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Risky Asset Substitution in the Insurance Industry: An Historical Example*

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Abstract

In the 1980s, life insurers sold guaranteed investment contracts (GICs) to pension plan sponsors, then backed these contracts with portfolios heavily weighted with higher risk assets such as common stocks and junk bonds. Ultimately this caused considerable loss, and history has repeated itself in many respects in recent years via holdings of equities and mortgage-backed securities. We evaluate the risky asset substitution in the life insurance industry from an historical perspective to determine if organizational form or other factors might be rationale for managerial decisions to engage in asset substitution. We find evidence that stock insurer managers are more likely than their mutual counterparts to engage in this type of risky asset substitution. Our findings provide rich ground for future research as the subprime mortgage and credit default swap debacles unfold, as well as public policy implications for insurance regulators concerned with the fiscal health of the insurance industry.

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Introduction

As a group, life insurers recently have been among the hardest hit industries in the U.S. in terms of market valuation and financial strength. Touryalai (2009) notes an average loss in life insurer stock values of nearly 60% between April 2008 and 2009, compared to a drop of approximately 40% for the Standard and Poor's 500 index. While some recovery of valuations has occurred in early-to-mid-2009, ratings downgrades and the poor stock performances of life insurers have left leading investment analysts and financial advisors leery of the industry's future prospects (Mercado, 2009).

One of the great concerns to regulators is the continuing decline of life insurers' financial strength ratings (FSRs). Thirty-one life insurers experienced downgrades in their FSRs during 2008, while only eight were assigned upgrades (Touryalai, 2009). Downgrades in 2009 have been announced for such prominent life insurers as Hartford Life, ING USA Annuity and Life, Lincoln National, MetLife, Protective Life, and Prudential Financial, to name a few.

Some of the more troubled life insurers have been forced to bolster their capital positions by turning to national governments and/or attempting to sell some of their key business units. For instance, ING Groep N.V. turned to the Dutch government to absorb 80% of their residential mortgage-backed securities (RMBS), but their U.S. subsidiaries still have substantial exposure to both residential and commercial mortgage-backed securities (MBS) (Mirabella and Edelsberg, 2009).

Lincoln National and Hartford Financial recently have followed an unprecedented strategy of buying relatively small thrift institutions just so they could access funds from the U.S. government's Troubled Asset Relief Program. Potential spillover effects to the property-casualty industry are apparent in the case of Hartford Financial. After failed attempts to sell their life insurance operations, Hartford reportedly explored selling their core property-casualty insurance businesses, which carried higher financial ratings than the life subsidiaries (Greenwald, 2009a; Greenwald, 2009b).

The woes of the life insurance industry are reminiscent of the 1991 Executive Life debacle, which stemmed from risky "junk" bond investments, although today's industry is suffering because of investments in MBS and equities. It appears that at least with respect to high-risk investment behavior, history has repeated itself. What factors might be useful in explaining such risky behavior on the part of firms that are primarily in the business of reducing the financial consequences of risk for others?

Events in the life insurance industry point to fundamental failures in asset-liability management by many large firms. In particular, analysts and observers cite frequent mismatches of long-term bonds, equities, and MBS with the variable annuity liabilities that often feature relatively high, short-term, guaranteed rates. By the end of 2008 such prominent life insurers as Allstate Life, Hartford Life, ING USA Annuity Life, John Hancock Life, and Security Life of Denver were reported to hold commercial MBS rated A or lower that exceeded total capital and surplus for each firm (Touryalai, 2009).

Financial researchers are just beginning to explore both the impact and causes of the recent asset-liability management problems among U.S. life insurers. In particular, real-estate-related holdings, especially residential MBS, have been expanded greatly,

and potential ratings downgrades have been projected to greatly affect insurer capitalization in the future (Baranoff and Sager, 2009; Liebenberg, Colquitt, and Hollans, 2009). These are preliminary results at best, however, and we are unlikely to more fully understand both the motivations for management to mismatch assets and liabilities during the recent crisis and the ultimate effects until more data from subsequent years are available.

In this study we take a different approach from prior researchers by looking back to a previous era in which managers of some life insurers may have exploited unique regulatory and market conditions to deliberately mismatch assets and liabilities. We first provide readers with a review of the literature on asset substitution and explain how it can pertain to life insurers. We then discuss regulatory and market conditions in the late 1980s that allowed insurers to actively engage in mismatching assets and liabilities in an effort to increase equity values. Finally, we empirically explore specific factors that can lead to such practices.

Executive Life and GICs

Leading up to the 1991 Executive Life insolvency, along with the insolvency of other insurers that had overextended their portfolios in risky assets, were historic changes in U.S. financial markets, including uncharacteristically high interest rates, heightened competition among financial institutions, development of new financial products, and expanded demand in the pension marketplace. Much of the increased demand from pension funds came from the rapid growth of 401(k) retirement plans, a type of defined contribution pension plan that was introduced into the U.S. tax code in 1978.

Between 1983 and 1988, the number of workers covered by 401(k) plans nearly quadrupled, bringing new money into the pension marketplace that needed to be invested. Life insurers, as traditional providers of investment products for the pension industry, were the natural suppliers for this market. Large insurers, with broad in-house expertise and reputations for financial stability, began to design new financial products for retirement plan sponsors. Among the more popular products was the guaranteed investment contract (GIC), which is similar to a certificate of deposit in that it has a fixed maturity and the issuer is obligated to repay principal and interest in a lump sum at maturity.

