Tax Sheltering Behavior of Property-Liability Insurers: Some Additional Evidence

CharngYi Chen

and

Richard PonArul

ABSTRACT

Past tests of the tax sheltering behavior of property-liability insurers have looked at the relation between net income and tax-exempt income. This article proposes an alternate test that uses the data on insurers' portfolio choices. The relation between insurers' equity level (policyholders' surplus to total assets) and their portfolio choice is formally derived and tested using data for California insurers. The prediction that insurers with higher equity levels will invest more in tax-favored securities is supported by the data. The test results also support the view that policyholders bear the corporate tax burden of insurers.

The portfolio behavior of property-liability insurers has been of considerable interest to researchers in finance and insurance. Hendershott and Koch (1980) and Cummins and Grace (1988) provide recent examples of such research. These authors base their models of property-liability insurers' portfolio choices between taxable and tax-exempt bonds on profit maximizing behavior. They assume that the yields from tax-exempt bonds are higher than the after-tax yields from taxable bonds for property-liability insurers. Thus an insurer will invest in taxable bonds until all the underwriting losses and other expenses are offset by the investment income from these bonds. Thereafter, the insurer will invest in tax-exempt bonds. Such a model leads to an empirically testable hypothesis that an insurer's reported net income should equal its investment income from tax-exempt bonds. The aforementioned studies, therefore, focus on testing the relation between reported net income and tax-exempt income.

In this article an alternative test for the tax sheltering behavior of property-liability insurers is proposed. Unlike the previous studies which examined property-liability insurers' bond portfolio choices by using income

CharngYi Chen and Richard PonArul are Professor of Finance and Associate Professr of Finance, California State University at Chico.

The authors thank the Associate Editor and two anonymous referees for valuable suggestions.

data, this test directly employs portfolio data. Property-liability insurers are assumed to select a mix of taxable and tax-favored securities in order to maximize the tax benefits of underwriting losses.[1] This leads to a hypothesis about the effect of the insurers' equity level (policyholders' surplus to assets ratio) on their tax sheltering behavior.

The rest of the article is organized as follows: The next section reviews the theory of property-liability insurer's tax sheltering behavior and develops the testable hypothesis. Then, the data and results of empirical tests of the proposed hypothesis are discussed. Concluding remarks appear at the end of the article.

Theory and Hypothesis

Property-liability insurers are assumed to have a choice of two classes of securities—taxable and tax-favored. The investment income from a taxable security is fully taxed, while the investment income from a tax-favored security is either partially or fully tax-exempt. As in past studies, the following market equilibrium condition is assumed: for a given level of risk, the pre-tax yield from a taxable security is higher than that from a tax- favored security, but the after-tax yield (for the insurer) from the taxable one is lower than that from the tax-favored one.[2]

To formally derive the relation between the equity level and the portfolio choice, consider a single-period model of the insurer, like the one found in Smith (1989). At the beginning of the period P dollars of premiums are written. Losses will occur and loss payments will be made at the end of the period. The following notations are used:

- X = proportion of portfolio invested in tax-favored securities
- P = total premiums collected
- s = policyholders' surplus to total premiums ratio at the beginning of the period
- S = equity level (policyholders' surplus to assets ratio) at the beginning of the period
- R_s = required rate of return for the insurer's equity
- T_e = effective tax rate for returns on tax-favored securities
- R_e = equivalent pre-tax rate of return for tax-favored securities.

If the tax-favored portion of the portfolio is entirely in municipal bonds, then T_e is the implicit tax rate defined as one minus the ratio of tax-exempt and taxable yields (see Heaton, 1986, p. 484). If the tax-favored portion is entirely

[1] Treasury bonds and corporate bonds are considered taxable securities since the interest income is fully taxable. Common and preferred stocks are considered tax-favored since only 20 percent of the dividend income is taxable. Further, in the case of common stock, a substantial portion of the return is typically in the form of capital gains. The effective tax rate on capital gains can be lowered by postponing the realization of gains. Municipal bonds are considered, in this article, as tax-favored rather than tax-exempt since their reduced yields create a *de facto* tax incidence.

