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The Role of Monitoring in Reducing the Moral Hazard Problem Associated with Government Guarantees: Evidence from the Life Insurance Industry

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The Role of Monitoring in Reducing the Moral Hazard Problem Associated with Government Guarantees: Evidence from the Life Insurance Industry [1]

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Abstract: State guaranty funds provide partial protection to life insurance holders in the event of an insolvency, thus creating a moral hazard problem akin to the one associated with deposit insurance in the banking industry. We find that differences across states in the financing of these government guaranty systems affects risk taking by life insurance companies (LICs). In states where taxpayers do not pay for the costs of resolving insolvencies, LICs hold portfolios with lower overall stock market risk. These portfolios, however, are characterized by higher levels of both capital and risky assets. These empirical findings have policy implications for improving monitoring of financial intermediaries receiving government liability guarantees. We also examine the effects of franchise value, size and ownership structure on portfolio risk. We find that larger LICs and LICs with more franchise value take less risk. We also find that risk decreases with insider holdings until insiders own about 25 percent of the firm and increases thereafter.

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The Role of Monitoring in Reducing the Moral Hazard Problem Associated with Government Guarantees: Evidence from the Life Insurance Industry

One of the consequences of the large number of costly financial institution failures in recent years has been a reassessment of the impact of government guarantees on risk taking behavior. It has been demonstrated both theoretically and empirically that deposit insurance for commercial banks and savings and loan associations (S&Ls) creates a moral hazard problem by shielding creditors from the consequences of risk taking.[1] As a result, banks and thrifts have a greater desired level of risk than they would otherwise have in the absence of deposit insurance. Harrington (1991) raises the concern that the government guarantees of insurance company liabilities may lead to similar problems.

This paper studies the determinants of portfolio risk and its components (leverage and asset risk) for a sample of publicly-traded stock life insurance companies (LICs) with these incentive problems in mind.[2] Our study extends the literature in a number of ways. First, we construct a novel data set by combining LIC stock market data with accounting information from the Statutory Reports of Condition filed with the state insurance commissions. We use these data to relate both stock market and balance sheet measures of risk to firm characteristics in order to explain cross-sectional differences in risk taking. Second, we identify how the moral hazard problem stemming from the presence of government guarantees of LIC liabilities has been contained. Although there exists no federal program protecting life insurance policyholders from insolvencies, individual states have established guaranty funds. Given that state insurance guaranty funds create incentives for LICs to increase risk, we ask how regulatory policies and the financing of the guaranty funds have limited these incentives.[3]

Financial theory suggests that changes in asset mix or financial leverage should influence the value of equity. Because shareholders hold residual claims on earnings, their interests often diverge from those of other stakeholders. Limited liability provides shareholders with the incentive to invest in risky assets. If the risky investments pay off, shareholders keep all the gains; if losses are incurred, they are shared with other stakeholders. While shareholders have incentives to increase risk and leverage, however, there are offsetting factors which weigh against these incentives. In an unregulated environment, bondholders enforce covenants which limit management's ability to increase risk and facilitate a transfer of wealth from the bondholders to the shareholders. In the case of the life insurance industry, where the bulk of liabilities are in the form of life insurance policy and annuity reserves, regulators restrict risk taking behavior by enforcing capital adequacy standards and limiting the kinds of assets that may be held.

Beyond regulatory discipline, we find evidence consistent with the idea that larger LICs hold less risk, that LICs whose management hold a larger share of the firm take less risk, and that LICs with greater franchise value take less risk. Each of these results is consistent with recent evidence from the banking industry. For instance, Saunders, Strock and Travlos (1990) find that firm-specific risk increases with the concentrations of ownership by insiders at bank holding companies. In contrast, however, note that Gorton and Rosen (1995) find that balance sheet measures of risk decline with management holdings. Our results appear consistent with the earlier Saunders, et al findings. Keeley (1990) and Acharya (1996) find that banks with higher franchise value are safer than banks with little or no franchise value, consistent with our findings for LICs. Demsetz and Strahan (1995) show that large bank holding companies are better

diversified than small and thus, ceteris paribus, less risky. We also interpret the negative relationship between size and LIC risk as a diversification effect.

Given the clear incentive problems associated with government guarantees, one important policy question that arises is how best to structure such guarantees to mitigate these problems. This paper provides new evidence that the financing of government guaranty systems can be an important determinant of risk taking behavior. In contrast to federal deposit insurance, the method used to pay for resolutions of failed LICs differs across states. Consequently, the life insurance industry provides a convenient laboratory in which to study how the financial structure of a government guarantee affects firm behavior.

