_i}{MV_i}\right]MORET + F_1\left[\frac{Junk_i}{MV_i}\right]RHYBOND, \qquad (A.9)$$

where MORET is a proxy for the return on the S&L's other assets and RHYBOND is an index of the total return on junk bonds. In the empirical analysis, we assume that the returns on other S&L assets are uncorrelated with the return on junk bonds. The return on the NYSE index (MRET) is used as a proxy for the return on other S&L assets.

To account for cross-sectional differences among S&Ls in their sensitivity to general stock market movements, equation (A.9) is rewritten as

$$RET_i = \lambda_i + \sum_{i=1}^{N} \beta_i Z_i MRET + F_1 \left[\frac{Junk_i}{MV_i} \right] RHYBOND, \qquad (A.10)$$

where β_i is the stock market beta coefficient of the ith S&L (i=1,...,N) and Z_i = 1 for the ith S&L (i=1,...,N) and zero otherwise.

The F_1 expression measures the responsiveness of market value of equity to a change in the value of S&L assets. It can be shown that the F_1 is,

$$F_1 = N(d_1), \qquad (A.11)$$

where

$$d_1 = [ln(A_i/X_i) + (r + \sigma_i^2/2)\tau]/\sigma_i\sqrt{\tau}, \qquad (A.12)$$

with r = risk-free rate of interest and N(.) is the cumulative normal distribution function.

Galai and Masulis (1976) show that $N(d_1)$ varies inversely with the capital-to-asset ratio. Following James' specification, we assume that a linear approximation for $N(d_1)$ can be written as

$$N(d_1) \cong 1 + \phi_1 \left[\frac{MV_i}{A_i} \right], \qquad (A.13)$$

where ϕ_1 is a parameter, with the prediction that $\phi_1 < 0$.[13]

Substituting (A.13) into (A.10), adding a stochastic error term and dummy variables to control for "other" cross-sectional effects, and rearranging results in

$$RET_{i,t} = \alpha_0 + \sum_{i=2}^{N} \alpha_i Z_i + \sum_{i=1}^{N} \beta_i Z_i MRET_t$$

$$+ \theta_1 \left[\frac{Junk_{i,t}}{MV_{i,t}} \right] RHYBOND_t + \theta_2 \left[\frac{Junk_{i,t}}{TA_{i,t}} \right] RHYBOND_t + \omega_{i,t}, \qquad (A.14)$$

where $\theta_2 = \theta_1 \phi_1$ and $\omega_{i,t}$ is a stochastic error term. Equation (A.14) is reported as equation (9) in the text.

FOOTNOTES

[1]Noninvestment grade securities may be transferred to a holding company affiliate or (for mutuals) to a separately capitalized subsidiary.

2California, Connecticut, Florida, Louisiana, Ohio, Texas, and Utah were the states with more lenient guidelines for state chartered S&Ls.

[3]It is worth noting that our specification for the junk bond variable is equivalent to dividing junk bonds by total assets and multiplying by leverage. Thus, leverage is implicitly interacted with the ratio of junk bonds to total assets in this specification. We thank an anonymous referee for clarifying this point.

[4]One might expect that stock return volatility may be positively related to growth since many S&Ls suffering large losses also were growing rapidly during this period. We did not include this variable for two reasons. First, Brewer (1989) found no statistically significant relationship between growth in liabilities and stock returns. Second, we believe that growth is a consequence rather then a cause of S&L risk taking, since more rapid deposit growth enables an institution to acquire more risky assets. In this section, we choose to focus on the relationship between stock return volatility and asset choice.

[5]For each of the holding companies included, the S&Ls were the major activity of the holding company in terms of assets. The mean ratio of S&L assets to total holding company assets was 96 percent over the sample period. Other holding company activity included real property management, housing development, brokerage services, insurance products, data processing services, corporate debt and equity services, and real estate appraisal services. Assets for the holding companies were obtained from Moody's *Banking and Finance Manual*, various years.

[6]Two additional tests were performed. First, using White's test for heteroskedasticity, we were unable to reject the null hypothesis of homoskedasticity. Second, we estimated the equations using Fuller's and Battese's (1974) error components model and the results were qualitatively similar to those reported.

