THE RELATIONSHIP BETWEEN NET PREMIUM WRITTEN AND POLICYHOLDERS' SURPLUS

RAYMOND W. BECKMAN AND ROBERT N. TREMELLING II

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DISCUSSION BY G. L. COUNTRYMAN

Mr. Beckman and Mr. Tremelling conclude from historical evidence that the premium—surplus relationship is unstable and does not show long-term trends. They further conclude that policyholders' surplus has been the volatile element of the ratio primarily because of fluctuations in the stock market.

The conclusion that the relationship has been historically unstable requires some sort of criterion against which stability can be compared. That is, stability—and instability—are relative concepts, and become meaningful only when viewed in the context of some standard or norm. No stability criterion is suggested by the authors.

Characterizing the premium—surplus ratio as unstable may be inappropriate. A review of the historical data presented in Exhibit I of the authors' paper shows that the ratio has varied from about .8 to about 1.7 between 1928 and 1971. In the context of Mr. Thomas Morrill's statement in the June 1970 report on profitability and investment income to the National Association of Insurance Commissioners cited in the authors' study, the variations in the ratio seem quite modest. Mr. Morrill states there is a rule of thumb which sets ". . . $2.00 of premium written for each dollar of surplus as conservative, three or four dollars of premium as safe, but beyond that caution should be observed." Thus, the ratio has fluctuated within very narrow limits when compared to the range of adequacy suggested by Mr. Morrill.

Mr. Morrill's statement raises another issue. If a 2/1 ratio is conservative, why have stock companies historically operated at lower ratios? The authors do not address themselves to this issue.

In controversy with the authors' conclusions, the historical data also suggests a modest long-term trend. It would appear there is a gradual increase in the premium—surplus ratio under way. If the mid-1940's is used as a dividing line, it seems clear that the relationship has drifted up-

ward and may be, on the basis of the most recent evidence, shifting markedly upward.

This tentative conclusion is reinforced by the authors themselves. By forecasting premium writings and policyholders' surplus separately, the authors conclude that by 1976 the relationship may go as high as 2.1 and exceed 2.5 by 1980. If the authors' simple extrapolations are at all valid, it seems that the relationship is expressing a trend that is long-term in character and represents a marked departure from history. The authors fail to identify this experience as a long-term trend and offer very little rationale as to why the relationship is moving towards entirely new levels.

One possible rationale for this upward trend in the premium—surplus relationship may be a more widespread recognition that the Industry is over-capitalized. This rationale leads to what I believe is the more interesting question, which is not what the premium—surplus ratio is, but what the relationship ought to be.

What the relationship ought to be is of interest to many. It is of interest to investors and financial managers because it is a measure of financial leverage and is therefore important in forecasting the level and stability of returns on funds committed to the enterprise. It is of interest to regulators because they are obligated to monitor and assess companies' financial strength. Further, it is of increasing concern to regulators in their attempts to measure profitability. In their report on *Measurement of Profitability—Property and Liability Insurance,* regulators in the New York Insurance Department recognize that premium—surplus ratios play an important role in assessing a firm's profitability.[1] They do not suggest what the relationship should be, but recognize its importance.

The authors do not evaluate what the relationship ought to be. They only attempt a forecast based upon current trends in premium writings and surplus.

Beyond the normal hazards of forecasting from historical evidence, there is the danger that such forecasts will focus on the wrong sources of change. In the authors' case, forecasts are made almost as though premium and surplus levels are influenced only by factors that are beyond the con-

[1] This report was prepared by New York Insurance Department staff and was presented at a hearing in December 1972. Reference is made to the importance of the premium—surplus ratio on pp. 11—14 of their report.

trol of insurance company managements. It is likely over the long term, particularly for the individual company, that premium—surplus relationships are largely within the control of company management. After all, management has the means to loosely control premium growth. Moreover, through pricing, underwriting, investment, and dividend policies, company managements can also, to a degree, control surplus growth. To the extent both premium and surplus levels are within the control of company managements, future premium—surplus relationship will be more responsive to what management perceives the relationship ought to be and less responsive to investment and underwriting uncertainties.

To suggest that management can control the premium—surplus relationship is about the same thing as saying that management can control the firm's capital structure. Theoretically, the optimum capital structure, assuming favorable long-run underwriting results, is a maximum amount of leverage subject to the constraint of adequate surplus necessary to assure solvency. Saying it another way and ignoring the earnings instability arising from leverage, the optimum capital structure will be that which provides the highest premium—surplus ratio but which still assures solvency.[2] What the optimizing ratio ought to be is a difficult question. Certainly it will be different for different companies under various circumstances. A less ambitious question is simply to ask whether or not it is likely stock companies are currently operating at generally optimizing premium—surplus levels.

One way to look at the problem is to asses the contributions to surplus and demands on surplus in a static state under conditions of maximum adversity. During any one annual period there is a nearly certain expectation that contributions will be made to surplus from fixed income securities held and derived from both reserves and surplus. On the other hand demands will be made on surplus arising out of capital losses and unprofitable underwriting performance. Further, premium growth during the period will also make demands on surplus because of gross unearned premium reserving.