Studies of state-administered deposit insurance systems of the nineteenth and early twentieth centuries have shown that their success depended on precisely how the member banks paid for the insurance. For example, Calomiris (1989) found that systems of mutual liability, self-regulating deposit insurance in the pre-Civil War era were successful in dealing with financial panics. In these systems, surviving member banks were responsible for paying off depositors of failed institutions. Calomiris contrasts their success with the state deposit insurance systems of the 1914-1929 era, which led member banks to engage in excessive risk taking and rapid growth. These later systems failed because banks had little incentive to monitor the behavior of other member banks, with deposit insurance giving each institution an incentive to increase risk.

A more recent use of mutual liability, self-regulating guaranty systems can be found in exchange clearinghouses. A clearinghouse serves as a guarantor to member firms' trades to mitigate credit risk exposure. Clearing associations have an incentive to monitor the insolvency

risk of members because losses can be pro-rated among other clearinghouse members [Baer and Evanoff (1990) and Rutz (1989)]. However, by ceding the monitoring function to the clearinghouse, the individual firms do not have the same incentive to monitor as they would if there were no clearinghouse. Thus, even in a market with a clearinghouse overseeing activity, the sharing of insolvency costs tends to encourage risk taking and provides incentives to use the system for subsidies or transfers between the members.

In a similar vein, we examine which methods used to finance state guaranty funds are most successful in promoting financially stable LICs. These funds are currently financed by *ex post* assessments made on surviving LICs operating in the individual states where a failure has occurred.[4] The cost of an insurance resolution is prorated based on the proportion of total premiums collected within the state by the remaining LICs. However, in 39 states the incentive to engage in industry self-monitoring is quite weak because LICs may *credit* these assessments against their state premium taxes. In a study of 1990 life-health guaranty fund assessment costs, Barrese and Nelson (1992) found that over 80 percent of the present discounted value of these assessments was borne by taxpayers because of federal and state tax offsets. In the other states, companies are permitted to add a premium surcharge but may not credit assessment costs against taxes. In these cases, profits of surviving LICs would decline if they are unable to pass all of the assessment costs onto existing policyholders.

The cross-sectional variation in the financing of the funds allows us to estimate whether the imposition of higher costs on survivors affects portfolio behavior. Our results indicate that in states where taxpayers pay for the majority of costs of resolving failed firms, LICs hold significantly more capital and more risky assets than do LICs operating in states without tax

offsets. The net effect of these portfolio changes is a reduction in overall risk. These findings are consistent with the performance of the early state deposit insurance funds.

The remainder of the paper is divided into three sections. Section one describes the proposed determinants of LIC portfolio risk and presents the hypotheses to be tested. Section two presents the model specification, describes the data sources and variables used in the analysis, and presents the results. Section three concludes.

I. The Determinants of LIC Risk

In this section, we describe the determinants of the choice of risk at LICs that we examine in our empirical analysis. We begin with the idea that limited liability gives equity holders an incentive to increase risk, both by increasing leverage and increasing portfolio risk.

In an unregulated environment, discipline from creditors provides the main offset to the incentive to increase risk stemming from limited liability. If creditors face increased costs associated with default when the firm increases leverage and/or portfolio risk, as they do in the absence of government guarantees, they will monitor the firm's performance and enforce restrictive covenants during periods of financial distress. In the life insurance industry, the incentive to perform this costly monitoring function is reduced by the presence of the state guaranty funds. Nevertheless, LIC creditors may still have some incentive to hold risk taking in check, both because they lack full confidence in or knowledge of the state guarantees and because the state guarantees provide less than complete protection for policyholders.

In fact, guaranty fund coverage does vary from state to state. In most states, policyholders are protected up to $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. Some states also cover unallocated annuities such as GICs up to a certain amount (usually $5 million). Even if policyholders are fully protected by the fund, the state can take several years to liquidate a failed company; hence, creditors may not have full access to their funds immediately. Policyholders can impose creditor discipline by taking out policy loans or surrendering the policies for their cash value. As a result, the LIC is not only constrained to keep risk and leverage at acceptable levels but also to maintain sufficient liquidity to meet potential cash demands from its customers.

LICs' propensity to engage in high-risk behavior is also likely limited by regulatory pressure, as Merton (1977) and Buser, Chen, and Kane (1981) noted for the banking industry. LICs with weak balance sheets may face greater regulatory scrutiny, increased audit frequency and limitations on asset holding powers, all of which impose costs on the firm. In theory, this mechanism prevents insured firms from exploiting the incentive to engage in excessively risky activities provided by government liability guarantees. However, the degree of regulatory scrutiny may vary across institutions. Ely and Weaver (1990) have shown that over the period 1981:1-1986:1 large commercial banks facing less regulatory pressure because they are presumably "too big to fail," do, in fact, take advantage of easier regulation by holding less capital.