During the 1980s the value of GICs outstanding increased from less than \$5 billion to over \$150 billion, with more than 60% of all 401(k) retirement plan participants investing in these instruments by the end of the decade (Morris, 1990). GICs were attractive to pension fund managers because the suppliers of GICs tended to be the larger, more highly rated life insurers. These firm characteristics imparted an aura of safety to GICs, even though they were priced to provide yields comparable to intermediate-term government and corporate bonds (Walker, 1992).

The sale of GICs created a substantial infusion of cash to large life insurers, and managers faced the challenge of investing to earn returns in excess of the promised yields. One possibility was to buy higher risk assets such as common stocks and below-investment-grade bonds, popularly known as junk bonds. Short-term profits from such a strategy proved too lucrative for some insurance managers to ignore. By mid-1987, life insurers had become the largest institutional buyers of junk bonds, which accounted for 7.5% of admitted assets (Smyth, 1987; A. M. Best, 1992). Not all GIC suppliers invested in higher risk assets, however. For example, New York Life and Guardian Life, both issuers of GICs, eventually publicized their negligible holdings of junk bonds (Lublin, 1990).

In this study, we argue that the sale of GICs and subsequent investment of proceeds in common stocks and junk bonds systematically increased the risk profiles of some insurers' asset portfolios during the 1980s. The substitution of higher-risk assets for lower-risk ones is what we are referring to as asset substitution, and is first described in Jensen and Meckling (1976). While this strategy should not be dynamically consistent with limited disclosure of insurers' asset portfolio values, new incentives to invest in 401(k) plans, and misinformation about junk bond risks, allowed managers to pursue this strategy.

Our evidence suggests that, in such an environment, managers of stock insurers generally found asset substitution strategies to be more appealing than did managers of stock insurers. For a sample of 95 life and health insurers in 1989, our multivariate model indicates that managers of stock insurers maintained an *incremental* common stock and junk bond position amounting to 4.3% of total assets held. This difference translates to an economically significant amount exceeding \$105 million worth of common stocks and junk bonds per stock insurer. Because GIC returns were approximately equal across issuers,⁵ our results suggest that managers of stock insurers were able to engage in asset substitution that potentially transferred wealth from fixed to residual claimants. Nine years later, when the conditions conducive to asset substitution should have dissipated, we find no similar evidence of asset substitution.

Motivated by conflicting research on whether mutual-owned stock (MOS) firms act more like mutual or stock firms, we find some evidence that managers of MOS insurers issuing GICs during the late 1980s behaved similarly to mutual managers during the late 1980s, or maybe even a bit more conservatively.

Our study is organized as follows. First, we discuss the implications of organizational forms in the insurance industry for managers' investing policies. We then explore why managers of insurers were able to substitute assets during the 1980s. In the next section, we present our primary hypothesis and discuss other factors that must be considered in conducting our empirical tests. We then describe the research design, followed by our empirical results. In the final section, we summarize our main findings and offer suggestions for future study.

5. See, e.g., surveys in *Pensions and Investments Age* of GIC rates offered by leading suppliers (Williams, 1989a, 1989b).

Organizational Form and Asset Substitution by Insurers

Two organizational firms—the mutual firm and the stock company—dominate in the life insurance industry. As explained by Esty (1997) and Lee, Mayers, and Smith (1997), fixed and residual claims are bundled in a mutual organization, while they are separable in a stock firm. Residual claimants of an insurer essentially hold a call option. One implication of options pricing theory is that any managerial action that increases the volatility of firm value will increase the value of this call option while decreasing the value of fixed claims. Esty (1997) states that either investing in assets with volatile cash flows or mismatching the duration of assets and liabilities can accomplish this goal. In addition to Esty (1997), Staking and Babbel (1995) also discuss the effect of mismatched duration (and leverage) on the value of the investors' call option with respect to property/casualty insurers. Consequently, residual claimants in stock firms can increase their wealth by providing managers with incentives to use the previously described techniques to increase the volatility of firm value. Fixed claimants therefore should expect higher contracting and monitoring costs and should extract a risk premium, such as a higher yield on GICs purchased.

Because residual and fixed claims are bundled in mutuals, the claimants cannot expect a net gain when asset volatility is increased, and they are unlikely to give managers incentives to do so. This conclusion represents a natural extension of the managerial discretion hypothesis (Mayers and Smith, 1981), which states that mutual insurers will be limited to operations requiring relatively less managerial discretion because the residual claimants of mutuals also are fixed claimants, and they have no incentives to encourage higher risk activities. Lee, Mayers, and Smith (1997) find that managers of mutual insurers are less prone to increase portfolio risk around enactments of state guaranty fund laws, which lends support to this extension of theory.

Our study differs from Lee, Mayers, and Smith in that we examine risk shifting in a naturally evolving, competitive marketplace. We contribute to the literature by explaining how certain market conditions and opaque accounting procedures can combine to create an environment in which managers are able to substitute assets. We then empirically test for asset substitution among insurers in such an environment and at a later time when the favorable conditions should have dissipated.

We follow the rationale of Lee, Mayers, and Smith (1997, p. 13) in assuming that common stocks generally are riskier than the other major categories of assets held by insurers. Another identifiable, higher risk category is that of junk bond holdings, which exhibit relatively high credit and liquidity risks and are typically callable, thereby adding interest rate risk to insurer portfolios. During the 1980s, the average maturity of GICs issued by insurers often was much shorter than that of the junk bond portfolio underlying them (Richmond, 1992). Consequently, the addition of junk bonds to insurer asset portfolios generally increased both the risks of cash flow volatility and the interest rate risk caused by asset/liability mismatching.

Asset substitution should not be dynamically consistent in competitive markets because fixed claimants will quickly realize that part of the value of their claim is being transferred to residual claimants and they will demand a risk premium and/or costly contractual protection. We argue that the confluence of several unique factors in the financial markets of the 1980s created opportunities both for asset substitution by managers and a natural experiment for researchers to test systematic relations between insurers' organizational structure and the investment decisions of managers.

