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Junk Bond Holdings, Premium Tax Offsets, and Risk Exposure at Life Insurance Companies

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Abstract

Life insurance company (LIC) risk exposure has increased in the 1980s while capital ratios have been declining. Although state guaranty funds exist to handle losses to policyholders in the event of an LIC failure, these funds can create incentives for excessive risk taking as did the federal deposit insurance system for savings and loan associations. This paper also examines the relationship between stock market risk and LIC risk exposure. Stock market risk is found to be positively related to financial leverage as well as to differences in asset mix in a sample of 44 LICs, confirming that market data can help identify institutions with greater risk exposure.

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The failures of several large life insurance companies, such as Mutual Benefit and Executive Life in 1991, have raised the possibility of pervasive failures in yet another category of financial intermediaries that would require government intervention and taxpayer expense.[1] Given the cost of the savings and loan (S&L) bailout to federal taxpayers and the importance of life insurance to millions of policyholders, an evaluation of the current risk exposure and regulatory structure of the U.S. life insurance industry would be useful for several reasons. First, the life insurance industry is a major supplier of funds to capital markets, so insolvency problems could affect credit availability. Second, because state guaranty funds provide protection for policyholders, the incentive for LICs to take additional risks might be greater than it would be in the absence of these guarantees, so it is important to evaluate whether the current guaranty system affects LIC risk taking.[2] Third, since guaranty fund assessments can be credited against an LIC's premium taxes in most states, insurance failures could reduce expected tax revenues to state governments.

This paper is divided into six sections. Section two provides background information on recent industry performance and assesses its current risk exposure. Section three analyzes the characteristics of several LICs that failed in 1991. Section four examines the regulatory environment and the role of state guaranty funds. Section five reports empirical results on the stock market's assessment of life insurance riskiness. Section six concludes with some policy implications.

II. BACKGROUND

In the process of offering risk protection to their customers, LICs expose themselves to a number of risks. Mortality and morbidity risk are related to the probability of a policyholder dying, conditional on age, illness, and other variables. In addition to these insurance risks, a life insurance company faces risks similar to those of other financial intermediaries, including

interest rate risk, liquidity risk arising from policyholders' right to borrow against their policies or to cash them in for their surrender value, and credit risk.

Historically, life insurance companies have played an important role in the bond and mortgage markets.[3] Within the bond market, LICs are major buyers of private placement debt, which are securities issued in the U.S. but not registered with the SEC.[4] Life insurers are also very active in the commercial real estate segment of the mortgage market, which provides a market for loans on nonresidential properties, such as office buildings and manufacturing plants. Life insurance companies, commercial banks, and S&Ls are the major suppliers of credit to this market.[5]

Lending in the private placement and commercial real estate markets requires substantial amounts of information gathering in the form of credit evaluation and monitoring of borrowers' managements through covenant enforcement. Recent studies of the private placement and commercial real estate markets have indicated that the loans made by LICs in these markets generally have terms that are less uniform than other investments, such as publicly traded corporate bonds. As a result, private placements and mortgages are less liquid. Yields are higher to reflect information gathering costs and greater default risk.

According to the Federal Reserve Flow of Funds Accounts, LICs represented approximately 11.6 percent of total assets held by financial intermediaries in the U.S. over the 1986-1990 period. Table 1 contains balance sheet data for the industry for selected years from 1970 to 1991. As of the end of 1991, life companies held over $1.5 trillion in assets. Government securities as a percentage of total assets rose sharply in the early 1980s. Holdings of corporate bonds grew rapidly in the latter half of the 1980s, especially between 1986 and 1988 when they rose from 36.5 to 41.2 percent of total assets, due in part to the growth in corporate debt securities not of investment grade ("junk" bonds). Direct mortgage loans declined from over one-third to less than one-fifth of total assets from 1970 to 1991. These portfolio changes reflect the movement toward greater securitization of financial instruments as well as rapid growth in the amount of corporate debt outstanding. While these securities have enhanced the liquidity of

LIC portfolios, they may also have exposed LICs to prepayment risk (in the case of mortgage-backed securities) and credit risk (in the case of junk bonds).[6]

Turning to the liability side of the balance sheet, one can observe the growing importance of pension and annuity business relative to traditional life insurance. Policy reserves for life insurance in force fell from 55.7 percent of total assets in 1970 to 24.0 percent in 1991, while reserves to cover annuity payments rose from 23.5 to 57.6 percent between 1970 and 1991. However, regulatory capital as a fraction of total industry assets declined from 9.4 percent in 1970 to 8.0 percent in 1991. Regulatory capital as a percent of general account assets (total assets less separate account assets) also fell from 9.7 percent in 1970 to 8.5 percent in 1990.[7] In 1991, the life insurance industry increased its capital-general account asset ratio to 9.3 percent, signalling an improved ability of firms to absorb losses without becoming insolvent [see Benston (1992), Kane (1992), and Kaufman (1992)].

Effects of inflation and high interest rates in the 1970s and early 1980s forced changes in both LIC investment strategy and the types of insurance products offered. To stem outflows and attract additional funds, LICs developed new insurance products, such as universal and variable life, which differed from traditional whole life policies in that the size of the death benefit and/or the annual premium could change to reflect investment performance over the duration of the policy. Another product was the guaranteed investment contract (GIC), which promised a fixed return for a specified period. At year-end 1991, the share of industry general account assets financed by GICs was about 8 percent.

Because the interest rate credited on universal life policies and other interest sensitive products affected the demand for these instruments, LICs had an incentive to offer high rates during the early years of these policies to attract new customers and forestall policy lapses and surrenders by existing customers. Wright (1991) contends that competition with other companies and pressure from insurance agents and brokers also kept rates high. The decline in market interest rates in the mid- and late 1980s, however, squeezed profit margins for many LICs. In order to maintain the high returns being paid on GICs and other liabilities, Wright also

contends that many insurance companies decided to increase interest income by either taking on riskier real estate loans or reducing the quality of their corporate bond portfolios.[7]

Table 2 examines the financial characteristics of LICs, categorized by their book value net worth-total asset ratios in 1990. Almost seventy percent of the industry's assets were held by LICs with capital and surplus less than 6 percent of assets (low capital LICs). Low capital LICs held more mortgage loans and junk bonds than companies with capital ratios greater than 6 percent (high capital LICs). At the same time, low capital LICs held a smaller proportion of their assets in equity investments. GICs are a relatively more important funding source for low capital LICs than for high capital companies. Return on equity is generally lower for low capital LICs than for higher capital companies.