In the insurance industry, the degree of regulatory scrutiny varies widely across firms. As summarized in Cummins (1988), insurance companies are monitored by both state regulators as well as the National Association of Insurance Commissioners (NAIC). In general, site audits by state insurance examiners are performed once every three to five years. However, the NAIC does

computerized audits of LICs on an annual basis, and companies that fail four or more of eleven audit ratio tests are subject to greater regulatory review. Nevertheless, the quality of examinations can vary due to the size and sophistication of the state insurance departments and the amount of resources a state government wishes to allocate to the supervision of insurance companies. Life insurance companies chartered to operate in the state of New York, for instance, face particularly stringent regulatory and capital adequacy requirements. In our empirical analysis, we consider whether the more stringent regulatory environment in New York reduces risk taking by firms operating there.

Beyond direct regulatory scrutiny, the incentive of life insurance companies to lobby successfully for less restrictive regulations or scrutiny may vary across states. As noted in the introduction, in some states surviving companies do not receive tax credits for assessments to the state guaranty fund following an insolvency. In these states, surviving LICs have a greater incentive to monitor and pressure regulators to take prompt corrective actions against companies likely to become insolvent. While the incentive to pursue a high risk strategy is unaffected by whether or not surviving firms or taxpayers pay for resolutions, when surviving LICs actually bear the cost of the insolvencies they will be more concerned with the financial health of other LICs in the state.

A third factor which will tend to offset LIC's tendency to increase risk is the firm's level of franchise value, defined as the present value of future profits that the firm can generate as a going concern. Better-run firms, for instance those with superior efficiency to their competitors, or older firms with longstanding customer relationship based on reputation, will tend to have more franchise value than newer, less efficient firms. Previous research on moral hazard in

banking has shown that franchise value works to mitigate banks' incentives to increase risk (see Marcus 1984, Keeley 1990, and Acharya 1996). In fact, some argue that the dramatic increase in risk taking, both at banks and thrifts, was the result of the secular decline in franchise value which began in the late 1960s and persisted throughout the 1980s.

Franchise value can act to reduce risk taking in two ways. First, like capital, franchise value gives equity holders a larger stake in the firm and thus more to lose if things go bad. To the extent that management acts to maximize shareholder value (rather than firm value), franchise value will thereby tend to reduce the incentive to increase risk. Franchise value may also act like a bankruptcy cost if much of its value is lost if the firm becomes bankrupt. Thus, even in a world where management acts to maximize total firm value, franchise value may lead to reduced risk taking by increasing bankruptcy costs.

The notion that franchise value may be lost in insolvency follows naturally in the banking industry, since banks often lend based on private information about borrower quality. Because of this private information, a large fraction of the bank's assets cannot be sold to third parties for their full value. Hence, much of the bank's franchise value could be lost in insolvency. Like banks, a large proportion of the typical insurance company's assets is not fully marketable. For instance, life insurance companies purchase 50 to 80 percent of newly-issued private placement debt (Carey, Prowse, Rea and Udell 1993). A secondary market in privately placed debt has only recently developed between institutional investors as a result of Rule 144A (adopted by the SEC in April 1990). Nevertheless, LICs still stand to lose some of their franchise value in insolvency; those with more franchise value have, in effect, higher bankruptcy costs.

Finally, the conflict between management and stockholders may affect the firm's willingness to bear risk, since risk averse management may rationally choose to hold a safer portfolio than that which maximizes firm value. Jensen and Meckling (1976) and others suggest that managers receive private benefits from control of the firm. Because managers have an undiversifiable stake in the firm that employs their human capital, they have an incentive to limit risk in order to protect their stake. Thus, the willingness of firms to invest in risky assets may be held in check by the concern of managers for their future employment.

Previous research has shown that firm performance is related to ownership of insiders, although that relationship may not be monotonic (Merck, Shleifer and Vishny 1988). At low levels of management holdings, increases in ownership increases management entrenchment, thus leading to lower firm value. In the context of risk taking, this suggests that increases in management holdings will reduce risk over this range. At higher levels, increases in management holdings tend to facilitate alignment between the interests of shareholders and management. So, we expect increases in management holdings over this range to increase LIC risk.

II. The Impact of Firm-Specific factors on LIC Risk

A. Model Description and Data Sources

Dependent Variables

This section develops the empirical framework used to test how management's selection of portfolio risk is affected by the existence of policyholder guarantees and other variables. We estimate a reduced form regression which relates the level of risk to a set of predetermined

variables thought to affect the firm's choice of risk. Our primary measure of risk is the standard deviation of the daily stock return. This is an "all-in" concept of risk which incorporates risks associated with all of the firm's assets, liabilities and off-balance sheet positions and reflects any diversification across those positions. In addition, stock market volatility reflects firm leverage. That is, firms with greater leverage generally have more volatile stocks since a given degree of portfolio risk has a greater effect on equity values for firms with greater leverage.

