

Capital Structure, Solvency Regulation, and Federal Income Taxes for Property-Casualty Insurance Companies

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ABSTRACT

The tax shields from debt financing reduce the cost of operations for firms with low cost of bankruptcy. State regulation prevents insurers from using long-term debt as statutory surplus, to ensure sufficient equity capital to meet policyholder obligations. Constraints on regulatory capital force policyholders to fund high tax costs on insurers and reduce the market forces that support solvency. Banks' risk-based capital (RBC) standards show how long-term subordinated debt can be used as secondary capital. Revisions in state regulation of capital structure may decrease premiums and give incentives to bondholders to monitor reserve adequacy. Moving to the banking RBC model benefits all parties: policyholders pay lower premiums, insurers have access to wider capital markets, and regulators gain market allies to ensure solvency.

KEYWORDS

Capital structure, solvency regulation

Regulatory constraints on capital structure and the double taxation of equity financing raise the cost of insurance and the risk of insolvency. Revisions in state regulation to bring capital standards for insurers in line with those for banks would benefit all parties: premiums would decrease, insolvencies would decline, and capital markets would optimize the use of capital.¹

If changes in capital structure made operations more efficient, firms would make the changes on their own. But statutory constraints unwittingly prevent efficient operations. Changing these constraints should lower prices and improve solvency by reducing the tax drag on insurance operations and providing financial incentives to avoid insolvency. Regulatory constraints should help markets lead to optimal capital structure.

1. Capital structure

Insurers hold capital in two places: explicitly in surplus and implicitly in gross unearned premium reserves and full value loss reserves. The advent of risk-based capital (RBC) requirements has led insurers and rating agencies to emphasize capital adequacy, reducing premium to surplus ratios. The insurance industry now has a 1 to 1 premium to surplus ratio. If the capital embedded in unearned premium and loss reserves is added to statutory surplus, the ratio is substantially lower.²

Equity financing is more expensive than debt, since interest payments are tax deductible but stockholder dividends are paid from after-tax

funds.³ Property-casualty insurers pay two layers of corporate tax on the investment income from capital funds before remitting dividends to their owners, who then pay personal income taxes.⁴ The cost of double taxation is 35% of the pre-tax investment income, or 53.85% of the after-tax investment income, on capital and surplus funds. For long-tailed lines of business, about seven cents of every premium dollar goes to the IRS.⁵

The price elasticity of demand for insurance is low, so policyholders pay the cost of holding capital.⁶ This cost is variously quantified, rang-

¹Capital structure has been a cornerstone of financial theory for fifty years, yet the reasons that firms choose more or less debt capital are still so little understood that it would be presumptuous to speak of optimal capital structure. The cost of double taxation is hard to quantify, since we cannot easily measure the effect of personal tax rates on bond vs. stock yields. Our intentions are more modest: we explain how corporate tax rates and capital market efficiency may affect premium prices and insurer solvency. The benefits of debt financing are hypotheses, not facts; they can be verified only by experience.

²A. M. Best's *Aggregates and Averages* [9] shows written premium of \$437.7 million and statutory surplus of \$438.7 million for 2005.

³Modigliani and Miller [53] set the theoretical framework for the financial theory of capital structure in perfect capital markets, with comments about tax effects. Modigliani and Miller [54] and Miller [49] expand their theory to the U.S. tax structure, with the present value of tax shields equal to 46% (now 35% after the 1986 Tax Reform Act) of the market value of debt. Miller [50] offsets the supply-side tax benefit of debt with the demand-side tax benefit of equity; see also DeAngelo and Masulis [17], who include other tax shields (such as investment tax credits) besides debt financing. Stiglitz [70, 71] builds upon the Modigliani and Miller papers and sets the current economic perspective on capital structure. See also Scott [67], Graham [29], and MacKie-Mason [42], who reframe the issues and provide further testing of the tax hypotheses. Investors' tax advantage for equity decreased with the 1986 Tax Reform Act, which reduced the maximum personal tax rate to 28% and eliminated the lower rate on long-term capital gains and retained only the deferral of the tax until the gains are realized; see Miller [51]. Personal tax rates on bonds vs. stocks diverged again in 1990 and were widened especially by the tax changes in 2004, which reduced the personal tax rates on both capital gains and stockholder dividends to 15%. See Erikson and Maydew [20] for the general framework of tax clienteles for investment analysis, and Kraus and Litzenberger [39] for a financial engineering approach to capital structure.

⁴See Petroni and Shackelford [61], who provide a financial economic analysis of capital structure for insurers. Miccolis [48] relates the cost of capital to shareholder preferences for stocks vs. bonds.

⁵The tax burden increases with the lag between premium collection and loss payment, the NAIC risk-based capital requirements and the rating agency capital adequacy standards, and the insurer's RBC ratio or capital adequacy ratio. A longer claim payment lag causes a greater implicit interest discount in the reserves with more equity capital embedded in the full value loss reserves and creating a tax drag on the policy premium.

⁶See Harrington and Doeringhaus [33] on the price elasticity of demand for auto insurance. Personal auto insurance is mandated by compulsory insurance laws or needed to meet financial responsibility statutes. Drivers apply for insurance after buying the vehicle, and the cost of insurance has little effect on their driving. Workers compensation is mandated by statute, unless the employer self-insures. Property insurance and general liability are required by banks for mortgages and business loans.

ing from double taxation on equityholder supplied funds (the minimum) to the difference between the after-tax investment yield and the cost of equity capital (the maximum). We show how this cost is quantified, and explain the arguments for the lower and upper bounds.

Regulators often presume that equity financing reduces the risks of insolvency, and the higher quality of coverage benefits consumers. The opposite may be true:

- The tax costs of equity financing raise insurance premiums and hurt consumers. Partial debt financing should reduce premiums in long-tailed lines.
- Financing with long-term subordinated debt may reduce insolvencies by providing incentives for bondholders to assess the financial strength of insurers.

2. Cost of holding capital

The cost of holding capital connects the target return on capital and the indicated premium rate. A problem with terminology has plagued many discussions of this topic. To clarify the terms, we differentiate between the *cost of capital* and the *cost of holding capital*.