The effects of losses from inflation and disintermediation coupled with the decision of many companies to increase risk exposure in order to maintain high returns on interest sensitive liabilities have eroded the book value of industry capital over the past two decades. Moreover, because under historical cost accounting losses on bonds, mortgage loans, and real estate investments do not have to be realized unless they are sold or written down according to generally accepted accounting principles, the accounting value of net worth can overstate the economic value of capital available to withstand future losses.

III. CHARACTERISTICS OF RECENT LIFE INSURANCE INSOLVENCIES

One consequence of greater LIC risk exposure in recent years has been a rising number of "financially impaired companies" (FICs). FICs are firms that were subjected to any one of the following actions by state insurance departments: involuntary liquidation, receivership, conservatorship, cease-and-desist orders, suspension, license revocation, administrative orders, supervision, or any other action which restricted companies' freedom to conduct business [A. M. Best (1992)]. Figure 1 shows that from 1976 to 1986, an average of 10 companies were financially impaired each year. Since 1986, the number of FICs has averaged 36 per year, with 62 troubled firms in 1991. Moreover, the average size of FICs rose substantially in 1991. In 1991, FICs held about 3.2 percent of the industry's total assets. By contrast, for the 1984-1990

period, the average annual ratio of FICs' assets to industry assets was approximately 0.10 percent. To examine the 1991 experience in greater detail, characteristics of seven large life insurance companies that failed are compared with those for the industry as a whole in Table 3.

The two Executive Life companies that failed were subsidiaries of First Executive Corporation. Executive Life of California was seized by California regulators in April 1991. The company expanded very rapidly throughout its history, with total assets of $29 million in 1975, $606 million in 1980, $5.6 billion in 1985, and a peak of $13.1 billion in 1989. An increase in policy lapses and surrenders and a writedown of its bond portfolio caused total assets to decline to $10.2 billion in 1990. The principal cause of failure was a large exposure to junk bonds, which represented 62.7 percent of the company's total assets at year-end 1990. As Table 3 indicates, the exposure was so large that a decline of only 8.3 percent in the value of their junk bond portfolio was sufficient to wipe out completely both its mandatory security valuation reserve (which are reserves set aside, based on the risk classes of the bonds held by the insurance company, to cover possible losses on bond holdings) and its capital and surplus.

The situation at Executive Life of New York was quite similar. The company had total assets of $42.6 million in 1975, $230 million in 1980, $2.4 billion in 1985, and $3.9 billion in 1989. In 1990, total assets fell 18.7 percent due to policyholder runs and asset writedowns. The company was placed in receivership in April 1991. As with Executive Life of California, a large exposure to junk bonds (64 percent of total assets at the end of 1990) was the principal cause of its demise. Both units of Executive Life possessed a bond rating of A (the second highest rating) from A. M. Best at the end of 1988.

Fidelity Bankers of Virginia and First Capital of California, subsidiaries of First Capital Corporation, failed for similar reasons as did First Executive. Fidelity Bankers, with a low book capital ratio and 36.9 percent of its assets in junk bonds in 1990, could withstand only an 11.7 percent decline in its portfolio before exhausting its capital and mandatory security valuation reserve. The company was placed in receivership in May 1991. A. M. Best had given the company its highest rating of A+ at the end of 1989, and downgraded it to B+ at the end of 1990.

First Capital was also placed in receivership in May 1991 due to investment losses on its bond portfolio and increasing levels of policyholder surrenders. The company had grown from $221.4 million in 1980 to $4 billion in 1990. Approximately 40 percent of general account assets were invested in junk bonds. Given its low book capitalization (2.66 percent in 1990), the company had little protection from future losses on its assets. Nevertheless, it was rated A- in 1989 and B at the end of 1990.

Guarantee Security Life of Florida had $6.6 million in assets in 1980. Starting in 1982, it concentrated on writing individual annuity contracts, and it assets grew rapidly. By the end of 1990, it held $686.4 million in total assets with 60.7 percent invested in junk bonds, despite the fact that it had not purchased any additional junk bonds since the beginning of 1988. Due to insufficient information, A. M. Best did not assign a rating for the company.

The failures of Monarch Life of Massachusetts and Mutual Benefit of New Jersey do not fit into the same pattern as the other five companies. Both companies' growth rates throughout the 1980s were well below the industry average, and holdings of junk bonds relative to capital were comparable to those for the industry as a whole. Monarch had 10.9 percent of its assets in junk bonds, while Mutual Benefit's proportion stood at 3.1 percent. The problem with Mutual Benefit was a large exposure to commercial real estate loans, primarily in the northeastern United States. The ratio of capital to mortgage loans at the end of 1990 was 9.41 percent, implying that a market value decline of 10 percent in it commercial real estate loans would be sufficient to wipe out the firm's capital. Following a liquidity run by policyholders, Mutual Benefit was placed in receivership by New Jersey regulators on July 15, 1991. It received a rating of A from A. M. Best as recently as the end of 1990.

Monarch Life of Massachusetts managed a relatively large amount of separate account assets ($3.6 billion in 1990) in addition to its general account assets. The life company was seized by regulators in May 1991 apparently to protect it from problems at the parent company, Monarch Capital Corporation. According to Kopcke and Randall (1991), after the stock market crash of 1987, Monarch Capital used bank debt to invest heavily in real estate development and venture

capital deals in the New England region. The parent company experienced losses on these investments, triggering a default on the bank loans. Although Monarch Life had a capital-asset ratio well above the industry average, its commercial real estate portfolio was vulnerable to the New England recession. Monarch Life possessed an A+ rating in 1988 and an A rating at the end of 1989.

The failures of these seven companies can be divided into two groups. The first five failed because of a high exposure to junk bonds relative to their capital. They all exhibited extremely rapid asset growth. The last two companies failed due to problems in commercial real estate investments in the Northeast. With the exception of Monarch, all had capital-asset ratios below the industry average at the end of 1990. Given these and other LIC insolvencies, an important policy question is: who bears the cost of a life insurance insolvency? To help answer this question, we now discuss the role of government regulation of life insurance.