[2] This assumption implies that the tax rate of marginal investors is lower than those of property-liability insurers. Heaton (1986) reports evidence to support this assumption.

in preferred and common stocks, T_e is one minus the ratio of average after-tax expected return to the average pre-tax expected return. For each insurer the value of T_e will depend on the composition of the tax-favored portion of its portfolio. The after-tax rate of return for the tax-favored portion of the portfolio will be $R_e(1-T_e)$.

The insurance contracts are assumed to be zero beta securities.[3] To simplify the model, all the financial assets in the insurer's portfolio are assumed to be zero beta.[4] The insurer's decision rule for choosing between taxable and tax-favored securities will be as described by Hendershott and Koch (1980): invest in taxable securities to the point where income from these securities just offset the underwriting losses and invest the rest in tax-favored securities. In a competitive insurance market, the economic profit for the insurer should be zero. Hence the expected income from tax-favored securities should provide the expected return for the shareholders of the insurer. At the beginning of the period $P(1+s)X$ is invested in tax-favored securities. The after-tax expected return from the tax-favored securities will be $P(1+s)XE[R_e](1-T_e)$. The required return for the insurer's equity, sP, will be $sPE[R_s]$. Thus,

$$P(1+s)XE[R_e](1-T_e) = sPE[R_s] \tag{1}$$

Since the betas of the policies and the investment portfolio are zero, the insurer's equity will be zero beta. Thus the expected rate of return for the insurer's equity, $E[R_s]$, will be equal to $E[R_e]$ and (1) will reduce to

$$(1+s)X(1-T_e) = s \tag{2}$$

By definition $S = s/(1+s)$. Substituting this into (2) and solving for X

$$X = S/(1-T_e) \tag{3}$$

and $$dX/dS = 1/(1-T_e). \tag{4}$$

As the equity level, S, increases, the proportion of tax-favored securities in the portfolio, X, should increase. If the assumption that the investment portfolio is zero beta is relaxed, the positive relation between S and X remains as shown in Appendix A.[5]

Data and Results

The data for the empirical tests were taken from the annual statements filed with the California State Department of Insurance by the insurers doing

---

[3] See Biger and Kahane (1978) for evidence to support this assumption. Later work by Cummins and Harrington (1985) found the underwriting betas to be statistically significant but small in magnitude.

[4] This assumption may be reasonable for the taxable securities which are typically corporate and treasury bonds but not for the tax-favored securities which include common stocks. However, the main result from the model does not change when this assumption is relaxed, as will be shown in Appendix A.

[5] When the zero beta assumption is relaxed, the magnitude of dX/dS will also depend on the risk premium for the taxable securities.

business in the State of California. Of the top 50 property-liability insurers operating in California, 42 are stock companies. Because the California State Department of Insurance keeps only the most recent three years' annual statements, the following variables were computed for the 42 stock insurers, from 1986 through 1988.

$$\text{EQUITY} = \frac{\text{Policyholders' Surplus}}{\text{Total Assets}}$$

$$\text{TFS} = \frac{\text{Total Investment Portfolio - Total Taxable Bonds}}{\text{Total Investment Portfolio}}$$

The variables EQUITY and TFS correspond to S and X in the theoretical model in the previous section. The break down of short term securities into taxable and tax-favored was not available. Hence the variable TFS was measured in two ways (TFS[1] and TFS[2]), with and without the short term securities. Table 1 presents the summary statistics of these variables.

Table 1

Mean and Standard Deviation*

	1986	**1987**	**1988**	**Three-Year Average**
EQUITY	0.243	0.233	0.240	0.239
	(0.083)	(0.084)	(0.094)	(0.085)
TFS[1]	0.733	0.749	0.733	0.738
	(0.186)	(0.154)	(0.158)	(0.158)
TFS[2]	0.670	0.681	0.660	0.670
	(0.201)	(0.176)	(0.168)	(0.181)

* Standard deviation in parenthesis.