[7]The simple correlation coefficient between the junk bond-market value ratio and the charter dummy variable was -0.09, which was significantly different from zero at the one percent level.

[8]Data for the fourth quarter of 1989 were not available.

[9]This adjustment has been used by several other researchers including Marcus and Shaked (1984).

[10]For empirical evidence supporting this hypothesis see Pozdena (1991) and Gendreau (1991).

[11]Similar results are obtained when tangible accounting principle capital-to-asset ratios are compared.

[12]The junk bond index started October 31, 1986. The simple correlation coefficient between MRET and RHYBOND was 0.26 and was not statistically significanat from zero.

[13]In other words, a one percent decrease in total assets, ceteris paribus, has a much larger proportional change on the market value of equity when the capital asset ratio is lower. However, for market value insolvent institutions kept open by regulatory forbearance, a decrease in total assets, ceteris paribus, would also increase the value of the deposit insurance option. Thus, the sign of ϕ_1 becomes ambigious when MV gets close to zero.

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Table 1

Junk bond holdings at savings & loan associations--1985-1989

	All Savings and Loans		50 Largest Holders		"High" Junk Bond S&Ls in sample		"Low" Junk Bond S&Ls in sample	
Year : QTR	Total Junk Bond Holdings	Percent of GAAP Capital	Total Junk Bond Holdings	Percent of GAAP Capital	Total Junk Bond Holdings	Percent of GAAP Capital	Total Junk Bond holdings	Percent GAAP Capital
1985 : 4	6022.7	16.3	5919.5	122.0	3881.6	123.2	284.3	3.8
1986 : 2	6829.7	17.4	6747.6	135.6	4743.4	112.1	178.5	1.9
1986 : 4	8096.2	18.4	7971.6	141.9	5632.6	108.1	123.1	1.2
1987 : 2	10625.4	23.0	10437.1	113.1	7601.8	125.6	160.3	1.3
1987 : 4	12493.2	29.8	12271.8	128.4	9169.7	151.5	136.3	1.1
1988 : 2	13497.9	36.2	13193.0	144.9	9457.4	155.3	688.1	5.4
1988 : 4	15341.8	28.6	14845.4	141.7	10426.9	173.9	1023.9	7.5
1989 : 2	13424.7	26.8	12846.7	134.1	8491.0	146.7	1073.5	7.1
1989 : 4	10675.5	33.6	10316.5	296.8	6064.5	183.8	516.0	4.4

Notes: Data are from Quarterly Reports of Condition filed with the Office of Thrift Supervision. Junk bond holdings are expressed in millions of dollars, and as a percentage of net worth measured using generally accepted accounting principles (GAAP).

Table 2

The impact of asset mix on S&L stock return volatility (All S&Ls)

Estimated Equations:

$$\sigma_{i,t} = s_0 + \sum_{t=2}^{T} s_{0,t} W_t + \sum_{i=2}^{N} c_{0,i} Z_i + s_1 LEV_{i,t} + s_2 JUNK_{i,t} + \varepsilon_{i,t}$$

and,

$$\sigma_{i,t} = s_0 + \sum_{t=2}^{T} s_{0,t} W_t + \sum_{i=2}^{N} c_{0,i} Z_i + s_1 LEV_{i,t} + s_2 JUNK_{i,t} + s_3 RMORT_{i,t} + s_4 OMORT_{i,t}$$

$$+ s_5 CMORT_{i,t} + s_6 ADL_{i,t} + s_7 DIRECT_{i,t} + s_8 NONMORT_{i,t} + \varepsilon_{i,t}$$

where $\sigma_{i,t}$ equals the standard deviation of the ith S&L's stock returns in quarter t, W_t is a time dummy variable, Z_i is an S&L dummy variable, $LEV_{i,t}$ is the ratio of total assets-to-market capital, $RMORT_{i,t}$, $CMORT_{i,t}$, $ADL_{i,t}$, $OMORT_{i,t}$, $DIRECT_{i,t}$, $NONMORT_{i,t}$, and $JUNK_{i,t}$ are ratios to market value of capital of residential mortgage loans, of commercial mortgage loans, of acquisition and development loans, of other mortgage loans, of direct real estate investments, of nonmortgage loans, and of junk bonds, respectively. Coefficient estimates of time and cross-sectional dummy variables are not reported but are available upon request from the authors.