Why Asset Substitutions Strategies Could Persist in the 1980s

We posit that during the 1980s the estimates of wealth transfers by purchasers of products from life insurers were likely to be biased downward, thereby allowing managers to substitute assets for a prolonged period without suffering adverse effects on prices or contractual covenants. We subsequently discuss three likely factors for this phenomenon.

Industry Disclosure Environment

Although insurers filed asset portfolio data with state regulators and the National Association of Insurance Commissioners (NAIC) during the 1980s, these disclosures were inadequate for investors to accurately assess insurer portfolio risk. For example, bonds listed in the required annual statements were shown at amortized rather than market values. While the diligent fixed claimant could convert the book value of bonds to market values for actively traded securities, the secondary markets for most bonds held by insurers often were thinly traded, making market valuation problematic. GIC documents provided little additional disclosure because of a no-action letter from the Securities and Exchange Commission in 1977 that effectively extended Section 3(a)8 of the Securities Act of 1933 to GICs sold to tax-qualified pension and profit-sharing plans. This decision effectively exempted GICs from the registration and delivery requirements typical for investment products such as mutual funds.

Instead of direct valuation of insurers' underlying investment portfolios, fixed claimants could use financial strength ratings published by private agencies. Belth (1982, 1990) documents an upward drift in ratings by the dominant rating agency, A.M. Best Company, during the 1980s; however, in 1987, the year in which junk bond holdings of life insurers peaked, Best gave nearly all GIC issuers its top ratings.

To differentiate themselves from weaker competitors, some insurers turned to more exclusive agencies, such as Standard and Poor's and Moody's, but these ratings also tended to be inflated and were slow to adjust to financial deterioration.⁶

New Demand for Investment-Oriented Products

The Tax Reform Act of 1981 created new incentives to invest in 401(k) and other defined contribution plans (Ippolito, 1992).⁷ The 401(k) plan often became the vehicle of choice in the 1980s. Individual participants could select investments within these plans, and GICs frequently proved to be the favored, fixed-income product. Generally accepted accounting practices during the 1980s allowed plan sponsors to report GIC holdings at book rather than market values, so they did not have to explain market fluctuations to their presumably risk-averse participants.⁸

While the demand for GICs increased in the 1980s, sponsors of defined contribution plans were subject to much lower fiduciary standards under various federal laws, including the Employee Retirement Income Security Act. The most burdensome requirement was that sponsors deliver investment options commensurate with their stated risk-return qualities. Monitoring responsibilities were substantially shifted to the individual participants, who were likely to view themselves as customers rather than investors and not be as vigilant as large sponsors of defined benefit pensions once had been.

Misinformation About Junk Bond Risks

Although the junk bond market had operated since the late 1970s, sufficient data to allow empirical measurement of the risk-return attributes of these securities did not accumulate until the mid-1980s. Using data for 1977 through 1986, Blume and Keim (1987) found that junk bonds offered significantly higher monthly returns and lower variation than did investment-grade corporate and Treasury bonds. Researchers later noted that the comparative measures probably were biased because of improper default risk assessment, and better estimates of default rates eventually emerged (Altman, 1989;

6. For example, Executive Life of California maintained junk bond holdings approaching 40% of admitted assets in 1990 and it ranked 13th among life insurers in GIC sales. The insurer was rated A+ by Best, AAA by S&P, and A1 by Moody's. One year later, Executive Life was declared insolvent. See DeAngelo, DeAngelo, and Gilson (1994) for details of the Executive Life failure.

7. Poterba, Venti, and Wise (1994) question whether the growth of 401(k) plans represents net new savings or merely substitutes for traditional, defined benefit pension plans. Eisner (1996) examines U.S. Census Bureau data and concludes that individuals have not substituted 401(k) wealth for wealth previously held in defined benefit and other pension plans. Papke (1999) provides evidence that employers sometimes introduce 401(k) plans as substitutes for defined benefit plans, but generally finds this not to be the case.

8. In August 1992, the Financial Accounting Standards Board ruled, in FAS 110, that defined benefit plans would no longer be allowed to report GIC holdings at book values. Concern voiced in the financial press by GIC managers, insurers, and the pension industry about this ruling indicates the perceived worth of book value reporting (see, e.g., Geisel, 1991; Greenwald, 1991; and Williams, 1990).

Altman, 1992; Asquith, Mullins, and Wolff, 1989). Temporary mispricing of junk bonds during the first half of the 1980s should have increased incentives for managers already prone toward asset substitution to more actively pursue this policy.

Hypothesis and Test Variables

Main Hypothesis

Our primary research hypothesis, stated in alternative form, is:

Of the life insurers that issued GICs, managers of stock companies were more likely than managers of mutual or mutual-owned stock firms to accumulate higher risk investments, consistent with asset substitution strategies.

We condition our hypothesis on participation in GIC markets because, for the reasons discussed earlier, we believe these insurers had particular opportunities to profit via asset substitution during the 1980s.

Because the managerial discretion hypothesis indicates that mutual managers will tend to pursue actuarially predictable activities, one must question why mutual insurers offered GIC products at all. We suspect that, as with managers of stock insurers, mutual managers initially recognized opportunities to capitalize on their reputations and expertise in the pension marketplace to offer profitable new GIC products. As competition flourished in the 1980s, the spreads between GIC rates and underlying asset yields probably narrowed, yet many mutuals continued to offer GICs at competitive rates, most likely to retain their shares of the pension investment market.