[1] Short term securities treated as tax-favored.

[2] Short term securities treated as taxable.

To test how the insurer's investment in tax-favored securities is affected by its equity level, the following regression was estimated for each of the three years.

$$\text{TFS} = \alpha + \beta^{*}\text{EQUITY} \tag{5}$$

The results are presented in Table 2. The standard errors are reported in parentheses. For each of the three years the slope coefficient was positive as predicted.[6]

The following numerical example will interpret the regression results. Consider a typical insurer with $100 in total assets. Using 1986 figures for

[6]The intercept is also positive and statistically significant. This would appear to contradict Equation (3) which implies that the intercept should be zero. However, in the more general model presented in Appendix A the intercept term is positive and less than one.

Table 2

TFS = α + β*EQUITY

	Year	α	β	Adj. R^2
Short term securities	1986	0.516	0.891	0.136
treated as tax-favored		(0.085)	(0.330)	
	1987	0.583	0.713	0.127
		(0.067)	(0.272)	
	1988	0.580	0.638	0.121
		(0.064)	(0.250)	
Short term securities	1986	0.418	1.035	0.160
treated as taxable		(0.091)	(0.352)	
	1987	0.450	0.989	0.200
		(0.074)	(0.299)	
	1988	0.465	0.812	0.184
		(0.066)	(0.257)	

EQUITY and TFS^2 from Table 1, this firm will have \$67 invested in tax-favored securities and the value of its equity will be \$24.30. If there is an infusion of \$1 in surplus, the variable EQUITY will increase by 0.76. The slope of the regression is around 1. Thus there will be, approximately, a 0.76 increase in the variable TFS^2 which corresponds to an increase of \$1.44 in tax-favored securities. In addition to the \$1 from equity, an extra \$0.44 has to be invested in tax-favored securities so that the required rate of return for equity can be made available. This is consistent with the Myers and Cohn (1986) conclusion regarding policyholders absorbing the tax burden. According to equation (1), the effective tax burden, $P(1+s)XE[R_e]T_e$, increases with X.[7] Furthermore, since more of the investment income is now diverted to produce the return for equity holders, the loss coverage must decline. That is, the premium rate goes up reflecting the additional tax burden.

Conclusions

Competitive insurance markets will cause insurers to make portfolio choices that will minimize taxes. One implication of this behavior is that insurers with higher equity levels will invest more in tax-favored securities. The prediction is supported by tests using portfolio data for California insurers. The test results are also consistent with the view that the policyholders bear the corporate tax burden.

[7] With optimal tax sheltering, all of the income from taxable securities will be offset by underwriting losses. The effective tax burden will be based on the income from tax-favored securities rather than the income from taxable securities.

REFERENCES

Biger, Nahum and Yehuda Kahane, 1978, Risk Considerations in Insurance ratemaking, *The Journal of Risk and Insurance*, 45: 51–58.

Cummins, J. David and Elizabeth Grace, 1988, The Demand for Tax Exempt Bonds by Financial Institutions: The Case of Property-Liability Insurers, Working paper, Center for Research on Risk and Insurance, The Wharton School of the University of Pennsylvania.

Cummins, J. David and Scott E. Harrington, 1985, Property-Liability Insurance Rate Regulation: Estimation of Underwriting Betas Using Quarterly Profit Data, *The Journal of Risk and Insurance*, 52: 16–43.

Fairly, William B., 1979, Investment Income and Profit Margins in Property-Liability Insurance: Theory and Empirical Results, *Bell Journal of Economics*, 10: 192–210.

Heaton, Hal, 1986, The Relative Yield on Taxable and Tax-Exempt Debt, *Journal of Money, Credit, and Banking*, 18: 482-94.