- The *cost of capital* is the return demanded by the equity holders or other suppliers of capital to the firm.⁷ The cost of capital may be 8% for long-term debt, 13% for retained earnings, and somewhat higher for a new stock issue.⁸

Insurance product markets and capital markets are competitive, so policyholders pay the cost of holding capital. Myers and Cohn [57], using a narrow view of the cost of holding capital, say that policyholders pay the federal income taxes on the investment income on capital and surplus funds. This perspective on the incidence of federal income taxes has been widely accepted; see also D'Arcy and Doherty [15], Robbin [64], and D'Arcy and Dyer [16]. A dissenting view is Vaughn [76], who concludes that insurers can avoid taxes by holding taxable bonds to offset underwriting losses and growth stocks to back capital.

⁷We use the term equityholders to denote owners, shareholders, or investors. The ownership of mutual insurance companies is less clear, but as long as insurance product markets are competitive and mutual insurers are subject to the same solvency regulation, they also benefit from use of long-term subordinated debt.

⁸Financial analysts sometimes differentiate between the cost of internal equity (retained earnings) and the cost of external equity

- The *cost of holding capital* is what equity holders would lose by providing capital to the insurer were they not compensated by a profit margin in the policy premium.⁹

Double taxation is the primary cost of holding capital. Investors supplying capital to an insurer are taxed twice on the investment income on capital funds.

Illustration: An insurer needs \$100 million of capital to support its insurance operations. The opportunity cost of capital is the return its owners receive if they invest the \$100 million in projects of similar risk. The cost of *holding* capital is the difference between this cost and the return received by investment through the insurer.

- Suppose equity holders could invest \$100 million in risk-free bonds yielding a 10% return, on which they pay personal income taxes.
- If the insurer makes the same investment, it pays \$3.5 million of corporate income taxes before remitting the remaining \$6.5 million to the equity holders, who then pay personal income taxes on this return.

The cost of double taxation is the difference in the taxes incurred between (i) direct investment of capital and (ii) investment of capital through an insurer.

- The taxes paid on direct investment of capital = *investment yield* $\times$ *personal tax rate*.
- The taxes paid on investment of capital through an insurance company =

(new stock flotation). The difference is the flotation costs of a new stock issue.

⁹The cost of holding capital is not the same as the cost of capital.

- The cost of equity capital is greater than the cost of debt capital because of the greater systematic risk of equity. It is unrelated to the tax treatment of debt vs. equity.
- The cost of holding capital is greater for equity than for debt because of the tax deductible on coupon payments. It is unrelated to systematic risk.

The cost of capital is observed. The difference between equity and debt is empirical: we compare the average returns to stockholders and bondholders for the same firm. The cost of holding capital is inferred from tax law and financial friction costs related to investment of equityholder supplied funds.

- $\text{investment yield} \times [\text{corporate tax rate} + (1 - \text{corporate tax rate}) \times \text{personal tax rate}]$
- The difference is

$$\begin{aligned} & \text{investment yield} \times [\text{corporate tax rate} \\ & \quad + (1 - \text{corporate tax rate}) \\ & \quad \times \text{personal tax rate} \\ & \quad - \text{personal tax rate}] \\ & = \text{investment yield} \times \text{corporate tax rate} \\ & \quad \times (1 - \text{personal tax rate}). \end{aligned}$$

This is the after-tax difference to the equity-holder. The difference before personal income taxes is the $\text{investment yield} \times \text{the corporate tax rate}$.

3. Personal tax rates

The illustration discussed above assumes shareholders have the same tax rate on bonds and stocks. If stockholders' tax rates differ for bonds vs. stocks, we must consider both personal and corporate tax rates.¹⁰

Personal taxpayers have an average tax rate of 32% to 36% tax rate on bonds, depending on their tax bracket. The effective tax rate on common stocks depends on the holding period, the pretax yield, and the ratio of dividends to capital accumulation. The average insurance stock yields are 12% per annum, half dividends and half capital gains, and investors hold the stocks for an average of ten years before realizing gains.

In ten years, one dollar accumulates to \$3.106 at a 12% annual rate. The after-tax gain upon realization is $85\% \times (\$3.106 - \$1) = \$1.79$. The after-tax investment yield needed to achieve this gain is $(\$1.79 + \$1)^{0.1} - 1 = 10.81\%$, for an effective tax rate of $1 - 10.81\% / 12\% = 9.92\%$. Assuming a split of 50% dividends and 50% capital gains, the marginal tax rate on common stocks is $\frac{1}{2} \times (15\% + 9.92\%) = 12.46\%$.

¹⁰See Miller [50, 51] and DeAngelo and Masulis [17]. The lower personal tax rate on common stock after 2003 and the growing proportion of stocks held by tax-exempt entities (pension funds and IRAs) makes the effects important but hard to quantify.

The effective tax rate on stocks is about 12.5%. The difference from the personal tax rate on interest income is about 21.5%, and the cost of double taxation is about 13%.¹¹

4. Marginal investors

The marginal investors are the ones whose investment decisions are affected by a change in the tax rates. If the tax rate were 16% instead of 15% on stock yields, some investors would switch from stocks to bonds.

Stocks are also held by pension funds, IRAs, endowments (universities, charities, arts), and other tax-exempt investors, with the same tax rate (of zero) on bonds and stocks. The tax rates on the marginal investors in stocks and bonds affect the relative yields.

- If these are personal taxpayers, we use their tax rates for the cost of double taxation.
- If these are pension funds and IRAs, we ignore personal tax rates.

In practice, all these investors would probably switch some funds from stocks to bonds, but we do not know what percentage comes from each group.

The theory is disputed. Some financial economists use the personal tax rates. In the 1950s and 1960s, most stocks were held by wealthy individuals, and personal taxpayers were the marginal investors in common stocks.

Other financial economists reason that personal taxpayers have a comparative advantage in common stocks, whereas pension funds and IRAs have a comparative advantage in bonds. If all investors sought to optimize after-tax returns, we should see sharp boundaries between the assets held by each investor class. Personal taxpayers should hold stocks, not bonds, and pension funds should hold bonds, not stocks. In fact, both personal taxpayers and pension funds hold a mix

¹¹Other holding period, investment yields, and dividend percentages give slightly different results.

of bonds and stocks, at proportions that reflect their relative tax rates.