Dependent Variable

Because market valuation of insurer asset portfolio risk is not publicly available, we use annual statement values of different asset categories, as percentages of total invested assets, to measure risk in a manner similar to Lee, Mayers, and Smith (1997). While their analysis is limited to relative holdings of common stocks, our proxy for asset portfolio risk is the ratio of common stocks plus below-investment-grade bonds to the total value of the insurer's investment portfolio.⁹

9. We do not adjust our measure of portfolio risk for derivatives or off-balance-sheet instruments (for discussion of these assets see, e.g., Cummins, Phillips, and Smith, 1997). These data were not publicly available from the NAIC until 2001. Even if the data were available, assessing the actual value by which to reduce the underlying asset values is problematic. For instance, the value of a call option generally is far from a dollar-for-dollar hedge against market changes in the underlying stock unless the call is in-the-money and near expiration.

Organizational Form Variables

We investigate differences between stock and mutual insurers. We expect that stock insurers will have higher risk asset portfolios than mutual insurers in the late 1980s because managers of stock insurers have both greater discretion over investment policy and greater incentives to substitute assets, and because of the previously mentioned specific conditions characteristic to the 1980s. We also attempt to add to the discussion about whether mutual-owned stock (MOS) insurers act more like mutual or stock firms. MOS insurers are stock insurers for which mutual insurers hold most of the outstanding equity. Mayers and Smith (1994) argue that MOS and mutual insurers have similar operating characteristics, and so should exhibit similar behavior. However, Lee, Mayers, and Smith (1997) find that managers of MOS insurers act more like stock insurers by actively engaging in asset substitution in response to enactment of state guaranty funds.

Interaction Variable

GIC Liabilities

We include this variable, which reflects the extent to which the insurer is issuing GIC products, so that we can interact it with our organizational form variables. Cummins, Phillips, and Tennyson (2001) interact dummy and non-dummy variables in their regression models, and this method is described in more detail in Wooldridge (2003, pp. 233-234). For example, in a regression with a stock dummy and a stock dummy*GIC liabilities interaction term, the coefficient on the stock dummy measures the difference in intercepts between stock and mutual firms, while the coefficient on the interaction term indicates the difference in the slopes—that is, in the rate of change in asset portfolio risk taken on as GIC volume increases. Specifically, the significance of the interaction term indicates whether changes in GIC volume affect asset portfolio risk differently for stock and mutual insurers. For example, assume that the coefficient on the stock dummy is significantly positive. The interaction term provides a deeper understanding as follows.

A significantly negative coefficient on the interaction term implies that asset portfolio risk is higher for stock firms at lower levels of GIC volume, but the slope is greater for mutual firms. So at some higher GIC volume, asset portfolio risk for mutual insurers becomes higher than for stock insurers. If the coefficient on the interaction term is not significant, the slopes are the same. If the coefficient on the interaction term is significantly positive, the interpretation is that asset portfolio risk is higher for stock insurers than for mutual insurers at all levels of GIC volume, and that the gap increases as GIC volume increases.

Control Variables

We control for a variety of factors that should influence managers' investment decisions. Our rationales and proxies for these variables follow.

Firm Size

Cummins, Phillips, and Smith (1997) state that economies of scale in information and transaction costs are likely in the market for risky investments. This should include stock investments and, especially, the more thinly traded junk bonds. We therefore anticipate a positive association between size and higher risk investment holdings. Our proxy for firm size is the natural logarithm of the insurer's admitted assets.

Leverage

Managers' incentives to engage in asset substitution can increase with the proportion of fixed claims in the firm's capital structure (Gavish and Kalay, 1983; Green and Talmor, 1986). On the other hand, Cummins and Sommer (1996) suggest that a negative relation can be expected because insurers with greater capital are more likely to accept portfolio risk as they target their preferred solvency levels. Given the rationale and supporting empirical evidence of Cummins and Sommer, we anticipate a negative relation between leverage and asset portfolio risk. Our leverage proxy is the ratio of total liabilities to total assets. Because market values for insurer liabilities are not directly observable, we use book values to ensure adequate sample size and for comparability across stock and mutual forms.

One can argue that managers may simultaneously make decisions about both the amount of GICs or similar liabilities and the amount of investment risk they will accept with the assets generated by these new issues. To address such a potential problem, Greene (2003) and Kennedy (2003) suggest the use of a lagged dependent variable. We consequently implement a one-period lag for our leverage variable.

Observable Risk

Campbell and Kracaw (1990) demonstrate that observable financial risk is likely to be positively related to the unobservable risk of asset substitution by managers. In essence, managers of firms with a high level of observable financial risk have greater incentives to transfer wealth from fixed claimants to residual claimants, and they can do so via asset substitution.

Our ex ante proxy for observable risk is a relative measure of the Insurance Regulatory Information System (IRIS) ratios falling outside guideline ranges set by the NAIC as of the end of the previous year. We expect a positive relation with asset portfolio risk. The IRIS ratios are used by insurance regulators as an initial screening device to classify insurers in terms of potential insolvency. Klein and Barth (1995) and Grace, Harrington, and Klein (1998b) note that researchers have raised various criticisms regarding the effectiveness of IRIS, but the latter researchers find that the proposed alternative systems developed by critics are not clearly more effective than IRIS. The NAIC now uses the IRIS ratios to classify insurers in terms of solvency risk

before applying a more dynamic system known as Financial Analysis Solvency Tracking (FAST) to improve risk classification. The FAST system is not available to the public, however. Grace, Harrington, and Klein (1998a) show that IRIS ratios remain effective as an initial screening device for predicting insolvency.