We also explore the determinants of two balance sheet measures of risk, the capital-asset ratio as a measure of leverage and the ratio of junk bonds to total bonds as a measure of asset quality. The latter variable serves this purpose because junk bonds are the riskiest component of the typical insurance company's assets and bonds themselves account for the bulk of LIC assets (about 60 percent in our sample).

Explanatory Variables

Following the discussion in Section I, we include variables to control for the effects of the financial structure of the state guaranty funds, for the effects of franchise value, and for the effects of ownership structure on the firm's choice of risk. To test for the effects of the way the state guaranty funds are financed, we include the proportion of premium income from states that do not permit LICs to credit guaranty fund assessments against state premium taxes. Ideally, one would compare the risk choices of LICs operating only in states with tax offsets with those choices for LICs operating strictly in states without offsets, but most of the LICs in our sample operate in multiple states. As noted above, we expect that LICs receiving a greater share of premium income in states without tax offsets will choose to operate with lower total risk.

As a measure of franchise value, we include the ratio of the book value of equity to the

market value of equity. This variable will decline with LIC franchise value. We use the book-to-market ratio (rather than its inverse) since market capital is always positive. This variable, of course, is only a proxy for franchise value. In fact, when LICs become severely financially distressed the market value of equity will reflect, in large part, the option value of the government guarantee of life insurance products. Note, however, that this problem will tend to generate a downward bias on the coefficient associated with franchise value since the value of government guarantees (and thus the market value of equity) will be greater at riskier firms. This bias works in our favor since we expect to observe a positive coefficient on the book-to- market ratio. In addition, we have tried to control for this problem by including an indicator variable equal to one for LICs which failed during the sample period.

To control for the effects of agency problems associated with the separation of ownership and control, we include the percent of stock owned by managers and directors. We also include the square of insider holdings. As noted, previous researchers have found that at low levels of insider holdings, increases in the percent of stock owned by management worsens performance (e.g. Tobin's Q), presumably because such increases in insider holdings help entrench management. At higher levels, increases in insider holdings tend to improve performance as managers' incentives become better aligned with those of shareholders. Thus, we expect LIC risk taking to decline with insider holdings in the entrenchment region and then to increase with insider holdings in the alignment region.

Following Cummins and Sommer (forthcoming), we also include a series of other control variables in the model. We add the log of total assets and the number of states in which the LIC operates to control for diversification effects. We include an indicator equal to one for LICs

operating the New York state, an indicator for LICs using independent agents to market their life insurance policies and an indicator for whether life insurance holding companies have multiple life insurance subsidiaries.

Data Sources

The model was estimated on a sample of 59 publicly-traded insurance companies specializing in life insurance (greater than 60% of their assets) for each year for which all data were available from the end of 1986 to the end of 1991.[5] We have complete data for 344 out of a possible 354 firm-years. Stock market data for the 59 companies are from Interactive Data Services, Inc. A list of the corporations used in this study is presented in Table 1. Balance sheet variables are from the Statutory Reports of Condition that insurance companies are required to file with state regulators at the end of each year. For multiple LIC holding companies, we aggregate (sum) the assets and liabilities of individual subsidiaries. Our measure of insider holdings is based on Proxy Statements filed with the Securities and Exchange Commission. Note that we were only able to collect insider holdings for 305 out of the total 344 firm-years in our sample.

Regression Specification

We estimate the regression equations on the pooled time series/cross-section data set using ordinary least squares.[6] The volatility of daily stock returns is estimated separately for each firm during year ***t*** and regressed on variables measured as of the end of year ***t.*** We include a set of time fixed effects in all regressions to control for common shocks to risk across companies. These fixed effects control, for example, for changes in demand conditions in the industry as well as for changes in general economic conditions which could affect overall firm

risk and leverage. We also estimate the model with firm fixed effects to control for firm-specific factors not accounted for by the variables included in the model. Since some of our explanatory variables are time-invariant, we present the model based on all-in risk with and without firm fixed effects.

B. Results

The means and standard deviations of all of the variables in the model appear in Table 2. The average daily stock market volatility equals 0.028, or about 0.46 on an annualized basis. The capital-asset ratio averages a little more than 12 percent in our sample and about 7 percent of the average LIC's total bonds are less than investment grade (junk). The market to book ratio averages about 1.3, suggesting that during our sample period life insurance stock generally sold below book value. This is not surprising since our sample covers a period in which both the junk bond and commercial real estate markets faced severe downturns. Total assets average about $5 billion in our sample, ranging from $5 million to $47 billion. On average, about 16 percent of total premium income comes from states without tax offsets, although one LIC in our sample received as much as 97 percent of total premium income in these states. Finally, insider ownership averages a little over 10 percent.

The results of estimating the risk equation using stock return volatility as the dependent variable appear in Table 3. The first two columns report the results which exclude insider holdings. The last two columns report the results with insider holdings included in the model.