- If pension funds held only bonds and personal taxpayers held both stocks and bonds, personal taxpayers would be the marginal investors.
- If pension funds held both stocks and bonds and personal taxpayers held only stocks, pension funds would be the marginal investors.

In practice, pension funds and IRAs hold about half stocks and half bonds. Personal taxpayers hold mostly stocks, not bonds. Some analysts infer that pension funds and IRAs are the marginal investors in common stocks. We do not judge here which view is correct.

5. Empirical data

Tax rates change often. The table below shows the highest tax bracket personal tax rate on interest income and stockholder dividends, the personal tax rate on long-term capital gains, and the corporate tax rate since 1980.¹²

Personal Tax Rates			
Years	Interest/ Dividends	Capital Gains	Corporate Tax Rate
< 1982	70%	28%	46%
1982–1986	50%	20%	46%
1987	39%	28%	40%
1988–1990	28%	28%	34%
1991–1992	31%	28%	34%
1993–1996	40%	28%	35%
1997–2001	40%	20%	35%
2002–2003	36%	20%	35%
2004	36%*	15%*	35%

*In 2003, the personal tax rate on stockholder dividends became 15%, the same as the rate on capital gains.

¹²See Scholes et al., [65], page 75. The effective tax rates are more complex, for several reasons.

- Taxes on capital gains are deferred until the gains are realized. The effective tax rate depends on the holding period. Capital gains passed to heirs are not taxed at all.
- After 1986, the alternative minimum income tax applies to higher income personal taxpayers, reducing the tax advantages of tax exempt securities.
- Many personal taxpayers derive investment income from tax advantaged vehicles, such as pension plans, IRAs, life insurance, and variable annuities.

The large variations in the tax rates on stocks vs. bonds and corporate vs. personal tax rates should cause changes in firms' capital structures. The tax advantage of common stocks over bonds for personal taxpayers was great before 1981, fell to almost zero in 1986–1990, and rose to a new high in 2004. The Tax Reform Act of 1986 should have caused an increase in debt leverage, and the 2004 reduction of the effective tax rate on stocks should have caused a decrease in debt leverage.

The empirical data are inconclusive. The tax rates change, and debt leverage stays about the same.¹³ Other influences on capital structure are strong, and the lack of empirical evidence for the effects of personal income taxes is not conclusive.¹⁴

We do not specify the cost of double taxation in this paper. It is probably between 15% and 25%; some financial economists would say it is as low as 12.5% or as high as 30%.¹⁵

If policyholders paid this money directly to equityholders, this would be the full cost of hold-

Tax advantaged investment vehicles and the alternative minimum income tax reduce the tax advantages of common stock over bonds. The effect on pretax yields depends on who are the marginal investors. Tax economists differ. We do not try to resolve the issue in this paper.

¹³Some analysts believe the empirical evidence supports the theory; others infer the opposite. A range of views is provided by Peles and Sarnat [60]; Trzcinka [75]; Ang, Peterson, and Peterson [3]; Poterba and Summers [62]; Buser and Hess [11]; and Ang and Megginson [2]. The published literature shows little clear support for the effect of personal tax rates on capital structure.

¹⁴Some financial economists believe that corporate taxpayers are sensitive to the tax rates on their investments, but personal taxpayers are much less sensitive. This view accords with some anecdotal evidence: many personal taxpayers do not understand the tax implications of alternative investment strategies whereas firms are more likely to focus on after-tax returns. But this view is hard to justify by economic theory. Personal taxpayers deal with numerous complex investment issues, and taxes should be no exception.

¹⁵Vaughn [76] implies that the cost of double taxation is zero for insurers. If insurers were to follow his investment recommendations, "on average, expected underwriting losses will offset expected realized capital gains. Provided that all equity returns come as capital gains, and tax credits can be carried forward or back, the insurer's expected tax bill will be zero...The present value of expected insurance company tax is zero. The DCF insurance premium is given by the present value of expected losses and expenses—there is no need to adjust the DCF premium for insurance company tax or tax shields."

ing capital. But policyholders do not pay equityholders directly. They pay this money as part of the premium, and the insurer remits the money to the equityholders. This adds another layer of tax, since the policy premium is pretax and the dividends to equityholders are post-tax.

If the personal tax rate is the same on bonds and stocks, the needed margin in the policy premium, as a percentage of the investment yield on equityholder supplied capital, is

$$\begin{aligned} & \text{investment yield} \times \text{corporate tax rate} / \\ & (1 - \text{corporate tax rate}) = \\ & \text{investment yield} \times 35\% / (1 - 35\%) \\ & = \text{investment yield} \times 53.85\%^{16} \end{aligned}$$

If personal tax rates are 12.5% on common stocks and 34% on bonds, the needed margin reduces to $\{1 - [(1 - 35\%) \times (1 - 12.5\%) / (1 - 34\%)]\} / (1 - 35\%) = 21.27\%$.¹⁷

Double taxation affects capital; the money paid by policyholders is a margin on premium. The needed margin is $\text{capital} \times \text{investment yield} \times 53.85\% / \text{premium}$. If the premium is paid at policy inception and the average tax is paid at midyear, the needed margin is

$$\text{capital} \times \text{investment yield} \times 53.85\% / [\text{premium} \times (1 + \text{investment yield})^{1/2}]^{18}$$

There are other potential costs to holding capital, which are subject to considerable debate in the financial community.¹⁹

¹⁶ $(1 - 35\%) \times (1 + 53.85\%) = 100.00\%$. The pretax return must be grossed up by 53.85% so that the after-tax return is the same.

¹⁷See Miller [50] or any corporate finance textbook for this formula.

¹⁸The corporate tax return is filed by March 15 after the tax year, but the estimated taxes are paid quarterly.

¹⁹Atkinson and Dallas [6] say the cost of holding capital is the difference between the cost of capital and the insurer's after-tax investment yield. Their view is common among life actuaries and some property-casualty actuaries, but it is not prevalent in the financial community.

Illustration: Suppose the cost of equity capital is 12% per annum, and the insurer invests in 8% Treasury securities. The cost of double taxation is $35\% \times 8\% = 2.8\%$. The additional cost of holding capital from the insurer's conservative investments is $12\% - 8\% = 4\%$.

- The total cost of holding capital is $2.8\% + 4\% = 6.8\%$, which policyholders must pay to induce equityholders to fund the insurance operations.