[2] Professor Ferrari, in his paper entitled, "The Relationship of Underwriting, Investment, Leverage, and Exposure to Total Return on Owner's Equity", *PCAS*, Vol. LV, 1968, pp. 295—302, suggests that variability in the earnings effects of leverage maximization may modify this notion of the optimal capital structure. Professor Ferrari points out that stable earnings will be capitalized at a higher value than unstable earnings. Thus, evaluation of optimum capital structures should not only consider leverage but also the earnings instability it imposes.

The amount of surplus needed during one annual period can be given by the simple expression:

$$S = E\,R\,(P - P/G) + I_{cl} + U - I_p - I_s$$

Where:

S = policyholders' surplus
E = prepaid expense ratio
R = unearned premium reserve ratio
P = premium
G = premium growth rate
I_{cl} = unrealized capital loss
I_p = net investment income derived from underwriting operations
I_s = net investment income derived from policyholders' surplus
U = statutory underwriting loss

Let's assume some very adverse circumstances:

1. An underwriting loss equal to 15 percentage points of premium.
2. A decline in market value equal to 25 percent of the equity securities held.
3. Premium growth during the annual period of 10 percent.
4. Interest income from fixed interest securities held and arising out of underwriting operations equal to .03 of premium.
5. Interest income arising out of fixed interest securities associated with surplus equal to .025 of surplus.

Since Best's Aggregates and Averages shows that companies' investment in equity securities are about equal to surplus, it is possible to express all of the values in the above equation in terms of either surplus or premium:[3]

[3] Best's Aggregates and Averages shows that during the most recent five-year period the value of equity securities held for all stock companies combined have averaged about 1.08 of policyholders' surplus with very little variation from year to year.

$$
\begin{aligned}
E &= .3 \\
R &= .5 \\
G &= 1.1 \\
I_{cl} &= .25S \\
I_p &= .03P \\
I_s &= .025S \\
U &= .15P
\end{aligned}
$$

By substitution the equation yields:

$$
\begin{aligned}
S &= .172P \\
\text{or} \quad P &= 5.8S
\end{aligned}
$$

If the assumptions are conservative approximations of maximum adversity, it seems possible stock companies are not optimizing their premium—surplus relationships and hence their capital structures.

Of course, the static case has substantial limitations. For example, it is possible that a series of annual periods could collectively produce surplus demands exceeding those illustrated in the static case. To assess this possibility what is needed is an exhaustive analysis of optimal capital structures using a stochastic model of ruin.

The static case is presented here only for purposes of raising serious questions about whether or not the industry is generally optimizing its capital structure. It is not intended to suggest that 5/1 or 6/1 is the right relationship for all companies or for any individual company. I agree with the authors that each company must be considered separately. It would seem, however, that the static case does demonstrate the possibility of over-capitalization.

This possibility should be of interest to regulators, industry management, investors, and policyholders alike. If it is true, financial managers and investors have an opportunity to enhance returns on funds committed to the enterprise. Moreover, regulators and policyholders need not be alarmed if there is a gradual increase in the premium—surplus relationship. In theory, increased leverage will yield higher returns to investors thereby stimulating capacity and causing insurance services to be provided at lower cost.

In the last part of their paper, the authors attempt to show why the premium—surplus relationship ". . . is not completely accepted, cannot

be consistently applied, and in several respects is illogical." The authors' arguments may be summarized as follows:

1. Calculations of premium—surplus relationships are inaccurate for an individual company which is a member of a group.
2. The appropriate premium—surplus relationship is dependent upon the nature of the firm's operations and its historical performance.
3. It is difficult to obtain a satisfactory premium—surplus relationship that satisfies all interested parties because stockholders will prefer a high premium—surplus relationship while policyholders and regulators will prefer a low ratio.
4. Different relationships will apply to stock and mutual companies.

I generally agree with these arguments. However, they do not suggest to me that the premium—surplus relationship is not useful. Rather, they only suggest that the relationship should be calculated and applied with care and discretion. I believe the relationship is particularly useful to assess, as I have pointed out, whether or not the Industry is generally over-capitalized.

Finally, I believe the authors have presented an interesting review of the whole subject of premium—surplus relationships and think they have made a valuable contribution in setting the subject into historical perspective. I hope the authors' paper will stimulate actuarial research into this important area of insurance companies' financial structures.

DISCUSSION BY DAVID J. GRADY

Messrs. Beckman and Tremelling have addressed themselves to a question which is of fundamental importance to the insurance industry. The determination of the appropriate relationship between net written premium and policyholders' surplus could provide a key to the problems of pricing, profitability and capacity.

The authors provide a brief summary of the current rules-of-thumb by which regulatory authorities test the adequacy of policyholders' surplus. They point out that the formulas employed today are not the result of