As reported in the first row, there is a robust, positive relationship between risk and the book-to-market ratio. As expected, firms with higher franchise value take less risk. This finding is consistent with studies of risk taking in banking and suggests that moral hazard problems are,

in part, contained when firms have more to lose in the event of insolvency (Marcus 1984, Keeley 1990 and Acharya 1996).[7] Also, we find some evidence that larger LICs are less risky than smaller ones, although this result does not hold up in the model with firm fixed effects.

The third row of Table 3 provides evidence that overall LIC risk is lower when firms face some of the costs associated with insolvencies by their competitors. In both of the models without firm fixed effects (i.e. with and without insider holdings), the coefficient associated with the proportion of premium income from states without tax offsets is negative and statistically significant at the one percent level. In fact, the coefficient in the first model suggests that a one standard deviation increase in the proportion of total premium income earned in states without tax offsets leads to a decrease in risk of about 0.003, or about 10 percent of the unconditional mean. In both of the models which include firm fixed effects, however, the coefficient, while still negative, is no longer statistically significant.

In columns three and four we find that insider holdings are statistically significantly related to LIC risk taking. The F-test on the joint significance of the linear and squared terms is statistically significant at the one percent level in both models. Moreover, the negative coefficient on the linear term and positive coefficient on the squared term indicates that risk falls with insider holdings up to some point and then rises thereafter. The inflection point occurs when insiders hold about 25 percent of the firm based on the model with firm fixed effects. This is consistent with Morck, Shleifer and Vishny (1988), who find a negative relation between insider holdings and Tobin's Q when insider holdings are between 5 percent and 25 percent, and then a positive relationship beyond 25 percent.[8]

Columns one and three of Table 3 present the results which include the structural control variables which do not vary over time (these two models do not include firm fixed effects). These results suggest, not surprisingly, that LICs which failed during the sample period exhibited higher stock market risk.[9] Interestingly, LICs whose products are distributed through independent agents display greater risk, suggesting perhaps that market discipline is reduced when policyholders rely on independent agents.[10] We find no evidence that LICs operating in New York display less risk, despite New York's more stringent regulation of the life insurance industry. Finally, LICs operating across more states exhibit less risk, presumably as a consequence of better diversification opportunities. As an alternative explanation, LICs operating in more states may face greater monitoring because they are regulated by more state insurance departments.

Table 4 presents the relationship between balance sheet measures of risk and the variables of interest in the model with firm fixed effects. The intent of this analysis is to understand how the determinants of overall risk affect the key components of risk, namely leverage and asset risk.

As shown, we find that firms with greater franchise value (i.e. firms with lower book-to-market equity ratios) hold fewer risky assets, although franchise value does not appear to influence leverage. By contrast, size is positively related to leverage but only weakly negatively related to risky assets. This is consistent with Demsetz and Strahan (1995), who find that large bank holding companies hold less capital than small banking companies. Note that the greater leverage of larger LICs suggests enhanced diversification associated with size, since Table 3 shows that larger LICs exhibit, if anything, less overall risk than do smaller LICs. These findings are consistent with Cummins and Sommer (forthcoming), who argue that larger LICs' better

diversification allows them to operate at their optimal level of risk with less capital than smaller LICs.

The third row of Table 4 shows that firms operating in states without tax offsets for payments to the guaranty fund hold both more capital and more risky assets.[11] Note that these results are economically, as well as statistically, large. For instance, a one standard deviation increase in the proportion of income from states without tax offsets increases the capital-asset ratio by about one percentage point. Evidently, LICs operating in states without tax offsets achieve reductions in overall risk by holding more capital. Nevertheless, this reduction in risk is attenuated to some degree by increases in risky assets.

An alternative interpretation of the positive association between the presence of tax offsets and overall risk is that the life insurance industry possesses greater political influence in states with tax offsets (and thus LICs can take more risks in these states). To test this notion, we looked at the proportion of revenues for each company earned in states in which the insurance commissioner was elected rather than appointed. Since we find no correlation between the presence of tax offsets and the method by which the various states choose their insurance commissioner, we reject this alternative view in favor of the notion that the tax offsets themselves influence LIC risk taking behavior.

Finally, column 4 of Table 4 suggests that insider holdings influence the choice of asset risk but not leverage. Although neither coefficient on insider holdings is individually significant, the F-test on both the linear and squared terms is jointly statistically significant at the 10 percent level in the model with firm fixed effects. Consistent with the results based on all-in risk (Table

3), we again find that asset risk falls with insider holdings up to some point and then rises thereafter.

