

Brainstorms

by Stephen W. Philbrick

In my last column, I considered two approaches for calculating rates of return for lines of business with differing riskiness. Jim Gant picked up the challenge and added his own thoughts on this issue. His letter is reproduced below. I have added some comments in square brackets.

The "Brainstorms" column in the November 1996 issue of the Actuarial *Review* sparked my interest, and I would like to offer my own thoughts on a key rate of return issue. Should a riskier line of business require a higher rate of return or a higher leverage ratio?

Mr. Philbrick correctly points out that there is a non-trivial difference in the associated implied profit margins given a choice between requiring twice as large a return and twice as large a capital allocation, due to the contribution of the investment income earned on the supporting capital. We can add a second contributing factor that also makes a non-trivial difference, and that is the contribution of the investment income earned on the premium written by line. When this is done, I think that the choice implied in choosing either a higher rate of return or a higher leverage ratio becomes more clear.

Let us suppose, in Mr. Philbrick's original example, three additional assumptions:

1. the company can earn 6 percent after-tax on the invested capital;
2. the company writes \$100 of premium in each line; and
3. the company can earn 7 percent after-tax on reserves as a percent of premium.

[So you don't have to pull out the original article, the original assumptions included:

- Two lines of business, Line A and Line B
- Line A is twice as risky as Line B
- The entire company requires \$150 in capital]

For the moment, let us consider

Under Case 1, the profit provisions for Line A and Line B become, \$11.53 and (\$12.31). The provisions change to \$9.23 and (\$10.00) under Case 2. Next assume the reverse, that the riskier line generates

Should a riskier line of business require a higher rate of return or a higher leverage ratio?

that the lines generate equal reserve volumes and require similar adjustments so that the investment income generated by both equal 7 percent of premiums. Let us label the choice in which we allocate capital equally between the lines as Case 1, and the choice in which we allocate capital differentially as Case 2. Under Case 1, the implied profit provisions for Line A and Line B are \$5.35 and (\$6.15) respectively. Under Case 2, the provisions are \$3.08 and (\$3.85) in the same order.

[The values shown reflect a conversion to pre-tax at a tax rate of 35 percent. For example, if I need a return of \$15.00 for Line A, the investment income at a rate of 6 percent on \$75 of capital provides \$4.50, and the investment income at a rate of 7 percent on premium of \$100 provides \$7.00, so I only need $\$15.00 - \$4.50 - \$7.00 = \3.50 as an after-tax profit margin, or \$5.35 before-tax.]

Now let us vary the investment income by line assumption. First, assume that the riskier line has less investment income potential, say, 3 percent of premiums, while the less risky line generates 11 percent of premiums from invested reserves.

11 percent of premiums from invested reserves while the less risky line returns 3 percent. The results for Case 1 and 2 become \$(0.77) and \$0, and (\$3.08) and \$2.31.

The last case is an exception to a more general result. If we allocate capital varying leverage ratios in proportion to risk, the implied profit provisions by line are less disparate than if we allocate the same amounts of capital and require higher rates of return in proportion to risk. Whether or not less disparity in profit provisions is a desired result may be the key question, that is more important to answer as a practical matter than which method is more theoretically correct.

My thanks to Mr. Gant for his contribution, which will help address the question of whether allocation of surplus to line is required, or can be accomplished by adjusting leverage ratios.

Stephen W. Philbrick, FCAS, is a consulting actuary with Tillinghast Towers Perrin in Westogue, Connecticut. ■