IV. INSOLVENCY REGULATION OF LIFE INSURANCE COMPANIES

State insurance departments, not the federal government, regulate insurance companies. The motivations for regulating life insurance companies are similar to those for regulating financial services industries. Life companies have better information about the market value of their net worth than do policyholders. Although many LICs have changed the nature of their insurance products from insurance policies to investment contracts, traditional long term insurance products still make up a significant proportion of life companies' liabilities. In the absence of regulation, life companies would have an incentive to increase risk taking after the writing of an insurance policy. In the event of an LIC failure, there is also the possibility of contagion effect if policyholders at other LICs lose confidence in their own companies' ability to meet their obligations and exercise their surrender options.[8]

Companies that wish to write insurance in an individual state must receive permission from the state insurance commissioner. Regulators enforce rate setting, asset restrictions, and other policies established by state legislation. Insurance companies are required to file annual reports to state insurance commissioners with detailed balance sheet and income statement information.

The state insurance departments perform periodic examinations (usually once every 3 years) of the companies operating within their borders. Most states also tax premiums in part to finance the cost of regulation.

To protect policyholders and to manage insolvencies, all 50 states (including the District of Columbia) have set up guaranty funds. Prior to 1970, only one state had a guaranty system to cover the obligations of life and health insurance companies. In 1970, the National Association of Insurance Commissioners (NAIC) adopted a "model" guaranty system for subsequent consideration by individual state legislatures. Within one year, nine states adopted legislation based on or similar to the NAIC model. The guaranty systems are designed to satisfy benefit claims of policyholders and annuitants in the event that, after liquidation, an insolvent company does not have enough assets. These funds are financed by ex post assessments on the surviving insurance firms which operate in the individual state. The size of the assessment for each company is based on the proportion of the total premium income they generate. In 39 states, the assessment can be offset against the company's state taxes, thereby shifting the cost of failure directly onto state taxpayers. In other states, LICs are allowed to impose a premium surcharge to cover the cost of the assessment.

For most states, coverage under guaranty funds is $300,000 in death benefits, $100,000 in cash or withdrawal value for life insurance, $100,000 in present value of annuity benefits, and $100,000 in health benefits. As shown in Table 4, some states cover all insurance policies written by an insolvent firm located in the state; others cover residents only. Some states cover unallocated annuities such as GICs purchased by companies to fund pension plans up to a certain amount, usually $5 million.

Because of differences in state guaranty funds and in how insolvencies are managed, who actually bears the cost of an insurance failure varies across states. Surviving insurance companies initially pay the assessment and claim it as an expense on their federal corporate income tax return, reducing their federal income taxes. As the companies receive the tax credits in subsequent years, these credits become taxable income. Because of the time value of money,

the federal government bears part of the cost of an insolvency since it does not fully recover the present value of the tax decrease granted in the assessment year. The majority of the cost, however, is paid by state taxpayers in the form of a loss in tax revenues. Barrese and Nelson (1992) found that for 1990 life/health guaranty fund assessments, 73.6 percent was paid for by state taxpayers, 8.9 percent by federal taxpayers, and 17.5 percent by the equity holders of the surviving firms.

The way in which state guaranty funds are financed raises several policy concerns. First, the LIC does not have to make any ex ante payment to receive the guarantee. Second, the assessments are based on the ex post cost of the failure and have no relationship to current or future LIC risk exposure. Third, companies in states with premium tax offsets have little incentive to monitor each other because over 80 percent of the assessment will be recouped through lower taxes. Finally, insurance guaranty funds can weaken market discipline by policyholders. Without insurance guaranty funds, policyholders would have an incentive to buy insurance products from safe insurers.

As we learned from the S&L crisis, underpriced deposit insurance creates a moral hazard problem. Institutions with low net worth have every incentive to gamble for resurrection by investing in riskier assets. If the investments make good, they keep all the gains. If the investments turn sour, the deposit insurer bears the cost of failure. The method of financing insurance guaranty funds is worse in terms of the incentives it creates than federal deposit insurance because assessments are ex post and can be credited on state taxes. Thus, a poorly capitalized LIC has an incentive to write policies (even charging lower premiums to attract business from healthy institutions), invest in risky assets, and hope for the best. If the investments turn bad, the guaranty fund steps in and covers the costs of failure.[9]

Given the incentives that guaranty funds create for risk taking, it is important that state regulators vigilantly monitor the institutions to ensure they do not take excessive risks given their level of capital. Since it may be difficult to measure risk exposure using accounting data, we show in the next section how to use stock market data to examine the risk exposure of LICs.

V. THE EFFECTS OF ASSET MIX AND LEVERAGE ON STOCK MARKET RISK

A. Theoretical Considerations

Do changes in asset mix at LICs significantly affect their riskiness? We address this question by examining the relation between the volatility of LIC stock returns and various asset groups. 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 LIC equity, σ_{MV}, to the volatility of the return on an LIC's 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 the assets of a representative LIC. Equation (1) indicates that the volatility of LIC 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 leverage ratio, A/MV.

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

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

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

Christie (1982) indicates that the volatility of equity returns is affected by other variables besides leverage. For example, if an LIC holds a portfolio of assets with differing degrees of risk, then changes in asset mix can either increase or decrease the volatility of equity returns. The precise behavior of $\sigma_{i,t}$ will depend on the variance/covariance structure of the returns on the various asset categories. The asset categories analyzed in this study include: junk bonds (JUNK), mortgage loans (MORT), real estate direct investments (DIRECT), equity holdings

(STOCK), government and investment grade corporate bonds (OBOND), and other assets (OASSET) which include cash and policy loans.[10] Changes in the relative investment in these different assets can affect the volatility of LIC equity returns.

The volatility of equity returns is also affected by how much of the cost of managing insolvent LICs is borne by stockholders. For example, if guaranty fund assessments can be credited against state premium taxes, then taxpayers and not shareholders pay the majority of these costs. Thus, changes in asset risk will be reflected more fully in stock return volatility for firms that operate in states with no premium tax offsets than for firms that do [see Brickley and James (1986) for a test of this hypothesis for S&Ls].

