between U/P and P/S. It describes the case when the rate of underwriting return U/P is so low that the desirable written premium to surplus ratio P/S is equal to zero.

DISCUSSION BY ROBERT A. BAILEY

Mr. Ferrari has illuminated the relationships among return on equity, return on assets, and return on sales with simple formulas. These simple relationships provide valuable insight and should be helpful to anyone who must make meaningful decisions as to the future course of an insurer, in underwriting commitments, investments, and prices.

Mr. Ferrari's formulas illustrate the effect of leverage — the relationship of premiums and liabilities to shareholders' equity — and have thereby enabled him to pose the important problem of the optimum capital structure for an insurer.

His formulas lead to two significant conclusions:

(1) Capacity depends on profits. If the net result from underwriting plus the investment gain from the investable portion of the insurance reserves is a profit, capacity will increase. If it is a loss, capacity will decrease. (Of course, profits may also be dependent on capacity — too much capacity leading to reduced profits in a competitive market.) The correct measurement of investment returns from funds attributable to the underwriting operation is therefore of critical importance to the management of an insurer.

(2) The optimum capital structure, assuming a profitable result from underwriting and the underwriting portion of investment income, is a minimum of capital and a maximum of leverage. In fact, if it is possible, the optimum capital is less than zero. Mr. Ferrari suggests that variability of earnings introduces an opposing tendency to maximize capital in order to stabilize earnings, because stable earnings are capitalized at a higher rate than variable earnings. According to this theory the optimum capital structure is attained at some mid-point between the opposing tendencies to maximize leverage and to maximize stability of earnings. However, this restraint on attaining maximum leverage applies only if the insurer is an independent entity. This restraint is largely eliminated if the insurer is owned by a holding company that holds other enterprises in addition to insurance.

A holding company can treat its insurance operation like a separate

account, separate from its other operations. This separate account would contain only enough assets to equal the insurance liabilities. The profits on those assets would be included in the total result of the insurance operation. If the total result is a profit, the profit would be paid out of the insurance account into the holding company's funds. A net loss would require a payment into the insurance account from the holding company's funds.

Stripping away all the corporate structures and looking at the holding company as it is in reality, we would see several operations, one of them insurance, plus perhaps an air line, a television station, a leasing operation, a manufacturing operation, and so on. Each one would be operated as a separate account, with the cash flow from one account used to finance the cash needs of another, and with temporary losses in any account being covered by profits from others. The shareholders' equity required for such a holding company as a whole would be less than the sum of the shareholders' equities required if each account were operated independently.

The holding company could build an insurance operation without any additional shareholders' equity by using the already existing equities in the other accounts as security for the insurance operation. Putting the corporate structure back into the picture, the financial statement of the insurance subsidiary would show assets in excess of liabilities, but all of that excess, and perhaps more, would be represented by notes, bonds, and stocks issued by affiliates, plus real estate and equipment leased to affiliates, and deposits in affiliated banks.

The higher the marginal cost of debt financing by the holding company, the greater the financial advantage of using the insurer's assets to finance the cash needs of the holding company, the greater the investment return to the holding company on the insurer's assets, and the larger the underwriting loss that would be considered a break-even point for the insurer by the holding company. In other words, as the leverage of the holding company increases, the tendency is for the insurer's investments to become more speculative, and the underwriting policy to become more aggressive.

The only restraints on the amount of the insurer's assets used to finance the other operations of the holding company are the insurance investment regulations of the states, which vary considerably from state to state, and in some cases do not provide adequate restraints against misuse of an insurer's assets by a holding company.

A holding company would measure the riskiness of the insurance portfolio not in relation to the capital and surplus of the insurer but rather in relation to the earning stream and resources of all the operations included in the holding company.

With a large diversified holding company in the picture the actuarial problem of the expectation of ruin for the insurer, and the related restraints on investment policy and underwriting policy, become less significant, and the proper allocation of investment profits to the insurance account assumes major significance for the decision makers. And the optimum leverage becomes more than an actuarial problem. It becomes a question of social policy.

Mr. Ferrari is to be complimented on expressing complex relationships in simple mathematical terms and for an original contribution of great significance in analysing insurance profits and capital structure.