Reinsurance Ceded

Campbell and Kracaw (1990) posit that when managers with residual claims engage in costly hedging of observable risk, they signal their intentions to not increase unobservable risk through asset substitution. For insurers, the most visible form of risk hedging is through reinsurance cessions. We therefore predict a negative relation between net reinsurance ceded, as quantified by Mayers and Smith (1990), and asset portfolio risk for firms with equity claims outstanding.

Regulatory Environment

A commonly expressed goal of state regulators is to protect fixed claimants, especially policyholders, by monitoring the solvency of insurers licensed to do business in their states. While regulators have their own agendas, they also have incentives to monitor insurer solvency because of the political and economic costs of failures during their terms in office. We expect insurers subject to relatively strict regulation to be less prone to substitute assets. Following previous researchers (e.g., Boose, 1990; Wells, Cox, and Gaver, 1995; and Krishnaswami and Pottier, 2001), we use a binary variable for New York regulation as our proxy for stringent regulatory oversight.¹⁰ The New York insurance department is known for both rigorous regulation and enforcement of extraterritorial rules.¹¹

Separate Accounts

Regulators require separate investment accounts to be maintained for certain lines of insurance, such as variable life or variable annuities. Assets backing these obligations are included in a separate statement and are marked to market. Because separate accounts facilitate monitoring by fixed claimants, we expect the ratio of separate account assets to total assets to be inversely related to holdings of higher risk investments.

10. Although researchers commonly apply New York regulation as a control variable potentially affecting various insurer activities, Pottier and Sommer (1998) suggest that insurer licensing in New York could be a function of broadly defined lines of business. For our sample, potential endogeneity of the regulatory variable simply is not a factor, however. Running our model with and without the regulation variable generates virtually no differences in the coefficients of the other independent variables or goodness of fit. We choose to report the results for this variable because it is so commonly tested, however.

11. The rigor of New York regulators is demonstrated by the full recovery of promised benefits to policyholders of Executive Life of New York in 1993 after the parent company, First Executive, failed. In contrast, policyholders of Executive Life of California still were awaiting settlement of claims in 1995. In retrospect, the former insurance commissioner of California characterized the New York department's efforts as "very aggressive" compared to his own department's "lax" approach to Executive Life's financial problems (Geisel, 1992).

Affiliation

Managers of insurers that are affiliated with insurer groups generally have greater freedom to accept portfolio risk because it ostensibly can be reduced via diversification by the holding company. If so, we can expect a positive relation between group affiliation and asset portfolio risk. We apply a binary variable based upon whether the insurer is listed as a member of a group by the NAIC.

Research Design

Data

Our primary data source is the NAIC InfoPro database for life and health insurers. We selected 1989 as our base year because the junk bond market began a rapid decline shortly thereafter. We also analyzed data for 1998, choosing that year because it is distant enough that conditions conducive to asset substitution in the 1980s should have disappeared because of regulatory changes and the natural absorption of information by the markets. We also had hard copies of annual statements for spot-checking purposes.¹²

We gathered data on GIC and non-GIC issuers with the goal of using both in a Heckman two-stage procedure as described later. We started with the NAIC database, which contains the universe of life and health insurers licensed in the U.S. The 1989 NAIC database had 1,938 life and health insurers and among these, 125 reported positive *guaranteed interest contract* liabilities. Guaranteed interest contracts include GICs purchased by pension plan sponsors and some fixed-rate, single-premium deferred annuities purchased by individual investors. Following Walker (1992), we use this data item as our screen for identifying GIC issuers.

GICs normally are written in denominations of \$500,000 or more, and contracts seldom expire simultaneously on the financial statement date. We therefore omit 13 insurers with GIC liabilities of less than \$250,000 from our 1989 data. This group includes 12 stock insurers with median assets of less than \$12 million and one mutual insurer. We also drop 12 foreign-owned insurers and subsidiaries because of unique organizational or accounting structures that could cause double counting. We then eliminate three insurers that exclusively write reinsurance for other life insurers, and two insurers with inadequate data. Our final sample includes 95 GIC issuers, and all have assets of \$100 million or greater. For non-GIC issuers in the NAIC data, we use relevant screens identical to those applied to the GIC sample and eliminate firms with total assets less than \$100 million, resulting in a final sample of 416 non-issuers.

12. The NAIC database format changes from year to year, reflecting changes in the reporting forms required of insurers so that rigorous checks against hard copies of insurers' annual statements are necessary.

Based on *Best's Insurance Reports 1990 Life-Health* edition, our sample of 95 GIC issuers includes 31 mutual firms, 53 stock companies, and 11 MOS firms. The mutual parents controlled at least 95% of the stock of the MOS insurers. Our final sample of 416 non-issuers encompasses 51 mutual, 315 stock, and 50 MOS firms. We use the same method for the 1998 data, ultimately resulting in 78 GIC issuers and 432 nonissuers.

Regression Specification

We initially apply the following regression model to our sample of 95 life insurers with GICs outstanding in 1989:

$$\begin{aligned} \text{APRISK} = & \gamma_0 + \gamma_1\text{STKDUM} + \gamma_2\text{MOSDUM} + \gamma_3\text{GICLIAB} + \gamma_4\text{STKDUM} * \\ & \text{GICLIAB} + \gamma_5\text{MOSDUM} * \text{GICLIAB} + \gamma_6\text{LNSIZE} + \gamma_7\text{LNSIZE} + \\ & \gamma_8\text{LAGLEVER} + \gamma_9\text{OBRISK} + \gamma_{10}\text{REINS} + \gamma_{11}\text{REG_NY} + \\ & \gamma_{12}\text{SEPACCT} + \gamma_{13}\text{AFFIL} + \varepsilon \end{aligned} \quad (1)$$

where:

APRISK	=	asset portfolio risk measure (ratio of common stocks plus below-investment-grade bonds to total portfolio assets)
STKDUM	=	stock organizational form (stock=1, mutual=0)
MOSDUM	=	mutual-owned stock organization form (yes=1, no=0)
GICLIAB	=	guaranteed investment contract liabilities divided by total assets (in percent)
LNSIZE	=	natural logarithm of insurer's admitted assets
LAGLEVER	=	ratio of total liabilities to total assets lagged one period
OBRISK	=	observable risk, represented by the ratio of the number of Insurance Regulatory Information System (IRIS) ratios outside the NAIC-specified range to total IRIS ratios (12)
REINS	=	ratio of reinsurance ceded to the sum of direct premiums written plus reinsurance assumed
REG_NY	=	licensed in state of New York (yes=1, no=0)
SEPACCT	=	ratio of separate account assets to total assets
AFFIL	=	insurer is affiliated with other insurers through a holding company (yes=1, no=0)

In our regression specification, we omit mutual insurers, meaning that the coefficients on the STKDUM and MOSDUM results are relative to mutual insurers. We expect a significantly positive coefficient for the STKDUM results. A significantly positive coefficient for MOSDUM would indicate that MOS insurers behave more like stock firms in agreement with Lee, Mayers, and Smith (1997). An insignificant coefficient for MOSDUM would provide evidence that MOS insurers behave more like mutual firms in agreement with Mayers and Smith (1994).

Selection bias could be an issue in using only the insurers with outstanding GICs. We investigate the selection bias issue by applying Heckman's (1979) two-stage regression method.¹³ This method uses all insurers, both GIC and non-GIC issuers, in the first stage and generates a factor that is used in the second stage to correct for selection bias. If the correction factor (ρ) is significant in the second stage, we will use the Heckman results. An insignificant ρ in the second stages would indicate that selection bias is not a problem, in which case we will use OLS with only the GIC issuers.

Results

Descriptive Statistics

Table 1 provides descriptive statistics for our sample of life insurers. The median tests indicate a significant relation between GIC issuance and holdings of higher risk assets only for mutual insurers.

13. We use the Heckman procedure because managers first select into or out of the cohort of insurers that issue GICs. Once this decision is made, managers must make decisions in a different dimension—i.e. the level of asset portfolio risk to accept. Much has been written about handling selection bias. The Heckman procedure has been criticized by some observers, especially when applied to small samples (Kennedy, 2003). We follow the Heckman approach because our samples are relatively large, and Greene (2003) posits that this method normally is applied when selection bias is possible.

Table 1
Descriptive Statistics for Selected Variables for 511 Large Life Insurers in 1989

Variable ^a	Mutual Insurers		Stock Insurers		Median Test: Mutuals vs. Stocks ^b
	Mean	Median	Mean	Median	
APRISK					
GIC Issuers	6.56	5.68	10.60	6.29	Not Sig.
Non-issuers	6.41	3.89	10.98	6.13	Sig.
Median Test: GIC Issuers vs. Non-issuers ^c		Sig.		Not Sig.	
LAGLEVER					
GIC Issuers	95.34	96.14	91.11	93.08	Sig.
Non-issuers	88.432	91.00	83.02	87.78	Sig.
Median Test: GIC Issuers vs. Non-issuers		Sig.		Sig.	
LNSIZE					
GIC Issuers	22.32	22.27	21.05	21.03	Sig.
Non-issuers	19.87	19.52	19.95	19.75	Not Sig.
Median Test: GIC Issuers vs. Non-issuers		Sig.		Sig.	
OBRISK					
GIC Issuers	0.77	0.00	1.36	1.00	Sig.
Non-issuers	0.94	0.00	1.72	1.00	Sig.
Median Test: GIC Issuers vs. Nonissuers		Not Sig.		Not Sig.	
SEPACCT					
GIC Issuers	8.59	5.72	5.23	0.35	Sig.
Nonissuers	5.31	0.00	3.03	0.00	Not Sig.
Median Test: GIC Issuers vs. Nonissuers		Sig.		Sig.	
GICLIAB	15.74	14.15	10.70	2.46	Sig.

^a APRISK = stock and below-investment-grade bond holdings divided by total assets (in percent); LNSIZE = natural logarithm of the insurer's admitted assets; LAGLEVER = total liabilities (total assets – surplus) divided by total assets (in percent) for 1988; OBRISK = number of Insurance Regulatory Information System (IRIS) ratios outside the ranges deemed satisfactory by the NAIC; SEPACCT = separate account assets divided by total assets (in percent); and GICLIAB = guaranteed investment contract liabilities divided by total assets (in percent).

^b Sig. indicates median test for differences between mutual and stock insurers is significant at the 5% level. Not Sig. indicates no significant differences between mutual and stock insurers.

^c Sig. indicates median test for differences between GIC issuers and non-issuers is significant at the 5% level. Not Sig. indicates no significant differences between GIC issuers and non-issuers.

Both stock and mutual GIC issuers are larger and more highly leveraged than are the non-issuers. This suggests that the larger insurers with established reputations are more likely to enter the GIC markets. Despite significantly different leverage between GIC issuers and nonissuers, our observable risk proxy is not significantly different for the two samples. GIC issuers did have larger separate account liabilities, although the difference in magnitude was relatively small for stock insurers.

While stock GIC issuers generally held greater proportions of higher risk assets than their mutual counterparts, the difference was not significant. The results in Table 1 also reveal that the mutual GIC issuers were larger than stock GIC issuers, and they had issued both more fixed claims and separate account contracts. Our multivariate results, discussed later, address the mitigating impact of these factors with respect to organizational form.