To examine the impact of financial leverage and asset mix variables on stock return volatility, we estimate:

$$\sigma_{i,t} = s_0 + \sum_{t=2}^{T} s_{0,t} W_t + s_1 LEV_{i,t} + s_2 JUNK_{i,t} + s_3 MORT_{i,t} + s_4 DIRECT_{i,t} + s_5 STOCK_{i,t} + s_6 OBOND_{i,t} + \varepsilon_{i,t}, \quad (3)$$

where all asset variables are divided by total assets, and W_t is a time dummy variable that is equal to one for year t (t=2,...,T) and zero otherwise. We included time dummy variables in the empirical specification to control for possible correlation across time. We excluded one asset variable (OASSET) to avoid perfect multicollinearity; hence, one should interpret the coefficients on the individual asset variables as the impact of switching funds from cash plus policy loans into the particular asset category.

Estimation of equation (3) for a cross-sectional time series sample of life companies can provide a test of the relation between asset mix variables and LIC risk as reflected in the volatility of LIC equity returns. This measure of LIC risk, however, is imperfect because the criterion of volatility of equity returns could cause an LIC to be judged more risky than another LIC even if the former has more capital in every state of the world. An alternative is a risk measure employed by Boyd and Graham (1986), Wall (1987), and Brewer (1989). This measure, referred to as Z-score, represents the probability that losses (negative profits) will

exceed equity. For each LIC, z values, defined as $[(-1-\mu_E)/\sigma_E]$, where μ_E is the mean weekly stock return in a given period and σ_E is its standard deviation, are computed. Assuming the return on equity is a normal random variable, it can be shown that z is its standard normal variate, representing how far, in standard deviations, the rate of return would have to fall below its expected value for the LIC to fail. To be consistent with other studies that have used this measure of risk, we use the negative of z and denote it as Z-score. The advantage of this risk measure is that Z-score ($Z_{i,t}$) takes account of each LIC's equity and expected rate of return. A version of equation (3) was estimated by using $Z_{i,t}$ as the dependent variable. Since higher Z-scores indicate lower risk, the coefficients in this equation are expected to have signs opposite to those in the equation in which the risk measure $\sigma_{i,t}$ is the dependent variable.

A third approach to obtaining a measure of risk is to estimate the probability of failure using the square of the $Z_{i,t}$ values for each LIC. It can be shown by Chebychev's theorem that for any symmetric distribution with a finite variance, the probability of failure, PROB, will be such that:

$$PROB \leq \frac{\sigma_E^2}{(1+\mu_E)^2}. \qquad (4)$$

We employ the equality in equation (4), along with estimates of σ_E and μ_E, to obtain estimates of the probability of failure for each LIC. Equation (3) was estimated with the risk measure $PROB_{i,t}$ rather than $\sigma_{i,t}$ as the dependent variable to provide a check on the robustness of our results attained by using the first two risk measures.

B. Data Sources and Estimation Procedure

The data used in this paper are for 44 life insurance corporations whose stocks were traded on the New York Stock Exchange, American Stock Exchange, or over the counter and who filed annual reports of condition for each year from 1986 to 1990. Stock market data are from Interactive Data Services, Inc. For multiple LIC holding companies, the assets of individual LIC subsidiaries are consolidated using reports of condition to construct the balance sheet variables discussed below.

To obtain our measures of risk, we use weekly stock market data. For each year in the sample period, estimates of the standard deviation of the weekly returns on an LIC's equity were computed using data covering the twelve month period of each year. The second risk measure, $Z_{i,t}$, is obtained by dividing one plus the average rate of return on equity by the standard deviation of the rate of return. Finally, the risk measure $PROB_{i,t}$ is estimated by calculating the reciprocal of the square of the $Z_{i,t}$ values. The market value of equity is calculated by multiplying the number of shares outstanding at the end of each year by the price of the LIC's equity at the end of the year.

The asset-capital ratio (LEV) is calculated as the ratio of total book value of invested assets to the market value of capital. The variables JUNK, MORT, DIRECT, OBOND, and STOCK represent book values of junk bonds, mortgage loans, real estate direct investments, other bonds, and corporate stock holdings, respectively.[11] All asset variables were divided by the book value of total assets. Equation (3) was estimated for a pooled cross-section, time series sample of LICs from 1986 through 1990. Time dummy variables, DUM86-DUM89, are specified in each version of equation (3) to control for the effects of risk of changes in time-specific factors that are not captured by our other independent variables.[12]

Selected financial characteristics of the 44 stock LICs at the end of 1990 are presented in Table 2. The sampled companies held about 22 percent of industry assets and had a book value capital-asset ratio of 8.2 percent. They held a greater proportion of their assets in mortgage loans and other bonds and financed a greater proportion of their assets with GICs than the industry.

C. Empirical Results

Results from estimating equation (3) using ordinary least squares are reported in Table 5. The estimated values of the parameters represent their cross-sectional average values. In Table 5, the first set of equations shows the results of tests in which the risk measure $\sigma_{i,t}$ is the dependent variable.[13] The second set of equations presents the results of tests with $Z_{i,t}$ as the dependent variable. Finally, the last three equations show the results of tests with the risk measure $PROB_{i,t}$ as the dependent variable.

The results with $\sigma_{i,t}$ as the dependent variable indicate a significant positive relationship between LIC risk and the asset-capital ratio, verifying that greater stock return volatility is associated with increased financial leverage. The coefficients on JUNK and OBOND are positive and statistically significant. In equation (2) of Table 5, MORT, DIRECT, and STOCK are not significantly correlated with $\sigma_{i,t}$. The coefficients on the time dummy variables indicate that LIC risk rose in 1987, fell in 1988, was unchanged in 1989, and rose in 1990.

Equations (4) and (5) present results of tests with the risk measure $Z_{i,t}$ as the dependent variable. Because $Z_{i,t}$ is an indicator of the probability of failure, it is a different measure of risk than $\sigma_{i,t}$. These results suggest a negative correlation between $Z_{i,t}$ and JUNK and OBOND. Since higher values of $Z_{i,t}$ signal a lower probability of failure, the implications are the same as the $\sigma_{i,t}$ test: higher risk is associated with greater LIC holdings of junk and other bonds. The coefficients of MORT and STOCK are positive and are now statistically significant from zero. Lower risk is associated with greater LIC holdings of mortgage loans and stocks. The time dummy variables exhibit the same qualitative patterns as those found in the $\sigma_{i,t}$ equations.