Hendershott, Patrick and Timothy W. Koch, 1980, The Demand for Tax-Exempt Securities by Financial Institutions, *Journal of Finance*, 37: 1015–28.

Hill, Raymond D., 1979, Profit Regulation in Property-Liability Insurance, *Bell Journal of Economics*, 10: 172-91.

Myers, Stewart and Richard A. Cohn, 1986, A Discounted Cash Flow Approach to Property-Liability Insurance Rate Regulation, in *Fair Rate of Return in Property-Liability Insurance*, Edited by J. David Cummins and Scott E. Harrington, Hingham, Mass.:Kluwer-Nijhoff.

Smith, Michael L., 1989, Investment Returns and Yields to Holders of Insurance, *Journal of Business*, 62: 81-98.

Appendix A

The idealized balance sheet from Myers and Cohn (1986) will be used as the basis in this appendix.

Financial Assets	Policy Reserves Policy holders' Surplus (Equity Value)

The following additional notations will be used.

Beta of insurer's equity	$= \beta_s$
Beta of the tax-favored part of the portfolio	$= \beta_e$
Beta of the taxable part of the portfolio	$= \beta_t$
Rate of return for equity	$= R_s$

Rate of return for the tax-favored part of the portfolio	$= R_e$
Rate of return for the taxable part of the portfolio	$= R_t$
Risk free rate	$= r$
Rate of return for the market portfolio	$= R_m$
Loss payments at the end of the period	$= L$
The corporate tax rate	$= T_c$

The end of period value of equity should equal the end of period value of total assets less the loss and tax payments. That is,

$$\begin{aligned} Ps(1+R_s) &= (1-X)P(1+s)(1+R_t)+XP(1+s)[1+R_e(1-T_e)] \\ &\quad - \{L+T_c[P+(1-X)P(1+s)R_t-L]\} \end{aligned} \qquad -\ (1)$$

Taking expectations on both sides of (1) and noting that underwriting losses are *expected* to equal the income from taxable securities,

$$\begin{aligned} Ps(1+\mathbf{E}[R_s]) &= (1-X)P(1+s)(1+\mathbf{E}[R_t]) \\ &\quad +XP(1+s)(1+\mathbf{E}[R_e](1-T_e))-\mathbf{E}[L] \end{aligned} \qquad -\ (2)$$

where $\mathbf{E}$ is the expectations operator.

Substituting the relations $\mathbf{E}[L] = P+(1-X)P(1+s)\mathbf{E}[R_t]$ and $S = s/(1+s)$ into (2) and rearranging the terms

$$X(1-T_e) = S\,\frac{\mathbf{E}[R_s]}{\mathbf{E}[R_e]} \qquad -\ (3)$$

The beta of the insurer's equity will depend on the betas of the taxable and the tax-favored parts of its portfolio. To derive this relation, take the covariance of both sides of (1) with R_m and divide by the variance of R_m.

$$Ps\beta_s = (1-X)P(1+s)(1-T_c)\beta_t + XP(1+s)(1-T_e)\,\beta_e \qquad -\ (4)$$

Dividing both sides of (4) by Ps

$$\beta_s = \frac{(1-X)(1-T_c)\beta_t+X(1-T_e)\,\beta_e}{S} \qquad -\ (5)$$

Using the Sharpe-Lintner Capital Asset Pricing Model (3) can be rewritten as

$$X(1-T_e) = S\,\frac{r+\beta_s(\mathbf{E}[R_m]-r)}{r+\beta_e(\mathbf{E}[R_m]-r)} \qquad -\ (6)$$

Substituting (5) into (6) and rearranging terms

$$X = \frac{(1-T_c)\beta_t(\mathbf{E}[R_m]-r)+Sr}{(1-T_e)r+(1-T_c)\beta_t(\mathbf{E}[R_m]-r)} \qquad -\ (7)$$

The magnitude of dX/dS will depend on the tax rates as well as the risk premium for the taxable securities, but its sign will be positive.