The costs of double taxation are not unique to insurers; all firms pay more for equity than for debt capital. It is not clear why some firms use more debt than others, though it appears that firms with a high *cost of bankruptcy* tend to avoid debt.²⁰

The cost of bankruptcy is the cost of the bankruptcy process, not the loss that causes the bankruptcy. The high loss costs of natural catastrophes precipitate insolvencies; the loss costs themselves are not the *result* of the insolvency.²¹

The cost of bankruptcy stems from regulatory requirements for the insolvency process or specialized assets that lose their value in an insolvency. Attorneys' fees, court costs, research and development, patents, copyrights, customer lists, and future sales to existing customers are examples.²²

- Since the policyholders pay this money through the profit margin in the premium, which is taxed as underwriting income, the additional premium is $6.8\% / (1 - 35\%) = 10.46\%$.
- If the premium is paid at policy inception and the taxes are paid (on average) at midyear, the profit margin is $10.46\% / 1.08^{1/2} = 10.07\%$.
- The needed profit margin in the premium is 10% if the premium to capital ratio is 1 to 1 and 5% if the premium to capital ratio is 2 to 1.

Some analysts argue that corporate managers with discretionary control over excess capital may not invest it solely in the interests of equity holders. They cite examples from various industries, such as the oil industry in the 1970s, to show that managers often use excess capital to increase market share at the expense of profitability. Investors may be reluctant to provide more capital than is essential for the company's operations. The agent-principal problems are important for capital structure, but they are difficult to quantify.

²⁰For the mainstream view of debt-to-equity ratios, see Baxter [8], DeAngelo and Masulis [17], Harris and Raviv [34], Dhaliwal, Trezevant and Wang [18], and Fama and French [21]. Graham [31] provides a recent review.

²¹The loss costs that lead to insolvency are included in the expected return on invested capital. The costs of bankruptcy are the costs that would disappear if the same firm—at the same level of financial distress—were not declared bankrupt. See Haugen and Senbet [35], who first clarified this distinction.

²²Altman [1], Gilson, John, and Lang [27], Opler and Titman [59], and Hotchkiss [36] provide empirical data showing the costs of bankruptcy for firms. Warner [77] shows that the costs of bankruptcy are small for medium to large firms, such as most insurers. Warner does not quantify the indirect costs of bankruptcy, but these franchise costs are not large for insurers. Solvency regulation may create a cost of bankruptcy. An insurer whose capital falls below 35% of risk-based capital requirements may be liquidated, and the remaining capital may be used up in the liquidation process. But insurance solvency considers adjusted RBC surplus as a ratio to capital requirements, not the insurer's timely payment of

- Firms whose assets are diminished in bankruptcy (specialized machinery, research and development, patents and innovations) tend to avoid debt.
- Firms whose assets can be transferred without loss (real estate, warehouses, office buildings) tend to use more debt.²³

Illustration: Investors in a biotech startup spend \$100 million to develop a genetic medication. If the firm becomes insolvent, the entire \$100 million is lost. Investors in a hotel spend \$100 million to buy beach-front properties and build a resort. If the hotel becomes insolvent, the properties may be converted to condominiums.²⁴

Financial assets do not lose value in bankruptcy. Bonds and stocks can be sold without loss. Insurers' fixed assets are office buildings that can be used by any firm. The only assets lost in bankruptcy are the intangible *franchise costs*, such as the better quality of renewal business and the value of a direct writing distribution system. These assets are smaller than the franchise val-

debt coupons. The costs of insurance insolvency may not affect an insurer's desire to use debt, were it available.

²³Capital structures differ by industry, not just in the U.S. but in other countries as well. Empirical studies of capital structures by industry include Bradley, Jarrell, and Kim [10], Long and Malitz [41], Titman and Wessels [74], Smith and Watts [69], Gaver and Gaver [25], and Rajan and Zingales [63]. The debt-to-equity ratios appear correlated with the costs of bankruptcy; see Titman [73], Bradley, Jarrell, and Kim [10], Titman and Wessels [74], and Maksimovic and Titman [43].

The trade-off theory of capital structure is the mainstream view. But the costs of bankruptcy are rarely more than 3% of total capital and seem too small to justify the avoidance of debt capital; see Warner [77] and Tirole [72]. Myers [55] has suggested an alternative *pecking order theory*. This perspective accords with the discomfort that some managers express for debt, but it is not easily testable, does not explain differences in debt-to-equity ratios by industry, and assumes sub-optimal economic behavior. Myers [56] reviews the capital structure theories in light of more recent studies. Behavioral theorists relate capital structure to principal agent problems; see Jensen [37], Kim and Sorensen [38], Maksimovic and Zechner [44], Friend and Lang [24], and Martimort and Lafont [45]. The behavioral incentives are strong, but they can justify both debt and equity financing. See Tirole [72], page 51: "Debt is often viewed as a disciplining device, especially if its maturity is short. By definition, debt forces the firm to disgorge cash flow... By taking cash out of the firm, it prevents managers from "consuming" it. That is, it reduces their ability to turn their "free cash flow" into lavish perks or futile negative net present value investments."

²⁴Failing hotels are often sold to new management. Most of the capital invested in the hotel is preserved. In contrast, high-tech firms that fail may have no salvage value.

ues of pharmaceutical and high-technology firms that rely primarily on equity financing.²⁵

6. Debt and insurers

The low cost of bankruptcy for insurers makes them ideally suited to use debt instead of equity capital. The tax shields from debt capital comprise about 7% to 10% of the value of firms with low costs of bankruptcy.²⁶ But most insurers hold no debt on their own.

- Other firms need cash for plants, equipment, or research and development. Insurers have ample cash, since they collect premiums before they pay losses. They need equity to ensure they can fulfill long-term promises to policyholders.
- The cash from debt is offset by a liability to bondholders, so equity does not increase.

The advantages of debt capital for insurers are borne out by empirical evidence. Some insurers issue debt as capital or surplus notes or by holding companies and affiliates.

- Capital and surplus notes must be approved by regulators.²⁷ Interest and principal repayments are limited by statutory earnings or subject to the discretion of regulators. The uncertainty of coupon payments discourages creditors from funding these notes.
- Debt issued by holding companies is frowned upon by regulators. Insurers use round-about methods, preventing their use for solvency monitoring.