C. *LIC Performance and the Determinants of Risk*

Table 5 presents the relationship between the determinants of risk and LIC performance, as measured by the return on assets (the ratio of net income to total assets). Three main results emerge from this analysis. First, firms with higher franchise value as measured by the book-to-market ratio appear to have lower average performance based on return on assets. This result is consistent with the results in Table 4 which show that low franchise value firms are more likely to hold risky assets such as junk bonds which generate high income (conditional on solvency). Second, in the model without firm fixed effects LICs operating in states without tax offsets also exhibit higher asset returns. This result is presumably the effect of their lower leverage (see Table 4). Finally, LICs using independent agents to distribute their products exhibit significantly lower return on assets. This result is surprising since we find that these LICs are also riskier than those that do not use independent agents. A partial explanation for this result is that agent firms tend to have higher costs and lower profit margins than direct writers (Cummins and Sommer, forthcoming).

III. Conclusions

State guarantees of life insurance liabilities present LICs with the incentive to hold highly leveraged portfolios composed of risky assets. In the simple option framework of Merton (1977), stockholder wealth may be increased indefinitely by raising risk because of the asymmetric payoff: all upside gains accrue to shareholders while, particularly for poorly capitalized

institutions, little is at risk on the downside. These incentives can be contained by regulatory and creditor discipline. We also find that LIC risk taking is affected in important ways by firm specific factors such as franchise value, size, and ownership structure.

Our findings have an important policy implication. The empirical results indicate that the way the state guaranty funds are financed affects the behavior of LICs. The use of premium tax credits for guaranty fund assessments encourages LICs to increase overall risk, mainly by holding less capital. We believe the mechanism behind this finding is better industry self-monitoring in states without tax offsets. By eliminating these tax credits, the surviving LICs have a stronger incentive to pressure regulators to decrease the likelihood of failures. This finding should be of great interest to policymakers concerned with the long run viability of the state guaranty funds. Just as private insurance arrangements typically include co-payments and deductibles, well structured government guarantees of private liabilities should include similar features designed to impose some costs on insured liability holders in the event of an insolvency.

FOOTNOTES

[1]Merton (1977) was the first to demonstrate this result by modeling deposit insurance as a put option. For empirical evidence on the incentive effects of deposit insurance at S&Ls, see Barth, Bartholomew and Labich (1989), Brickley and James (1986), Kane (1985, 1989) and Brewer and Mondschean (1994).

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

[3]See Gilbert (1990) for a discussion of the effects of market discipline on the behavior of depository institutions.

[4]Similar funding arrangements for deposit insurance are used in Austria, Chile, France, Italy, the Netherlands and Switzerland. See U.S. Treasury (1991), page XXI-3. 1991.

[5]We included one company, the Travelers Corporation, that had less than 60 percent of their consolidated assets in life insurance because it is one of the largest firms in the insurance industry. Also, data for two companies, Financial Benefit Group and Unum Corporation, were not available in the fourth quarter of 1986.

[6]For a discussion of the existence of “other effects” in time series, cross sectional analysis, see Balestra and Nerlove (1966).

[7] The observed positive correlation between stock market volatility and the book-to-market ratio could be a spurious relationship caused by the fact that we use end of period measures of the right-hand side variables. (We do this to preserve degrees of freedom). If, for instance, declines in stock prices are associated with high measured volatility while increases are not also

associated with high volatility, then the positive correlation may have nothing to do with the hypothesized effects of franchise value on risk taking. However, we also find that firms with low book-to-market ratios hold fewer risky assets, suggesting that franchise value is indeed related to a LIC's choice of risk.

[8]An alternative interpretation of the relationship between risk and ownership structure is offered by Demsetz and Lehn (1985), who suggest that firms with higher risk require a greater degree of insider holdings, since it may be harder to monitor and control management in riskier firms. We agree that this interpretation is likely to be valid in making comparisons of ownership structure for firms in different industries. This is another reason why we present our results both with and without the insider holdings variables. We believe that within the life insurance industry, however, the firm's ownership structure is unlikely to be caused by the firm's risk, which depends most critically on the choices of leverage and asset risk--choices which are clearly under management control.

[9]For a discussion of the causes and consequences of the recent financial distress experienced in the life insurance industry, see Fields, et al (forthcoming), Fenn and Cole (1994), Brewer and Mondschean (1993) and Todd and Wallace (1992).

[10]For a discussion of these issues, see Cummins and Sommer (forthcoming).

[11]Note that when we estimate the models of Table 4 without firm fixed effects, we find a positive coefficient on the proportion of premium income from states without tax offsets, although these results are only significant at the 17 percent level in the model without insider holdings and the 12 percent level in the model with insider holdings. We do not present these results because firm-specific errors are likely to be important in regressions with dependent variables from the

balance sheet. For instance, deviations of book capital from economic capital are likely to be related to the types of assets held by the firm. To the extent that those assets, and thus the measurement error in the model, are related to the amount of business conducted in states without tax offsets, omitting the fixed effects will tend to bias the estimated coefficient on this variable. In fact, the coefficient on proportion of business in states without tax offsets is positive and significant at the one percent level in the model without firm fixed effects when we include risky assets as a regressor.