When $PROB_{i,t}$ is used as the dependent variable, in equations (7) and (8) of Table 5, the results are somewhat weaker than those of $\sigma_{i,t}$. In both equations, LEV, JUNK, and the time dummy variables have the same qualitative effects as those found in equations (1) and (2) of the table. However, there is no evidence of an association between LIC risk and OBOND.

The evidence provided with respect to the impact of asset mix variables on LIC risk is mixed. Regression results using two measures of risk indicate a significant positive relationship between JUNK and OBOND and risk, but the results using the third measure of risk show only a positive relationship between JUNK and risk. These results are consistent with the notion that junk bond investments are risk increasing. Holding leverage constant, there is little evidence of a consistent positive relationship between LIC risk and MORT, DIRECT, or STOCK.

We also examined whether states' policy on granting tax credits for guaranty fund assessments affected the relationship between asset mix variables and LIC risk. Since shareholders would bear the risk of unexpected assessments in states without tax offsets, we

expect changes in asset mix to have a greater impact on market risk for companies that do most of their business in these states. We test this hypothesis by interacting the asset mix variables with a dummy variable, DUM, that equals one for LICs with 20 percent or more of their premium income from states without premium tax offset and zero otherwise.[14] The results are presented in equations (3), (6), and (9) of Table 5. In the stock return volatility and PROB equations, only the coefficient of (JUNK)(DUM) is significantly different from zero. In the equation using $Z_{i,t}$ as the measure of risk, none of the interactive terms is significant. The stock return volatility and PROB of LICs with 20 percent or more of their premium income from states without premium tax offsets tend to be more positively related to junk bond holdings than the return volatility and PROB of other LICs. Many of the recent LIC failures have been associated with high junk bond exposure and occurred in states without premium tax offsets.

Thus, firms with large holdings of junk bonds appear to have greater stock return volatility. Consistent with the findings of Brickley and James (1986), we find that access to government subsidies (e.g. premium tax offsets) tends to affect firm common stock returns. Because firms in no premium tax offset states are not insulated from the financial impact of an LIC failure, changes in junk bond holdings will be reflected more fully in changes in stock return volatility than firms that have access to premium tax offsets. An F-test was used to determine if the estimated coefficients for LICs in states with no premium tax offset were significantly different from those of LICs in states with a premium tax offset. In the $\sigma_{i,t}$ and $PROB_{i,t}$ equations, the null hypothesis that all asset mix coefficients are equal for the two groups can be rejected at the 10 percent level ($F_{5,199} = 2.12$ and $F_{5,199} = 12.02$, respectively).

VI. CONCLUSION

Recent failures of several large insurance companies have raised questions about the overall risk exposure of the industry. Our analysis leads us to a number of conclusions. First, the industry's overall risk exposure appears to have increased in the 1980s. Second, LICs with lower capital ratios have higher concentrations of junk bonds and commercial real estate than do well-

capitalized LICs. Third, our empirical results show that stock market risk is positively related to increases in both financial leverage and holdings of riskier assets such as junk bonds.

The case studies of seven large 1991 failures raise concerns about the incentive effects of the guaranty funds on risk taking. Five of the failures resulted from rapid asset growth, low capital, and excessive investment in junk bonds. Protecting policyholders from the effects of insurance insolvencies may be worthwhile, but it may lead to increased risk taking. Many guaranty funds are financed mostly by state taxpayers through premium tax offsets or by policyholders through premium surcharges. Of the seven large 1991 failures discussed in this study, five were in states that permitted little, if any, premium tax offset.

The empirical results show that the lack of premium tax offsets dampens the relationship between high junk bond exposure and stock market risk. We believe that this is occurring because premium tax offsets shift the risk of unexpected ex post assessments from shareholders of risky firms to taxpayers because LICs do not bear the full cost of these assessments.

Guaranty funds essentially provide insurance for policyholders in the event of an insolvency. LICs can benefit from these guarantees because their products become more attractive to their customers. Thus, LICs should pay for the access to these guarantees. Currently, LIC premiums are a fixed proportion of premium income and are assessed ex post, independent of asset risk. As in the S&L crisis, this policy could lead to greater risk taking by LICs. To reduce potential moral hazard problems, ex ante risk based premiums should be collected from all participating companies. Life companies should not be allowed to receive a tax credit for these premiums; insurance is an expense of doing business. By making guaranty fund premiums risk based, control over LIC risk taking may be improved. Finally, the amount of capital an LIC holds should be made dependent on the overall riskiness of its operations.

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FOOTNOTES

[1]The term life insurance companies (LICs) is used throughout to refer to firms that are classified as life and/or life-health insurance companies.

[2]For a discussion of incentive effects of deposit insurance, see Kane (1989), Barth (1992), Barth, Bartholomew, and Labich (1989), Brumbaugh (1988), Brewer and Mondschean (1993), among others.

[3]According to Kopcke and Randall (1991), LICs held about one-half of the outstanding corporate bonds during the 1960s. This share has declined to one-third in a recent five year period. Over the past 30 years, LICs have held approximately 30 percent of all commercial mortgages, but their shares of residential mortgage loans have declined.

[4]See Cary, Prowse, Rea, and Udell (1992) for a discussion of life companies' participation in the private placement market.

[5]Cabanilla (1992) discusses the role of life companies in the commercial real estate market.

[6]Life insurance companies are not required to separate corporate and mortgage-backed securities in the summary tables of balance sheet data filed with state insurance commissioners, so it is not possible for us to separate these two classes of debt in the tables.

[7]Separate accounts are defined as groups of assets in which the investment risk is borne by the policyholder, and the insurer's guarantee is limited to mortality and expense charges [see Saunders (1986)].

[8]See Lang and Stulz (1992) for an excellent discussion of the contagion effects of bankruptcy announcements. Fenn and Cole (1992) analyzes the impact of policyholder behavior on the market value of insurance companies in the event of an insolvency.

[9] Harrington (1991) makes this point for property/casualty companies, which also benefit from state guaranty fund coverage.