	85:3 - 89:4		87:1 - 89:4	
Variable	Parameter Estimate	Parameter Estimate	Parameter Estimate	Parameter Estimate
Intercept	2.6417	2.6004	3.1987	3.2007
	(7.306)***	(7.991)***	(7.099)***	(8.069)***
LEV	0.0041	0.0082	0.0039	0.0068
	(21.939)***	(2.354)***	(19.177)***	(1.669)*
(JUNK)	0.0306	0.0330	0.0368	0.0447
	(4.819)***	(3.465)***	(4.988)***	(4.084)***
(RMORT)		-0.0023		0.0029
		(-0.479)		(0.503)
(OMORT)		-0.0096		-0.0072
		(-2.305)**		(-1.515)
(CMORT)		0.0091		0.0017
		(1.256)		(0.214)
(ADL)		0.1100		0.1389
		(8.102)***		(8.544)***
(DIRECT)		-0.0658		-0.0837
		(-4.506)***		(-4.511)***
(NONMORT)		-0.0076		-0.0080
		(-1.720)*		(-1.621)*
Adj. R-Sq	0.6050	0.6803	0.6637	0.7398
F-Stat:	22.017	28.430	20.481	27.201
N =	1277	1277	858	858

T-Statistics in parentheses are starred if coefficients are significantly different from zero at the 10(*), 5(**), and 1(***) percent levels.

Table 3

The impact of asset mix on S&L stock return volatility
Federal vs. State restriction of junk bond holdings
(All S&Ls)

Estimated Equation:

$$\sigma_{i,t} = s_0 + \sum_{t=2}^{T} s_{0,t} W_t + \sum_{i=2}^{N} c_{0,i} Z_i + s_1 LEV_{i,t} + s_2 JUNK_{i,t} + s_{2,1} (JUNK_{i,t})(DUM) + \varepsilon_{i,t}$$

where $\sigma_{i,t}$ equals the standard deviation of the ith S&L's stock returns in quarter t, W_t is a time dummy variable, Z_i is an S&L dummy variable, $LEV_{i,t}$ is the ratio of total assets-to-market capital, $JUNK_{i,t}$ is the ratio of junk bonds-to-market value of capital, and DUM is a binary dummy variable taking on the value of one for federally chartered S&Ls, zero otherwise. Coefficient estimates of time and cross-sectional dummy variables are not reported but are available upon request from the authors.

Variable	85:3 - 89:4 Parameter Estimate	87:1 - 89:4 Parameter Estimate
Intercept	2.6499	3.2101
	(7.357)***	(7.153)***
LEV	0.0041	0.0039
	(21.980)***	(19.237)***
(JUNK)	0.0553	0.0618
	(5.501)***	(5.206)***
(JUNK)(DUM)	-0.0385	-0.0385
	(-3.162)***	(-2.681)***
Adj. R-Sq	0.6080	0.6664
F-Stat:	22.055	20.452
N =	1277	858

Dum is a binary variable taking on the value of one for federally chartered S&Ls, zero otherwise. T-statistics in parentheses are starred if coefficients are significantly different from zero at the 1(***) percent level.

Junk bond coefficients

	85:3 - 89:4		87:1 - 89:4	
Charter-type	Parameter Estimate	Parameter Estimate	Parameter Estimates	Parameter Estimates
State	0.0553	0.0480	0.0618	0.0674
Federal	0.0168	0.0213	0.0233	0.0263
	(5.501)***	(4.151)***	(5.206)***	(5.085)***

Numbers in parentheses beneath the federally chartered S&L junk bond coefficients are the corresponding t-statistics. All t-statistics are significantly different from zero at the 1(***) percent level.