Illustration: An insurer with \$2 billion of surplus and a low RBC ratio seeks \$500 million of new capital. Issuing new stock with an expected

²⁵Commercial lines insurers using independent agents have insignificant costs of bankruptcy. The major personal lines direct writers are low-risk firms who benefit greatly from debt financing. If the renewal business is sold to another insurer, even the franchise value is not entirely lost.

²⁶The estimate is from Graham [30]. The present value of the tax shields from debt financing are 35% of the market value of the debt. The average debt-to-equity ratio is about 25%, so debt is 20% of total capital, and the present value of the tax shields is $20\% \times 35\% = 7\%$.

²⁷Surplus notes are generally restricted to mutual insurers.

cost of 12% per annum has drawbacks:

- Transaction costs are high.²⁸
- Shareholder dividends are paid from after-tax funds.
- A new stock issue often causes the stock price to decline.²⁹

The insurer may lose \$50 million from transaction costs and the decline of its stock price, and it incurs \$32.3 million of additional taxes each year.³⁰

Issuing debt avoids these drawbacks, but the cash from the debt issue does not raise the RBC ratio. Instead, the insurer sets up a holding company that issues \$500 million of debt. Transaction costs are low and the insurer's stock price does not decline. The holding company gives the \$500 million of cash to the insurer, increasing its statutory surplus.³¹

Using holding companies to issue debt circumvents state regulation. Regulators do not control debt issues by holding companies, which are not subject to insurance regulation.³² Insurers have

²⁸Transaction costs are lower for debt because investments are larger: \$100,000 to \$10 million of debt vs. \$10,000 to \$100,000 of stock. Even low-cost brokers take 2% to 3% of the stock price as their fee.

²⁹Investors see *seasoned equity* issues (in contrast to initial public offerings) as evidence that management believes the stock is overvalued. They reason that "if the stock is not over-valued, why is the firm selling shares?" The resulting decline in the stock price may be one-third of the new equity issued. New debt issues are viewed as positive signals by investors, and may lead to an increase in the stock price. They reason that managers must believe the firm will be profitable if they are willing to incur fixed coupon obligations. Managers spend much effort to dispel the negative implications of a seasoned equity issue. Investors presume that managers act for their own interests or for the interests of existing shareholders, not for new investors. See Asquith and Mullins [4] on price declines for seasoned equity issues and Myers [55] on the interests represented by managers.

³⁰The insurer must earn $12\% / (1 - 35\%) = 18.46\%$ on the new capital to pay the stockholder dividends. The additional taxes are $(18.46\% - 12\%) \times \$500 \text{ million} = \$32.30 \text{ million}$. Investors also pay transaction costs to buy the stock, which lowers the stock price received by the firm.

³¹The text is simplified to highlight the accounting logic, not the details. The mechanics of debt issue by holding companies is more complex.

³²The NAIC has a holding companies model act, but the regulatory reach of the states is limited. Loans between parents and subsidiaries can generate problems in defining debt vs. equity; see McDaniel, McMahon, and Simmons [47], pages 151–152.

financial incentives to use debt, which ultimately benefits policyholders. We should structure state regulation to optimize these benefits, not to eliminate them.

7. Debt and consumer promises

Some regulators presume that debt cannot support long-term policyholder promises. Loss payment patterns for workers compensation and commercial liability lines of business last many years. If the debt matures before the claims are settled, the cash from the bond is returned to bondholders and is not available to pay claims.

Bank regulation belies this presumption. Banks also make long-term promises to consumers, and insolvencies void these promises.³³ The same logic applies to banks as to insurers. But bank regulation allows *long-term subordinated debt* as Tier II capital for risk-based capital purposes.³⁴

³³Insurance policyholders, like bank depositors, are consumers who provide funds in exchange for promises. Individual promises made by insurers are more risky, but the aggregate promises made by banks are more affected by interest rate movements. Leverage ratios reflect these individual and aggregate risks.

- Banks' promises are limited to the deposits plus accumulated interest. Banks do not become insolvent by withdrawal of funds (if interest rates do not change), though they may have to call in loans. Insurers' promises to property-casualty policyholders are capped only by policy limits that are generally 100 times (or more) the annual premium.
- Banks' depositors can withdraw their funds, often by simply writing a check, so banks are sensitive to changes in interest rates. Policyholders cannot withdraw funds once they are paid as premiums, unless they cancel the policies. Interest rates changes have dampened effects on solvency, since losses are inflation sensitive. (Life insurance policyholders, who have access to the account values on permanent life insurance, are more similar to bank depositors.)
- Insurers have about a 2 to 1 reserves to surplus leverage ratio, so each dollar of debt is backed by 50¢ of capital. Banks have about a 10% to 20% surplus ratio, depending on their mix of business.

These differences may affect solvency monitoring, not the tax advantages of debt.

³⁴The tax treatment of interest payments on subordinated debt depends on the relation of stockholders and bondholders and the payment terms of the debt coupons. See *P. M. Finance Corp v. Commissioner*, 302 F.2d 786 (3d Cir. 1962): shareholder loans were deemed to be equity because the loans were subordinated to all "present and future bank loans." In contrast, *Jones v. United States*, 659 F.2d 618 (5th Cir. 1981) upheld the debt status of loans even though state regulations required subordination to policyholder claims.

- If the debt matures within five years, only a pro rata portion counts as capital.
- The bond indenture says that depositors' claims come before bondholder claims.

Capital requirements for banks issued jointly by the comptroller and the Federal Reserve (before the banking risk-based capital requirements were developed) defined subordinated debt as secondary capital and the Basel accords continue this definition.³⁵ The debt included in secondary capital reduces 20% for each year after the fifth year before maturity. Long-term subordinated debt is now part of Tier II capital for the banking and risk-based capital requirements, and is phased out on a straight-line basis over the last five years before maturity.³⁶

8. Debt and solvency

Some regulators presume that even if long-term subordinated debt can support promises to insurance policyholders, debt leaves an insurer weaker than equity financing. They reason that debt raises the bankruptcy risk for other firms, so it should raise the insolvency risk for insurers. "Solvency regulation is enhanced by all-equity financing," say these regulators.