Table 2 shows the correlation analysis of the proxies for the independent variables in our model. The only correlation above 0.5 is between leverage and size (0.54). We also compute the variance inflation factors (VIFs) developed by Belsley, Kuh, and Welsch (1980), and find that all fall below 2.0, except for size, with VIF = 2.48. Collinearity is likely not a problem if all VIFs are below 10.

Table 2
 Pearson Correlation Coefficients for Variables used in the 1989 Regression
 for the 95 Insurers that Issue GICs

	STKDUM	MOSDUM	GICLIAB	LNSIZE	LAGLEVER	OBRISK	REINS	REG_NY	SEPACCT	AFFIL
STKDUM	1.00									
MOSDUM	-0.41	1.00								
GICLIAB	<0.01		1.00							
LNSIZE	0.89	0.05		1.00						
LAGLEVER	-0.13	-0.30	0.29		1.00					
	0.21	<0.01	<0.01							
	-0.12	-0.25	0.21	0.54	1.00					
	0.24	0.02	0.04	<0.01						
OBRISK	0.19	<0.01	-0.03	-0.18	0.09	1.00				
	0.06	0.97	0.75	0.09	0.36					
REINS	0.07	-0.01	0.42	<0.01	0.11	0.12	1.00			
	0.50	0.92	<0.01	0.97	0.28	0.27				
REG_NY	-0.38	-0.02	0.11	0.44	0.29	-0.09	0.13	1.00		
	<0.01	0.85	0.29	<0.01	<0.01	0.41	0.22			
SEPACCT	-0.12	-0.03	-0.09	0.42	0.26	-0.03	0.03	0.36	1.00	
	0.25	0.77	0.40	<0.01	0.01	0.80	0.76	<0.01		
AFFIL	0.18	0.02	0.12	0.13	-0.11	-0.09	0.01	-0.22	0.04	1.00
	0.08	0.87	0.25	0.20	0.31	0.41	0.89	0.03	0.69	

STKDUM = 1 if insurer is a stock company and 0 otherwise; MOSDUM = 1 if insurer is a stock company owned by a mutual insurer and 0 otherwise; GICLIAB = guaranteed investment contract liabilities divided by total assets (in percent); LNSIZE = natural log of admitted assets; LAGLEVER = total liabilities (total assets - surplus) divided by total assets (in percent) for the period t-1; OBRISK = the number of Insurance Regulatory Information System (IRIS) ratios outside the ranges deemed satisfactory by the NAIC; REINS = reinsurance ceded divided by the sum of direct premiums written plus reinsurance assumed; REG_NY = 1 if insurer is licensed in New York and 0 otherwise; SEPACCT = separate account assets divided by total assets (in percent); and AFFIL = 1 if insurer has a group affiliation and 0 otherwise. Significance of correlations (p-value) are in italics.

Regression Results

When we implement the Heckman (1979) two-stage procedure, we find that the correction factor (ρ) is not significant (p-value: 0.79) in the second stage, indicating that selection bias is not a problem. Consequently, we report only OLS regressions using only the GIC issuers. In Table 3 we compare results for our samples of GIC issuers in 1989 and 1998.

Table 3
Regression Results for Large Life and Health Insurers with
Guaranteed Investment Contracts Outstanding

	Dependent Variable = APRISK				
	Expected	Dependent Variable = APRISK			
	Sign (1989)	1989 (n=95)	1998 (n=78)		
	Coeff.	Coeff.	p-value	Coeff.	p-value
Intercept	n/a	23.99	0.20	29.50	0.04**
STKDUM	+	6.31	0.02**	0.50	0.82
MOSDUM	+/insig	-6.49	0.11	-3.97	0.16
GICLIAB	+	0.14	0.12	0.28	0.16
STKDUM*GICLIAB	+	0.14	0.03**	-0.30	0.16
MOSDUM*GICLIAB	-	0.18	0.76	-0.15	0.62
LNSIZE	+	1.44	0.09*	1.03	0.08*
LAGLEVER	-	-0.46	0.01**	-0.52	<0.01***
OBRISK	+	2.19	<0.01***	-0.41	0.61
REINS	-	3.40	0.33	-0.01	0.80
REG_NY	-	0.46	0.85	-1.22	0.48
SEPACCT	-	-0.24	0.03**	-0.16	<0.01***
AFFIL	+	0.68	0.84	4.19	0.38
Adj. R-squared		0.17		0.18	
F-statistic		<0.01***			0.01**

STKDUM = 1 if insurer is a stock company and 0 otherwise; MOSDUM = 1 if insurer is a stock company owned by a mutual insurer and 0 otherwise; GICLIAB = guaranteed investment contract liabilities divided by total assets (in percent); LNSIZE = natural log of admitted assets; LAGLEVER = total liabilities (total assets - surplus) divided by total assets (in percent) for the period t-1; OBRISK = the number of Insurance Regulatory Information System (IRIS) ratios outside the ranges deemed satisfactory by the NAIC; REINS = reinsurance ceded divided by the sum of direct premiums written plus reinsurance assumed; REG_NY = 1 if insurer is licensed in New York and 0 otherwise; SEPACCT = separate account assets divided by total assets (in percent); and AFFIL = 1 if insurer has a group affiliation and 0 otherwise.

* p-value < 0.10

** p-value < 0.05

*** p-value < 0.01

Results for GIC Issuers – Organizational Form Variables

The 1989 results show that the stock organizational form is positively and significantly related to asset portfolio risk at the 5% level, which supports our primary hypothesis. On average, stock insurers issuing GICs maintained an incremental position in common stocks and junk bonds amounting to 4.3% of total assets held. This translates to an economically significant difference of over \$105 million worth of higher risk assets per stock insurer. The STKDUM*GICLIAB interaction term is positive and significant at the 5% level. Along with the STKDUM results, this indicates that stock insurers were taking on more asset portfolio risk than mutual insurers at all levels of GIC volume, and that the gap increases as GIC volume increases. Overall, these results provide evidence that during the 1980s and among the insurers that issued GICs, stock companies were more prone to asset substitution—that is, accumulating higher risk investments—than were mutual insurers.