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Table 1
Publicly-traded life insurance holding companies, December 31, 1990

Life insurance company	Total assets	Book Value capitalization ratio
	(millions of dollars)	(percent)
Academy Insurance Group	333.1	16.3
Acceleration International Corporation	112.8	19.1
Aetna Life & Casualty Corporation	47,301.6	4.6
Alfa Corporation	327.3	19.8
American Bankers Insurance Group	524.9	15.2
American Family Corporation	6,557.7	8.6
American General Corporation	24,367.5	11.8
American Heritage	669.2	8.9
American National	4,247.5	24.9
Amvestors Financial Corporation	1,536.3	4.8
AON Corporation	8,202.4	15.3
Atlantic American Corp	75.2	23.6
Broad Incorporated	7,394.1	5.5
Capital Holding Corporation	13,101.8	7.2
Central Reserve Life Corporation	59.0	34.7
CIGNA Corporation	28,859.8	4.5
Citizens Incorporated	58.0	8.1
Colonial Companies Incorporated	372.4	21.8
Conseco Group	10,973.9	1.4
Cotton States Life & Health	80.4	19.9
Durham Corporation	690.7	12.6
Equitable of Iowa Corporation	3,210.5	8.4
Financial Benefit Group	568.5	3.2
First Capital Holding Corporation	8,103.9	2.8
First Centennial Corporation	17.0	12.4
First Executive Corporation	14,100.0	5.2
Home Beneficial Corporation	1,091.7	29.4
ICH Corporation	6,030.3	15.3
Independent Insurance Group	1,031.2	9.6
Intercontinental Life	953.7	22.1
Jefferson Pilot Corporation	3,868.9	22.0
Kansas City Life	1,899.3	9.6
Kemper Corporation	7,618.6	4.1
Kentucky Central Life	1,322.9	4.8
Laurentian Capital Corporation	718.0	16.5
Liberty Corporation	1,047.3	10.9
Lincoln National	17,990.2	7.6
Manhattan National Corporation	3,467.8	5.3
MCM Corporation	290.4	7.7
Monarch Capital Corporation	1,133.2	12.0
National Western Life Corporation	1,889.5	3.4
NWNL Companies Incorporated	7,472.6	5.4
Penn Treaty American Corporation	38.6	22.3
Presidential Life Corporation	2,326.6	4.4
Protective Life Corporation	1,932.3	9.0
Provident Life & Accident Insurance	13,519.8	11.9
Reliable Life Corporation	390.6	13.9
Reliance Group Holdings	6,244.9	5.0
Statesman Group	2,372.7	3.7

Torchmark Corporation	4,655.7	18.7
Transamerica Corporation	16,893.3	11.6
Travelers Corporation	34,253.4	7.6
United Companies Financial Corporation	1,075.2	4.7
United Insurance Cos. Inc.	251.9	19.2
Universal Holding Corporation	55.1	4.4
Unum Corporation	8,595.4	8.3
USLICO Corporation	1,926.0	8.1
USLIFE Corporation	3,884.3	15.4
Washington National Corporation	1,855.2	6.0

Table 2
Sample Summary Statistics

	Mean	Standard Deviation
Standard Deviation of Daily Stock Market Return	0.0288	0.0207
Book Capital-Asset Ratio	0.1228	0.0749
Risky Assets (Junk Bonds to Total Bonds)	0.0707	0.0992
Return on Assets (Net Income/Assets)	0.0194	0.0239
Book-to-Market Equity Ratio	1.3053	2.7631
Total Assets (Millions of Dollars)	$5,106	$8,328
Proportion of Premium Income from States without Tax Offsets	0.1642	0.1347
Proportion of Stock Owned by Insiders	0.1188	0.1788
New York Indicator	0.2180	0.4135
Independent Agents Indicator	0.8710	0.3920
Number of States	42.6	12.6
Multiple Insurance Subsidiary Indicator	0.4884	0.5006

Notes: Sample size of 344 reflects data for 59 publicly traded LICs from 1986 to 1991 for all variables except insider holdings. For this variable, we have a sample of 305 since we were unable to collect this variable for all companies in all years.