The contrary may be true. Equity financing creates disincentives to preserve solvency, whereas debt financing creates the mechanism for better solvency monitoring.³⁷ Capital markets

evaluate a firm's long-term solvency more efficiently than state regulators do, since creditors have a financial incentive to accurately anticipate defaults.³⁸

If a distressed insurer is financed solely by equity, managers and shareholders have incentives to hide the financial problems and assume even greater risks.

- A distressed insurer that becomes insolvent is worth nothing to shareholders and causes managers to lose their jobs.
- Large gains from risky operations may return the firm to solvency, with all gains going to managers and shareholders.
- Large losses leave it as bankrupt as it was before, with no additional cost to managers or shareholders and all losses borne by policyholders and claimants.³⁹

centives to accept more risk when they are financially distressed. Debt financing leads bondholders to write indentures that limit the firm's ability to assume more risk. Policyholders share bondholders' perspective, not shareholders' perspective.

³⁸State regulators have incentives to judge domestic insurers leniently, lest state jobs and tax revenue be lost. The tendency of some regulators to overlook financial distress of domiciled insurers stimulated the mandatory sections of the risk-based capital model act.

³⁹The frequent complaint that actuaries underestimate loss reserves reflects these incentives. If reserves seem deficient, company actuaries have incentive to protect their employers (and their jobs) by taking an optimistic view of ultimate loss costs.

Shareholders of a distressed firm with deficient loss reserves reason: "If we admit that loss reserves are understated and we are liquidated by the state, we lose our investment. If we say the reserves are adequate and pursue risky but potentially profitable operations, we may return the firm to profitability."

In many cases (perhaps most cases), the shareholders' decision is simpler. Holding full-value loss reserves for a long-tailed line of business may cause statutory insolvency or a failure to meet the risk-based capital authorized control level, even though the insurer has more than adequate capital to meet its policyholder obligations. Full-value reserving standards with high capital requirements create powerful economic incentives for good managers to circumvent state regulation.

An actuary faced with a large reserve deficiency might reason similarly: "If I refuse to sign the Statement of Opinion because the held reserves are too low, another actuary will sign. If I sign the Opinion and the insurer stays solvent, I retain my position and may advance in the firm." The actuarial guidelines are vague; reserves must be reasonable, but reasonable depends on the actuary's perspective.

These incentives have distorted actuaries' perspective on their work. To rationalize underestimates of loss reserves, some actuaries say losses are inherently volatile and reserve estimation is a difficult art. But loss volatility and the art of reserve estimation do not cause dozens of skilled professionals to consistently understate reserves.

³⁵Nonperpetual preferred stock is treated like long-term subordinated debt, since it has many of the same characteristics: (a) long maturity, (b) after primary debt but before common stock in bankruptcy claims, (c) no stock voting rights.

³⁶On Basel II risk-based capital standards, see Chorafas [12] and Gup [32] for regulatory and practitioner perspectives. Ong [58] is of mixed quality, with several insightful chapters. French, Stark, Cave, and Feid [23] is a good up-to-date summary for U.S. depository institutions. For a pre-Basel perspective on capital structure for banks, see Scholes and Wolfson [66]. The five-year *cliff pattern* is not optimal (even for banks), since it creates refinancing problems. A better alternative is a gradual decline that allows rolling debt; see below in the text.

³⁷Shareholders of a financially distressed firm with negative equity may prefer high-risk actions with low or negative net present values that have a small probability of restoring the firm's financial health. Bondholders prefer low-risk strategies that minimize their loss upon insolvency. Firms financed entirely by equity have in-

9. Bondholders and policyholders

Insurers differ from other firms in the risk-taking incentives for shareholders. Financially distressed firms, with negative equity and a high probability of bankruptcy, have incentives to assume high-risk projects. But a distressed firm financed entirely by equity, with no debt to bondholders or banks, has no cash. It is bankrupt now, and makes no investments.

Insurers may have much cash from policyholders, even with negative equity and no debt financing. Ferrari [22] likens policyholders to bondholders:

- Bondholders provide cash at explicit interest rates which are repaid to each bondholder.
- Policyholders provide cash at implicit interest rates (the negative underwriting profit provision), which are repaid to those policyholders who suffer losses.

Bondholders monitor firms' financial strength and write indentures to limit excessive risk-taking.⁴⁰ Policyholders are naive bondholders. They buy policies (provide cash) with little or no direct consideration of the insurer's reserve adequacy or solvency risks. They rely on regulators, agents, and rating agencies to ensure their policies are enforced.⁴¹ As Vaughn [76] notes, many policyholders are further protected by state guarantee funds, so they have little incentive to monitor insurers' financial strength.

⁴⁰On the use of bond indentures (covenants) to limit risk-taking and deceptive behavior by managers and shareholders, see Smith and Warner [68], Asquith and Wizman [5], Crabbe [13], Bae, Klein, and Padmaraj [7], and Leland [40]. As explained below in the text, better firms encourage balanced bond covenants, since it lowers bond coupon rates.

⁴¹Most policyholders lack the expertise to evaluate insurers' solidity. They have neither the data nor the training to evaluate reserve adequacy and reinsurance arrangements. Even for large policyholders, the costs of solvency monitoring exceed the benefits. Bondholders monitor solvency when they lend millions of dollars for thirty years. Policyholders lending \$100,000 for two or three years will not spend \$50,000 to evaluate the insurer's financial strength.

But regulators and agents are poor substitutes for direct solvency monitoring. States lose jobs and premium taxes by declaring domiciled insurers insolvent. An independent agent loses income by avoiding weak insurers, and an exclusive agent's livelihood depends on writing business for the insurer.⁴²

If insurers are financed by long-term subordinated debt, bondholders and bonds underwriters have incentives to keep the insurer solvent. Bondholders are policyholders with the incentives and ability to monitor insurance solvency. They would write indentures that prevent insurers from excessively risky operations that jeopardize their funds.⁴³

To qualify as RBC capital, the debt must be subordinated to policyholder claims, as reflected by loss and unearned premium reserves. If an insurer becomes insolvent, insurance claims—including IBNR claims—take precedence over bondholders' claims. Regulators have several years to liquidate, rehabilitate, or sell the insurer and settle the claims before bondholders can withdraw their capital.