[10]OASSET also includes a small but unknown amount of collateralized loans and other investment assets.

[11]With the exception of corporate stock holdings, all asset categories are reported at book values. Corporate stock holdings which include preferred stocks and common stocks are recorded at market values. However, Saunders (1986) indicated that preferred stocks on which dividends have been paid for the past three years are carried at cost, while others are carried at market value. All common stocks are reported at market values.

[12]For a discussion of the existence of "other effects" see Balestra and Nerlove (1966).

[13]Equation (2) was also estimated with each asset mix variable entering separately. The results indicate a positive and significant association between risk and JUNK and risk and OBOND, while they indicate a negative and significant association between risk and MORT and risk and STOCK. The results indicate a marginally significant correlation between risk and DIRECT.

[14]Alternatively, the dummy variable was defined to divide the sample into two groups using 10 and 30 percent of premium income from states without premium tax offset. The results of these tests were qualitatively similar to those reported.

TABLE 1
Balance Sheet of Life Insurance Companies, Selected Years, 1970-1991
(Percent)

Assets[a]	1970	1980	1990	1991
Government securities	5.3	6.9	15.0	17.4
U.S.	2.2	3.5	13.1	15.6
State, local, and foreign	3.1	3.3	1.9	1.8
Corporate securities	42.7	47.4	50.5	50.8
Bonds	35.3	37.5	41.4	40.2
Stock[b]	7.4	9.9	9.1	10.6
Mortgage loans	35.9	27.4	19.2	17.1
Real estate	3.0	3.1	3.1	3.0
Policy loans	7.8	8.6	4.4	4.3
Other assets[c]	5.3	6.6	7.8	7.4
Total assets (billions of dollars)	$207.2	$479.2	$1408.2	$1551.2
Liabilities and net worth				
Policy reserves				
Life insurance, total	55.7	41.3	24.8	24.0
Individual				
Ordinary	48.3	36.6	22.8	22.2
Industrial	5.9	2.6	0.9	0.8
Group[d]	1.5	2.1	1.1	1.1
Annuities, total	23.5	37.8	57.8	57.6
Group	16.4	29.3	36.6	35.3
Industrial[e]	7.1	8.5	21.2	22.3
Health insurance	1.7	2.3	2.4	2.5
Total policy reserves	81.0	81.4	85.0	84.1
Other liabilities[f]	9.6	10.0	7.5	7.8
Net worth[g]	9.4	8.5	7.5	8.0

[a]These data include assets in separate accounts.
[b]Market value.
[c]Includes cash, due and deferred premiums, due and accrued investment income, and other items.
[d]Includes reserves for credit life.
[e]Includes reserves for individual annuities and supplementary contracts with and without life contingencies.
[f]Includes policy dividend accumulation, funds set aside for policy dividends, and other items.
[g]Includes capital, surplus funds, and mandatory securities valuation reserves. Adapted from Curry and Warshawsky (1986).
Source: American Council of Life Insurance. Numbers may not add to totals due to rounding.

TABLE 2
Financial Characteristics of Life Insurance Companies as of December 31, 1990
(percent of total general account assets)

Net worth category	Proportion of industry	Mortgage loans	Junk bonds	Other bonds	Equity investments	Real estate direct investments	Policy loans	Other assets	Guarantee investment contracts	ROA	ROE[a]
BVA[b] ≤ 0	0.1	15.7	25.6	29.5	4.4	7.1	5.6	12.6	0.0	-5.00	-
$0 < BVA \leq 3$	5.7	21.7	9.5	58.6	1.3	1.1	2.4	5.2	17.1	0.07	2.9
$3 < BVA \leq 6$	63.6	24.7	7.7	49.0	3.9	3.0	5.1	6.5	11.1	0.51	11.3
$6 < BVA \leq 9$	13.4	21.6	4.7	54.7	3.0	2.2	6.5	7.3	14.6	0.68	9.9
$9 < BVA \leq 12$	4.5	12.1	4.8	56.7	7.1	1.5	5.0	12.7	6.1	2.17	20.8
$12 < BVA \leq 15$	3.6	13.3	3.4	63.7	5.6	0.9	5.9	7.2	0.0	2.03	15.9
$BVA > 15$	9.1	7.9	2.5	56.7	15.7	2.0	3.8	11.5	0.5	4.54	15.4
Industry		21.6	6.6	51.9	4.9	2.6	5.0	7.4	10.3	1.00	13.2
					44 Publicly traded life insurance companies						
	21.6	23.6	6.0	54.0	4.9	1.8	3.0	6.7	12.9	1.64	20.0

[a]Net income as a percent of net worth.
[b]Book value net worth-total asset ratio.
Source: National Association of Insurance Commissioners (NAIC) Database of Annual Statements.

TABLE 3
Characteristics of Insolvent Insurance Companies
(Percent)

	Growth in total assets		1990			
	1980-85	1985-90	General account assets (millions of dollars)	Net worth-total asset ratio	Ratio to junk bonds of net worth[a]	Ratio to junk bonds of net worth + MSVR[b]
Executive Life (California)	823.45	81.63	$ 10,167	4.66	7.44	8.29
Executive Life (New York)	922.29	34.49	3,172	5.82	9.10	10.41
Fidelity Bankers Life (Virginia)	34.39	1,683.45	4,069	3.00	8.12	11.72
First Capital Life (California)	675.17	135.13	4,035	2.66	6.69	11.26
Guarantee Security Life (Florida)	5,519.37	85.23	686	4.48	7.38	11.00
Monarch Life (Massachusetts)	35.17	12.98	851	11.70	107.01	115.82
Mutual Benefit Life (New Jersey)	58.73	41.28	13,006	3.38	108.81	138.89
Industry	66.38	69.20	$1,248,386	7.32	107.21	124.50

[a]Net worth includes surplus.
[b]MSVR refers to mandatory security valuation reserve.
Sources: Best's Insurance Reports, NAIC database, and the 1991 American Council of Life Insurance Fact Book Update.