Table 3
Determinants of LIC All-In Risk (Standard Deviation of Daily Stock Market Returns)

			Models with Insider Holdings	
	Basic Model	Basic Model with Firm Fixed Effects	Basic Model	Basic Model with Firm Fixed Effects
Book-to-Market Equity Ratio	0.0009 (2.70)***	0.0013 (3.55)***	0.0008 (2.41)**	0.0011 (3.04)***
Log of Assets	-0.0023 (-3.24)***	0.0034 (1.05)	-0.0027 (-3.61)***	-0.0029 (-0.69)
Premium Income from States w/o Tax Offsets	-0.0229 (-3.37)***	-0.0106 (-0.75)	-0.0229 (-3.44)***	-0.0016 (-0.11)
Failure Indicator	0.0198 (4.50)***	-	0.0205 (4.80)***	-
New York Indicator	-0.0007 (-0.26)	-	-0.0012 (-0.46)	-
Independent Agents Indicator	0.0089 (3.61)***	-	0.0084 (3.26)***	-
Number of States	-0.0005 (-5.10)***	-	-0.0003 (-3.08)***	-
Multiple Insurance Subsidiary Indicator	0.0026 (1.37)	-	0.0013 (0.64)	
Insider Holdings	-	-	-0.0139 (-0.96)	-0.0351 (-1.96)**
Insider Squared	-	-	0.0632 (2.98)***	0.0646 (2.82)***
Adjusted R^2	37.4%	57.4%	42.8%	59.5%
Number of Observations	344	344	305	305

Notes: All models contain an intercept and time fixed effects. All explanatory variables are measured as of the end of the period over which the standard deviation of returns was measured. Structural variables are dropped in models with firm fixed effects since these do not vary over time. T-statistics are in parentheses; "*", "**", and "***" indicate statistical significance at the 10, 5, and 1 percent levels, respectively. Coefficient estimates for the intercept and fixed effects are suppressed but are available on request from the authors.

Table 4
Determinants of LIC Risk as Measured on the Balance Sheet

	Capital Adequacy (Book Capital-Asset Ratio)		Risky Assets (Junk Bonds to Total Bonds)	
	Basic Model	Basic Model with Insider Holdings	Basic Model	Basic Model with Insider Holdings
Book-to-Market Equity Ratio	0.0003 (0.52)	0.0001 (0.20)	0.0028 (2.54)***	0.0026 (2.27)**
Log of Assets	-0.0425 (-7.39)***	-0.0487 (-6.86)***	-0.0168 (-1.66)*	-0.0231 (-1.73)*
Premium Income from States w/o Tax Offsets	0.0651 (2.62)***	0.0685 (2.85)***	0.0858 (1.96)*	0.0933 (2.06)**
Insider Holdings	-	0.0047 (0.16)	-	-0.0200 (-0.36)
Insider Squared	-	0.0029 (0.08)	-	0.0955 (1.33)
Adjusted R^2	90.0%	91.2%	82.4%	83.7%
Number of Observations	344	305	344	305

Notes: All models contain an intercept and firm and time fixed effects. Structural variables are dropped from models which contain firm fixed effects since these do not vary over time. T-statistics are in parentheses; "*", "**", and "***" indicate statistical significance at the 10, 5, and 1 percent levels, respectively. Also note that the insider and insider squared variables are jointly significant at the 10 percent level in column 4. Coefficient estimates for the intercept and fixed effects are suppressed but are available on request from the authors.

Table 5
Relationship between LIC Risk Determinants and Return on Assets

			Models with Insider Holdings	
	Basic Model	Basic Model with Firm Fixed Effects	Basic Model	Basic Model with Firm Fixed Effects
Book-to-Market Equity Ratio	0.0011 (2.38)**	0.0008 (1.62)	0.0012 (2.42)**	0.0008 (1.65)*
Log of Assets	-0.0009 (-0.93)	-0.0129 (-2.94)***	-0.0001 (-0.05)	-0.0109 (-1.87)*
Premium Income from States w/o Tax Offsets	0.0333 (3.47)***	0.0167 (0.88)	0.0363 (3.67)***	0.0220 (1.11)
Failure Indicator	-0.0120 (-1.93)*	-	-0.0116 (-1.84)*	-
New York Indicator	0.0015 (0.40)	-	0.0021 (0.54)	-
Independent Agents Indicator	-0.0130 (-3.71)***	-	-0.0112 (-2.95)***	-
Number of States	0.0003 (1.79)*	-	0.0002 (1.26)	-
Multiple Insurance Subsidiary Indicator	0.0022 (0.81)	-	0.0024 (0.84)	-
Insider Holdings	-	-	0.0581 (2.70)***	0.0265 (1.08)
Insider Squared	-	-	-0.0625 (-1.98)**	-0.0136 (-0.43)
Adjusted R^2	6.3%	43.0%	8.2%	44.2%
Number of Observations	344	344	305	305

Notes: All models contain an intercept and time fixed effects. Structural variables are dropped in models with firm fixed effects since these do not vary over time. T-statistics are in parentheses; "*", "**", and "***" indicate statistical significance at the 10, 5, and 1 percent levels, respectively. Coefficient estimates for the intercept and fixed effects are suppressed but are available on request from the authors.