- Short-term debt cannot support long-term policyholder promises, since the debt matures during the year or two needed for regulators to investigate a distressed insurer.
- Nonsubordinated debt cannot support policyholder promises, since the debt takes precedence over unsecured claims.
- Long-term subordinated debt can support insurance liabilities just as they support bank liabilities.

⁴²Rating agencies have a complex but symbiotic relation with insurers. The rating agencies demand high-equity capital, raising premiums for policyholders, reducing returns for shareholders, and creating onerous requirements for insurers. But insurance managers gain from strict rating agency capital requirements. The high requirements raise barriers to entry to the insurance industry, protecting incumbent insurers against upstarts who might lower rates. They ensure that shareholders provide enough capital and few insurers become insolvent, protecting the jobs of existing managers.

⁴³Similar bond indentures are common practice in other industries. A maximum debt-to-equity ratio is one of the most common provisions in bond indentures.

10. Solvency monitoring

The *sine qua non* for using long-term subordinated debt as capital is that bondholders (or their representatives) can monitor the company's reserve adequacy and withdraw their debt capital if the firm fails preset standards, such as the RBC authorized control level.

- The debt is subordinated, so it remains secondary to policyholder claims.
- Since the capital does not meet the RBC authorized control level, regulators may liquidate the firm. The equity capital pays policyholder claims if it is sufficient. The debt capital covers any deficiencies.⁴⁴
- If the regulator decides not to liquidate or rehabilitate the insurer, the bondholders withdraw their capital. The insurer would surely fail the RBC authorized control level with only its equity capital, and the onus of insolvency falls on the regulator. Few regulators would take this responsibility; they would prefer to liquidate the insurer while the debt capital supports policyholder claims.

If bondholders catch financial distress before equity is depleted, the insurer pays reserves with the funds backing them. They have incentive to catch insolvencies as soon as possible, to avoid losing their own funds. If actuaries can monitor reserve adequacy reasonably well, the probability of policyholders losing from insurance insolvencies is low.⁴⁵

Senior insurance managers fear insolvency more than policyholders, regulators, shareholders, or bondholders. Senior managers lose their jobs in an insolvency and rarely find comparable positions elsewhere.⁴⁶ Bondholders who independently monitor reserve adequacy, and who

can force liquidation of the insurer if it fails the RBC authorized control level, provide powerful incentives for the insurer to avoid risky scenarios. Managers would avoid excessive concentrations of risky exposures and maintain high premium to surplus ratios. Insurers that become impaired would be liquidated before their debt capital is withdrawn, and policyholders would not lose.

Bondholders would want insurers to maintain a cushion of equity to ensure the safety of their funds. The bond indenture may require that the insurer maintain equity of at least 50% of total capital (a debt-to-equity ratio of 100% or lower), with actuarial reserve estimates performed by the bond underwriters (or other representatives of the bondholders) to ensure the 50% cushion. If equity drops below 50% of total capital, bondholders recall their capital, the insurer falls below the RBC authorized control level, and the equity pays policyholder claims. Claims not covered by equity are paid by debt funds, which are subordinated to policyholder claims. The result is effective solvency monitoring, since the bondholders have strong incentive to avoid insolvency and can force liquidation of the insurer if sufficient capital is not preserved.

Strong bondholder rights protect well-managed insurers and prevent fraudulent insurers. The bond market is efficient, so bondholders neither gain nor lose by additional rights. If bondholders cannot withdraw their capital when the insurer falls below the mandated debt-to-equity ratio, they charge high coupon rates and have no incentive to monitor the insurer's solvency. If they can withdraw their capital, insurers avoid excessive risks, keep an equity cushion to retain their debt capital, and bondholders charge lower coupon rates.⁴⁷

⁴⁴If the financial distress is caught before the insurer becomes insolvent, no debt capital is lost.

⁴⁵Regulation is most efficient when it enables market incentives. State regulators should specify that long-term subordinated debt serves as RBC capital only if bondholders or their representatives may monitor reserve adequacy.

⁴⁶See Gilson [26] and Gilson and Vetsuypens [28] for managers' cost of bankruptcy.

⁴⁷Current state guarantee funds have the opposite effect. Well-managed insurers pay the insolvency costs of risky and fraudulent insurers. Unethical insurance managers have incentives to treat insurance as Ponzi schemes: selling policies below cost, expanding their books of business, paying themselves handsome salaries and generous pensions, relying on guarantee funds to protect their policyholders, and letting other insurers pay the guarantee fund assess-

Optimal capital structures would be determined by the capital markets. States prescribe the rights of bondholders and the insurers who issue bonds, such as subordination and solvency monitoring rights. The free market determines the debt-to-equity ratios.⁴⁸

- If the insurer uses too much debt, it would not meet the debt-to-equity ratio conditions in the bond indentures.
- If the insurer uses too much equity, the cost of holding capital (double taxation) would make it less competitive.

The optimal capital structure reduces policy premiums and the risk of insolvency. Regulators determine the basic structure, such as the type of debt that can serve as RBC adjusted surplus, and competitive capital markets ensure minimal cost to policyholders.

11. Debt refinancing

Long-term subordinated debt creates problems during the years before maturity. If the debt must have a remaining maturity of at least five years to qualify as RBC capital, an insurer financed by a 30-year bond issue may not have sufficient capital the last five years.

Two ways to avoid this problem are debt refinancing and rolling maturities.

(1) Insurers may refinance their debt as it loses its status as RBC capital. The constraints on debt capital complicate the refinancing, since the in-

ments. When the states introduced guarantee funds, insurance insolvencies increased ten-fold; see Wilcox [78]. Insurance managers have the expertise to anticipate risky behavior and choose business strategies to avert insolvency. Insolvency regulation should place the costs of insolvencies on managers who cause them, not on the well-performing managers who avoid risky behavior. See Cummins [14] for the incentive effects of guarantee funds.