The 1989 MOS coefficient is negative but not significant. The MOSDUM * GICLIAB interaction term is not significant, indicating there is no significant difference between mutual and MOS insurers in the slopes—that is, in the rate of increase in asset portfolio risk taken on as GIC volume increases. Our results support the theory of Mayers and Smith (1994) that MOS insurers should behave more like mutual insurers than stock insurers in contrast to the empirical findings of Lee, Mayers, and Smith (1997). Even though MOS coefficient results are not significant, it is close to being negatively significant at the 10% level. Another interpretation of these results is weak evidence that MOS insurers are even more conservative than mutual insurers when it comes to higher risk investments. As discussed in Mayers and Smith (1994), fixed claimants, such as policyholders and investors, have virtually no power to remove managers of MOS insurers because they do not have the right to engage in proxy fights for control of the mutual firm that appoints managers. To control the high costs of this fixed claimant-management conflict, managers of MOS firms are likely to be given even less managerial discretion over activity choices than are mutual managers, which could explain why the coefficient on the MOS variable is negative and close to being significant. We also state a note of caution about the MOS results because there are only 11 MOS insurers in our sample.

By 1998, the unique conditions causing informational asymmetries should have dissipated as regulations changed (see, e.g., footnote 6), information about GICs and junk bonds was fully disseminated, and the demand for new pension products stabilized. The incentives for stock managers to issue GICs and accept relatively greater portfolio risk should have correspondingly evaporated. Our regression using the 1998 data indicates that the stock form variable is insignificant, so stock managers were not actively substituting assets by that time. The MOS coefficient remains negative and still insignificant, as in the 1989 results.

In another regression, not reported in the tables, we combine the 1989 and 1998 data for GIC issuers and control for structural change across time as described in Wooldridge (2003, p.431). In this test, we start with the regression model in equation (1), omit the interaction terms, and add a binary variable for the year 1998, plus we interact this variable with all the other variables. The coefficients for the 1998 dummy and for interaction for 1998 dummy and stock organizational form variables are both

negative and significant at the 10% level. This provides some evidence that after controlling for unobserved structural change (that is, change not reflected by the variables in the regression) between 1989 and 1998, stock firms issuing GICs in 1998 did not take on as much asset risk as stock firms issuing GICs in 1989. These findings supply further support for our contention that stock managers were able to substitute assets in 1989, but that such a practice is not dynamically viable.

Results for GIC Issuers – Control Variables

In the 1989 results, size is positively related to higher risk investments as expected and significant at the 10% level, which is consistent with the economies of scale and transaction costs arguments. The 1989 results indicate a significantly negative relation between leverage and asset portfolio risk. These findings support the Cummins and Sommer (1996) hypothesis that managers of firms with higher capital levels are more likely to hold higher risk portfolios as they target their preferred solvency levels. The coefficient for observable risk is positive and significant at the 1% level, consistent with our expectation. The separate accounts factor is significantly negative at the 5% level, also as expected. This finding provides some support for our argument that fixed claimants can more effectively monitor separate accounts, thereby limiting managerial opportunities to engage in asset substitution through investment in higher risk assets.

The coefficients for reinsurance activity, regulation, and group affiliation are not significant in 1989. The results for the regulatory variable could be at least partially attributable to the relatively crude proxy available to us.

The results for 1998 are very consistent with those for 1989, as all but one of the previously significant control variables remain significant. The one exception is the observable risk coefficient, which indicates that managers of GIC issuers with observably higher default risk were not prone to take greater investment risk by the late 1990s.

Conclusions

Regulators, consumers, and investors are concerned about asset substitution that may be detrimental to various stakeholders. Under normal conditions, we would not expect insurer management to substitute higher risk assets without adverse effects on contracts and/or prices. Our analysis suggests that in the 1980s, a period notable for changes in pension and investment markets and lagging regulatory policies, managers were able to engage in this type of asset substitution. Future research should examine the subprime mortgage crisis and insurer holdings of those assets in the early part of the millennium.

We posit that agency theory, in tandem with the managerial discretion hypothesis, provide a viable explanation of why some managers of GIC issuers shifted risk via asset substitution while others did not. Our results provide evidence that managers of stock firms issuing GICs were more likely to accept greater asset portfolio risk during the unique period of the late 1980s. Nearly a decade later, after regulatory policies were revised and market conditions stabilized, we find no evidence of asset

substitution by managers of stock insurers. Direct tests for the effects of changes in market conditions and regulatory policies remain outside the scope of this study, but impress us as likely topics for future research.

A debate has centered around whether MOS form is more like the stock or mutual organizational form (Mayers and Smith, 1994; Lee, Mayers, and Smith, 1997). Agency theory indicates that the MOS form should at least partially mitigate managerial incentives to accept risk and, therefore, to substitute assets when market conditions allow. Our evidence suggests that MOS insurers behave more like mutual insurers, or perhaps are even marginally more conservative than mutual insurers.

Our analysis and evidence suggests that the positive theory of insurance must be developed further to explain incentive structures or regulatory regimes that can prevent insurers from accumulating relatively risky asset portfolios when market conditions are conducive to asset substitution. This study has focused on insurer asset portfolio risk. Future studies should expand the investigation to insurer underwriting portfolio risk.

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