Table 4

A pooled cross-section time series examination of the relationship between the interest rate paid on CDs with maturities greater than six months and the characteristics of the S&L

Estimated Equation:

1987:1 - 1989:3

$$RCD_{i,t} = \delta_0 + \delta_1 RTB_t + \delta_2 CAP_{i,t} + \delta_3 RISK_{i,t} + \delta_4 SIZE_{i,t} + \delta_5 JUNK_{i,t} + \delta_6 AGROWTH_{i,t} + \upsilon_{i,t}$$

where $RCD_{i,t}$ equals the interest paid on large CDs with a maturity between 6 and 12 months of the ith S&L in quarter t, RTB_t is the 182-day Treasury bill rate, $CAP_{i,t}$ is the ratio of market capital-to-assets, $RISK_{i,t}$ is the adjusted variance in stock returns, $SIZE_{i,t}$ is the natural logarithm of total assets, $JUNK_{i,t}$ is the ratio of junk bonds-to-market value of capital, and $AGROWTH_{i,t}$ is the percentage change in total assets.

	Parameter Estimate
Intercept	2.4690 (12.138)***
RTB	0.8066 (59.647)***
CAP	-1.0195 (-3.001)***
RISK	0.3532 (2.331)**
JUNK	0.0045 (2.312)**
SIZE	-0.0317 (-2.608)**
AGROWTH	0.4947 (2.143)**
Adj. R-Sq	0.8315
F-Stat:	638.449
N =	776

The estimates are generated for the period 1987:1 to 1989:3 because of data availability. Fourth quarter 1989 data were not available. T-statistics in parentheses are starred if coefficients are significantly different from zero at the 5(**) and 1(***) percent levels.

Table 5
Savings and loan organizations

Low-Junk Bondholders	Average Asset Size (in $1000's)
Ahmanson H.F. and Co.	30,966,285
Altus Bank F.S.B. (Alabama)	2,516,735
American Savings Bank F.S.B. (New York)	4,257,123
Ameriwest Financial Corp.	2,072,109
Atlantic Financial Federal	6,340,020
Bankers First Corp.	1,106,621
Buckeye Financial Corp.	1,204,078
Calfed, Inc.	21,952,827
CFS Financial Corp.	1,033,184
Citadel Holding Corp.	3,896,797
Citizens Savings Financial Corp.	3,123,631
Coast Federal Savings and Loan Association	1,188,942
Collective Federal Savings Bank	1,791,089
Columbia First Federal Savings and Loan Association	1,930,784
Comfed Savings Bank (Lowell)	1,366,644
Crossland Savings F.S.B. (New York)	12,966,772
D and N Savings Bank F.S.B.	1,870,513
Downey Savings and Loan Association	3,296,356
Financial Corp. of America	32,625,711
First Federal of Michigan (Detroit)	11,698,644
First Federal Savings and Loan Association of Fort Myers (Florida)	817,527
First Indiana Corp.	1,053,012
Firstcorp Inc.	700,138
Fortune Financial Group Inc.	2,742,964
Glenfed Inc.	20,018,974
Golden West Financial Corp.(Delaware)	14,553,048
Great Western Financial Corp.	27,586,241
Hawthorne Financial Corp.	841,382
Heart Federal Savings and Loan Association	729,155
Home Federal Savings Bank	282,947
Home Owners Federal Savings and Loan Association	2,799,110

Table 5 (cont.) Low-Junk Bondholders	Average Asset Size (in $1000's)
Landmark Land Inc.	1,880,827
Landmark Savings Association (Pennsylvania)	1,635,030
Mercury Savings and Loan Association	2,308,080
Metropolitan Federal Savings and Loan Association	1,119,425
Metropolitan Financial Corp.	2,163,200
Mid-State Federal Savings and Loan Association	885,966
Nafco Financial Group Inc.	1,545,312
Numerica Financial Corp.	964,641
Old Stone Corp.	4,019,481
Pacific First Financial Corp.	4,591,559
Pioneer Federal Savings and Loan Association	517,753
Pioneer Savings Bank	2,046,960
Ponce Federal Bank F.S.B.	1,048,691
Poughkeepsie Savings Bank F.S.B.	1,450,013
Prudential Financial Services	795,174
Security Capital Corp. (Delaware)	2,228,524
South Eastern Savings and Loan Association of Charlotte (North Carolina)	452,279
Southmark Corp.	3,084,502
Valley Federal Savings and Loan Association of Van Nuys (California)	2,972,382
Virginia First Savings Bank F.S.B.	463,006
Washington Federal Savings and Loan Association	1,734,864
Wesco Financial Corp.	347,415
Western Capital Investment	3,459,170
Western Federal Savings Bank PR	541,701
Western Savings and Loan Association	5,620,376
York Financial Corp.	712,656