⁴⁸The banking industry shows a dramatic example of risk-based capital requirements and capital structure. Until October 21, 1996, banks had issued no trust preferred stock, since it was uncertain whether it would be considered regulatory capital by the Federal Reserve Board. When the Fed allowed trust preferred stock as regulatory capital on October 21, 1996, banks issued billions of dollars of trust preferred stock in the following weeks.

surer is in a weak negotiating position. Several refinancing methods are possible:

- The insurer buys back the bonds in the open market. But bondholders know that the insurer must refinance the bonds, and they might demand a high premium.
- The insurer might include a call provision for the last eight years of the bond's life. But callable bonds require higher yields, reducing the value of debt capital for insurers.
- The bond indenture may specify an arbitration procedure to gauge the fair value of the bonds. This assumes an equitable arbitration procedure can be arranged.⁴⁹

(2) Refinancing debt adds to expense, offsetting some of the tax benefit. As an alternative, RBC capital may limit debt in the years before maturity to specified percentages of the insurer's surplus. For instance, debt in the last N years before maturity might be limited to $5N\%$ of the insurer's surplus. The insurer may issue debt with rolling maturities, so that no more than 5% of its surplus matures each year.

12. Debt and taxes

Debt capital has almost no costs of double taxation. The investment income from fixed-income securities held by the insurer pays the interest on its own debt. Insurance markets are competitive, so the savings are passed on to policyholders as lower premiums.⁵⁰

The tax savings on debt are partly offset by higher personal income tax rates on interest income vs. equity income. For personal taxpayers owing insurance company stock, this difference

⁴⁹Capital markets are innovative, and more efficient refinancing methods may develop. For instance, insurers might pay a third party to assume the debt, using the proceeds of a new debt issue to pay the assumption costs. Mortgage brokers have developed dozens of refinancing plans, even for homeowners in financial straits. We presume the capital markets will develop efficient refinancing techniques for insurance bonds.

⁵⁰A small part of the savings would pay the risk premium on the subordinated debt issued by the insurer, since the debt is not risk-free. For most insurers, the risk premium would not be great.

is about 21%; for tax-exempt investors (pension funds, IRAs, and endowments), this difference is zero. It is hard to measure the exact tax gain from debt financing.⁵¹

13. Hybrid debt

Long-term subordinated debt enables banks to combine the tax advantages of debt with the capital advantages of equity. This paper argues that insurers are like banks, and if their capital were not constrained to equity by RBC requirements, insurers would find the same advantages in long-term subordinated debt. The logic suggests that nonfinancial firms may find similar advantages in financing with the tax attributes of debt but the flexibility of common stock. Hybrid debt securities are long-term subordinated debt with equity-like features.⁵² They are attractive to firms that cannot afford the restrictions of senior debt or the high costs seasoned equity issues.⁵³

Coupon payments on hybrid debt are tax deductible, since the coupons are obligatory if the firm is financially healthy and the debt has no voting rights or similar equity attributes. If the firm does not meet specified earnings ratios, the coupon payments may be postponed, sometimes up to five years without triggering bankruptcy. The cumulative coupon payments precede stockholder dividends: if the firm did not pay the coupons one year, it must make up the missed coupons and pay the current coupons before paying shareholder dividends. In this regard, hybrid debt is like surplus notes, except that the trigger for postponing a coupon payment is an account-

ing ratio, not the insurance regulator's determination.⁵⁴

In other respects, hybrid debt resembles equity, giving the issuer operating flexibility and freedom from strict coupon obligations and principal repayments. The stated maturity is long; issuers have used 100-year debt and 1000-year debt.⁵⁵ But the effective duration is often medium term, relying on:

- Call protection for ten years, followed by periodic call dates (such as every five years).
- Step-up coupon increase after ten years of perhaps 100 basis points.⁵⁶

Hybrid debt, long-term subordinated debt, and surplus notes are similar solutions to a common problem. Adapting the solutions in one industry to parallel problems in another industry benefits both firms and their consumers.⁵⁷

14. Conclusion

Armchair theorists dispense advice to businessmen, deriving optimal this and optimal that from financial theorems. They view themselves as wise philosophers amid muddling practitioners. But their advice is rarely wise, since it emerges uncooked from recipe books, not baked in the oven of experience.

We have tried to steer clear of these errors. Our quarrel is with armchair regulators, who set capital structure for insurers by fiat and harm the constituents they aim to protect. We have no quarrel with insurers themselves, who use holding com-

⁵¹One might presume that insurers optimize their capital structure by selling bonds to tax-exempt investors. In efficient markets, prices depend on marginal investors. We don't know the marginal investors for insurance companies, so we cannot easily quantify the tax savings.

⁵²For the GAAP and tax accounting of hybrid debt securities, see Engel, Erikson, and Maydew [19], Mills and Newberry [52], and Maydew [46].

⁵³New equity incurs double taxation and may also cause a sharp drop in the stock price.

⁵⁴Evolutionary biologists say that structural and behavioral similarities among unrelated species show adaptations arise independently to meet biological niches. Organs with similar functions evolve independently because the features have adaptive advantages. Similarities among surplus notes, long-term subordinated debt for banks, and hybrid debt for nonfinancial firms show how capital structure can be improved by combining the tax attributes of debt with the flexibility of equity.

⁵⁵One thousand-year hybrid debt was issued in 2005 by Dong, a Danish utility.

⁵⁶The debt may have an 8% semiannual coupon for ten years. After ten years, the issuer may pay 9% semi-annual coupons or call the bond.

⁵⁷The similarity of hybrid debt to long-term subordinated debt used as RBC capital was pointed out to me by the *Variance* reviewer.

panies and affiliates to escape the inefficient regulation. Insurers are wiser than we are, since their wisdom reflects actual experience raising capital.

Our goal is not to prescribe capital structure for insurers, but to unleash the wisdom of the market. We examine the capital structure of banks and the bond indentures written by creditors to learn how other industries deal with long-term financial obligations. We do not tell insurers how to structure their debt vs. equity. The capital markets are efficient, and the financial interests of contracting parties force optimal capital structure.

Some regulators see their role as decision makers. To protect consumers, they override the dictates of the market. Some current regulation, such as state guarantee funds, lowers the costs of risky behavior and increases insurer insolvencies. Other regulation, including the requirement of equity financing, raises policyholder premiums and leaves shareholders and regulators to avert their eyes from failing insurers. Better regulation is more circumspect, channeling market incentives to the managers who can best use them. Unregulated markets may be harsh on the weak, but poorly regulated markets may be harsher on them.

Capital markets are more efficient than state planners. Regulators should maximize the incentives for insurers to reduce costs to policyholders and provide accurate information to equityholders and creditors who have the greatest incentives to ensure solvency. If capital markets are not impeded by undue regulation, they serve as the most efficient control on insurance operations.

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