TABLE 4
Basic Provisions of State Life/Health Guaranty Funds

State	Coverage	GICs	Effective date	Max annual assessments	Premium tax offset
Alabama	0	S	1/1/83	2%	none
Alaska	1	Y	5/16/90	2%	20% for 5 years
Arizona	1	S	8/27/77	2%	20% for 5 years
Arkansas	1	Y	3/9/89	1%	recoup from policy surcharge
California	1	N	1/1/91	1%	none
Colorado	1	N	6/1/91	1%	20% for 3 yrs. 7.5% for 2 yrs. for life and annuity, for health recoup from policy surcharge
Connecticut	1	Y	10/1/72	2%	20% for 5 years
Delaware	1	Y	7/23/82	2%	20% for 5 years
District of Columbia	1	S	7/22/92	2%	10% for 10 years
Florida	1	S	10/1/79	1%	.1% per year
Georgia	1	Y	7/1/81	2%	20% for 5 years
Hawaii	1	N	7/1/88	2%	20% for 5 years
Idaho	1	N	6/1/77	2%	100% in 1 of the following 5 years
Illinois	1	Y	1/1/86	2%	20% for 5 years
Indiana	1	Y	7/1/78	2%	20% per year or recoup from policy surcharge
Iowa	1	Y	7/1/87	2%	20% for 5 years
Kansas	1	N	7/1/82	2%	20% for 5 years
Kentucky	1	N	6/17/78	2%	20% for 5 years
Louisiana	1	N	9/30/91	2%	20% for 5 years
Maine	1	S	7/25/84	2%	recoup from policy surcharge
Maryland	1	S	7/1/71	2%	none
Massachusetts	1	N	4/3/86	2%	10% for 5 years
Michigan	1	Y	5/1/82	2%	amount varies according to a formula
Minnesota	1	Y	5/27/77	2%	none
Mississippi	1	Y	4/9/85	2%	25% for 2 years
Missouri	1	N	8/13/88	2%	20% for 5 years

TABLE 4 (cont'd)

State	Coverage	GICS	Effective date	Max annual assessments	Premium tax offset
Montana	1	S	7/1/74	2%	20% for five years
Nebraska	1	S	8/24/75	2%	20% for 5 years
Nevada	1	N	7/1/73	2%	20% for 5 years
New Hampshire	0	S	6/25/79	4%	none
New Jersey	1	Y	1/1/91	2%	10% for 5 years
New Mexico	0	S	4/9/75	2%	none
New York	1	Y	8/2/85	2%	80% when aggregate assessments for all insurers exceeds $100 million
North Carolina	1	Y	4/13/74	2%	20% for 5 years
North Dakota	1	Y	7/1/83	2%	20% for 5 years
Ohio	1	Y	9/14/88	2%	20% for 5 years
Oklahoma	1	N	9/1/81	2%	20% for 5 years
Oregon	1	N	9/13/75	2%	20% for 5 years
Pennsylvania	0	S	1/25/79	2%	20% for 5 years
Rhode Island	1	S	6/20/85	3%	10% for 5 years
South Carolina	0	S	7/14/72	4%	20% for 5 years
South Dakota	1	N	7/1/89	2%	20% for 5 years
Tennessee	1	N	7/1/89	2%	10% for 10 yrs. or .1% of premium written, whichever is less
Texas	1	Y	9/27/73	1%	10% for 10 years
Utah	1	Y	7/1/86	2%	20% for 5 years
Vermont	0	S	4/27/72	2%	20% for 5 years
Virginia	1	N	7/1/76	2%	.05% for 5 years
Washington	1	Y	5/21/71	2%	20% for 5 years
West Virginia	1	S	6/21/77	2%	none
Wisconsin	1	S	8/22/69	2%	20% for 5 yrs. if can't recoup through policy rates
Wyoming	1	S	7/1/90	2%	10% for 10 years

0=All policyholders S=SILENT N=NO
1=Residents only Y=YES
Source: National Organization of Life and Health Guaranty Associations.

TABLE 5
The Impact of Financial Leverage and Asset Mix on Life Insurance Company Risk
(Pooled Cross-Section Time Series Results for 1986-1990)