Table 5 (cont.) High-Junk Bondholders	Average Asset Size (in $1000's)
American Continental Corp.	4,021,889
American Savings and Loan Association of Florida	2,803,049
Boston Five Cents Savings Bank	2,092,630
Centrust Savings Bank	7,603,975
Cityfed Financial Corp.	10,146,035
Coast Savings and Loan Association	10,886,183
Columbia Savings and Loan Association	9,384,621
Commonwealth Savings and Loan Association (Florida)	1,361,745
Dime Savings Bank of New York F.S.B.	10,698,985
Far West Financial Corp.	3,661,383
Financial Corp. of Santa Barbara	4,367,618
Germania Bank A Federal Savings Bank	723,125
Gibraltar Financial Corp. of California	12,587,135
Great American First Savings Bank (San Diego)	14,206,294
Home Federal Savings and Loan Association of San Diego (California)	13,729,680
Imperial Corp. of America (Delaware)	10,315,176
Northeast Savings F.A.	6,512,365
Sooner Federal Savings and Loan Association	1,754,911

Notes: Data are an average of quarterly values from 1985:3 to 1989:4 from the Reports of Condition filed with the Office of Thrift Supervision. These values are for the S&L only and not for the entire holding company.

Table 6

Stock returns equations

A. The effects of high-yield returns on the common stock returns of S&Ls

Estimated Equation:

1987:1 - 1989:4

$$RET_{i,t} = \beta_0 + \beta_M MRET_t + \beta_H RHYBOND_t + v_{i,t}$$

where $RET_{i,t}$ equals the return on the ith S&L's stock in quarter t, $MRET_t$ is the return on the stock market portfolio, and $RHYBOND_t$ is the market return on the junk bond portfolio.

Variable	High-junk bond S&Ls Parameter Estimate	Low-junk bond S&Ls Parameter Estimate
Intercept	-0.1546	-0.0986
	(-9.366)***	(-11.120)***
MRET	0.8476	0.9927
	(5.665)***	(12.021)***
RHYBOND	2.7633	2.0009
	(5.043)***	(6.744)***
Adj. R-Sq	0.2800	0.2739
F-Stat:	39.301	125.303
N =	198	660

T-statistics in parentheses are starred if coefficients are significantly different from zero at the 1(***) percent level.

Table 6 (cont.)

B. A pooled cross-section time series examination of the relationship between S&L stock returns and junk bond holdings

Estimated Equation:

1987:1 - 1989:4

$$RET_{i,t} = \alpha_0 + \sum_{i=2}^{N} \alpha_i Z_i + \sum_{i=2}^{N} \beta_i Z_i MRET_t + \theta_1 \left[\frac{Junk_{i,t}}{MV_{i,t}}\right] RHYBOND_t$$

$$+ \theta_2 \left[\frac{Junk_{i,t}}{TA_{i,t}}\right] RHYBOND_t + \omega_{i,t}$$

where $RET_{i,t}$ equals the return on the ith S&L's stock in quarter t, Z_i is an S&L dummy variable, $MRET_t$ is the return on the stock market portfolio, $RHYBOND_t$ is the market return on the junk bond portfolio, $MV_{i,t}$ is the market value of the S&L's stock, $Junk_{i,t}$ is the book value of the S&L's junk bond portfolio, and $TA_{i,t}$ equals total assets of the S&L.

Variable	High-junk bond S&Ls Parameter Estimate	Low-junk bond S&Ls Parameter Estimate
Intercept	-0.144	-0.083
	(-1.313)	(-2.242)**
$\left[\frac{Junk}{MV}\right]$ RHYBOND	0.174	-0.308
	(3.207)***	(-3.430)***
$\left[\frac{Junk}{TA}\right]$ RHYBOND	5.221	87.832
	(0.716)	(2.606)***
Adj. R-Sq	0.281	0.277
F-Stat:	3.079	3.197
N =	198	660

Coefficient estimates of the market betas and cross-sectional dummy variables are not reported but are available upon request from the authors. T-statistics in parentheses are starred if coefficients are significantly different from zero at the 5(**) and 1(***) percent levels.