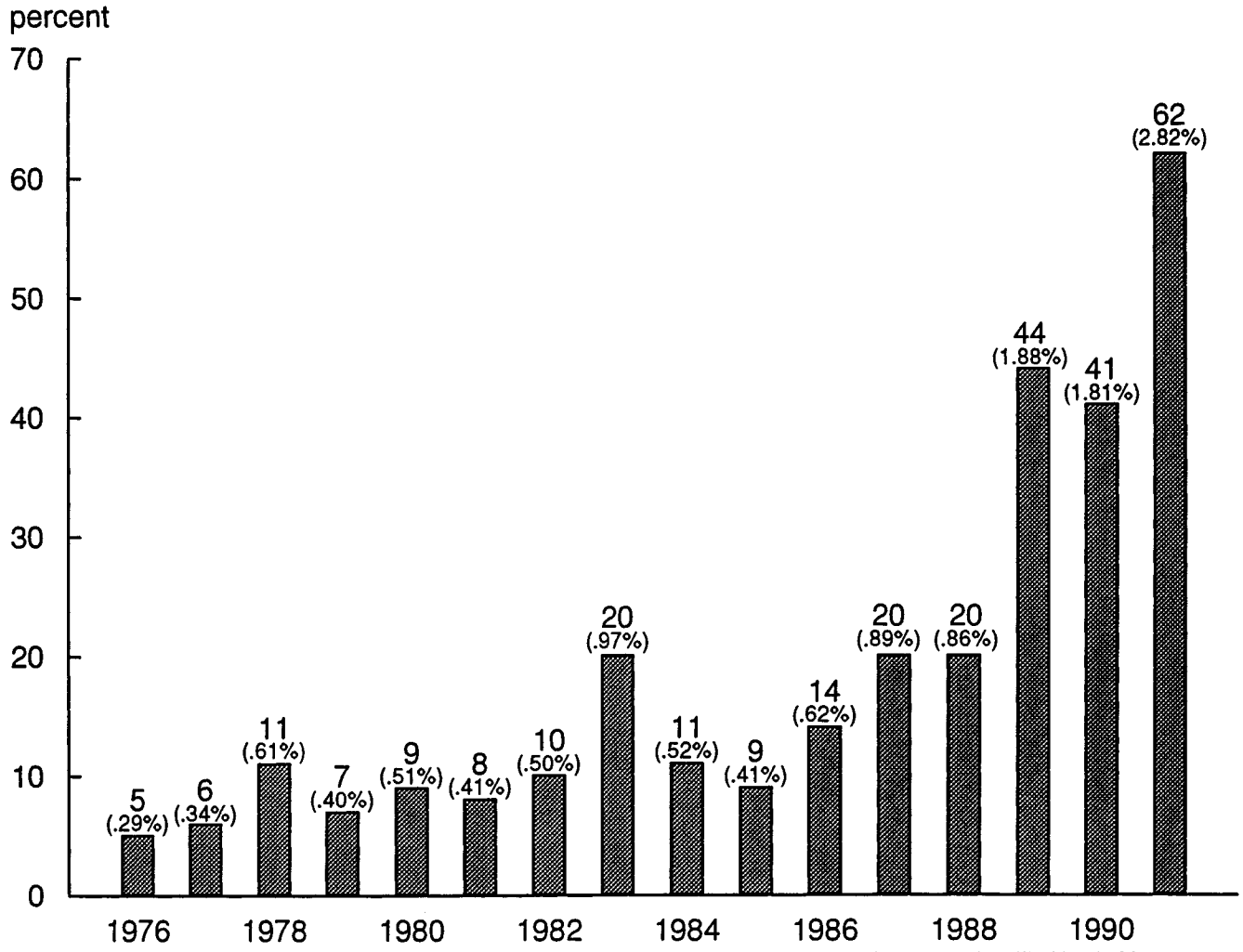
Equation	Dependent Variable	Intercept	LEV	JUNK	MORT	DIRECT	STOCK	OBOND	DUM	(JUNK)(DUM)	(MORT)(DUM)
(1)	σ	4.6643 (13.83)***	0.0286 (7.43)***	8.6163 (5.64)***	--	--	--	--	--		
(2)	σ	2.4269 (1.56)	0.0263 (7.48)***	8.5416 (4.18)***	-2.6081 (-1.50)	8.0069 (1.31)	-3.2042 (-1.17)	4.4254 (2.58)***			
(3)	σ	-0.3131 (-0.14)	0.0145 (3.03)***	9.2055 (3.81)***	-0.0571 (-0.02)	9.6337 (1.47)	-0.5063 (-0.15)	7.8054 (3.14)***	2.9541 (1.18)	0.0397 (3.20)***	-2.4712 (-0.55)
(4)	Z	26.0371 (15.08)***	-0.0605 (-3.07)***	-30.5363 (-3.90)***	--	--	--	--	--	--	--
(5)	Z	35.1637 (4.57)***	-0.0442 (-2.54)***	-26.7556 (-2.65)***	14.1143 (1.64)*	-22.5754 (-0.75)	34.6522 (2.56)**	-22.1328 (-2.61)***			
(6)	Z	44.0501 (3.96)***	-0.0429 (-1.78)*	-35.5925 (-2.91)***	5.1386 (0.45)	-33.2300 (-1.00)	23.5076 (1.39)	-31.0212 (2.47)**	-10.9742 (-0.87)	0.0233 (0.37)	11.9362 (0.52)
(7)	PROB	0.2559 (4.53)***	0.0066 (10.27)***	1.4277 (5.57)***	--	--	--	--	--	--	--
(8)	PROB	0.1068 (0.38)	0.0065 (10.12)***	1.4025 (3.75)***	-0.3156 (-0.99)	1.2188 (1.09)	-0.0906 (-0.18)	0.2943 (0.94)	--	--	--
(9)	PROB	-0.4497 (-1.22)	0.0022 (2.82)***	1.1919 (2.96)***	1.6500 (0.43)	1.2400 (1.14)	0.2442 (0.44)	1.088 (2.68)***	0.5276 (1.26)	0.0160 (7.73)***	-0.2774 (-0.37)

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

TABLE 5 (continued)
The Impact of Financial Leverage and Asset Mix on Life Insurance Company Risk
(Pooled Cross-Section Time Series Results for 1986-1990)

Equation	Dependent Variable	(DIRECT)(DUM)	(STOCK)(DUM)	(OBOND)(DUM)	DUM86	DUM87	DUM88	DUM89	$\bar{R}^2$	N
(1)	σ	--	--	--	-0.9688 (-2.13)**	-0.0023 (-0.01)	-1.2536 (-2.83)***	-1.2430 (-2.80)***	0.4247	216
(2)	σ	--			-0.5570 (-1.34)	0.2831 (0.70)	-1.1890 (-2.97)***	-1.2601 (-3.14)***	0.5306	216
(3)	σ	-14.1972 (-0.38)	-0.3276 (-0.04)	-2.0927 (-0.66)	-0.5021 (-1.23)	0.3046 (0.77)	-1.2144 (-3.105)***	-1.3303 (-3.39)***	0.5540	216
(4)	Z	--	--	--	1.7440 (0.75)	-3.2875 (-1.45)	4.7911 (2.11)**	6.8519 (3.01)***	0.2236	216
(5)	Z	--			-0.8760 (-0.43)	-4.9948 (-2.50)**	4.3327 (2.19)**	6.9384 (3.49)***	0.4087	216
(6)	Z	31.7707 (0.17)	-0.5115 (-0.12)	6.7868 (0.42)	-0.8393 (-0.41)	-4.7862 (-2.39)**	4.5305 (2.29)**	7.1598 (3.62)***	0.4145	216
(7)	PROB	--	--	--	-1.8037 (-2.37)**	-0.8422 (-1.13)	-2.0029 (-2.70)***	-1.8081 (-2.43)**	0.5141	216
(8)	PROB				-0.1548 (-2.04)**	-0.0652 (-0.88)	-0.1970 (-2.69)***	-0.1815 (-2.47)**	0.5280	216
(9)	PROB	-4.0852 (-0.66)	0.3663 (0.26)	-0.5265 (-0.99)	-0.1320 (-1.95)*	-0.0458 (-0.69)	-0.1946 (-2.99)***	-0.1952 (-2.99)***	0.6275	216

FIGURE 1
Number of Financially Impaired Life Insurance Companies (1976-91)



The numbers in parentheses are the percentages of the life insurance companies that were classified by A. M. Best Company as financially impaired companies.

SOURCES: A. M. Best Company (1992) and American Council of Life Insurance.