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## NAIC "EARLY WARNING SYSTEM" FOR LIFE AND HEALTH INSURANCE COMPANIES

by William Gould

An "Early Warning System" for Life and Health insurance companies has been developed by an NAIC Committee of state insurance department personnel, with some assistance from an industry advisory committee. (The group is known formally as The Life and Health Regulatory Task Force of the A-3 Computer Application Subcommittee).

The system is based on a set of "Regulatory Tests" and involves the calculation of various "test ratios" for each company, based on published Annual Statement data. The purpose of the system, as stated in a Users' Manual prepared by the NAIC committee, is "to help the various state Insurance Department identify the life and Health companies most likely to experience financial difficulties, so that the departments' resources for in-depth analysis and on-site examination of companies can be focused on these companies."

As a member of the advisory group, I believe some information on this subject may be of interest to readers of *The Actuary*.

The NAIC program of Regulatory Tests for Life and Health companies was instituted in 1972 on an experimental basis, beginning with a set of ratio tests based on statement data for 1972. A somewhat similar program of ratio tests for Property and Liability companies had been instituted in 1971, based on statement data for 1971.

The 1972 battery of Life and Health Regulatory Tests was found to be inordinately complicated, and a major revision was effected for 1973. The 1973 tests were continued for 1974, and are being continued again, with some additions, for 1975. The tests for 1975, i.e., based on the 1975 statement, will comprise 12 tests that measure various aspects of the company's financial condition and stability. For each test, bench marks for determining *Exceptional Values* — those test results considered most likely to signal potential financial difficulty — have been established.

The Users' Manual ("Using the Early Warning System Regulatory Tests" — 1975 Edition) states that these values were established by comparing past test results for insolvent and solvent companies. Actually, the determination of these bench marks has necessarily involved a considerable degree of judgment. It seems to me that the statistics in this area are too scanty and inconclusive to support a reliable measure of test results.

Under the present rules, the Regulatory Test results are treated as confidential and are made available only to state Insurance Departments and, on an individual basis, to each of the companies involved. It has been suggested that the rules be broadened to make Regulatory Test information available to the members of the Boards of the various state Life and Health Guaranty Associations; it is stressed that no lessening in the responsibility of the State Insurance Departments should be inferred from this proposal.

### Description of Tests

Of the 12 regulatory tests, Tests 1-7 are categorized as "Financial Tests" and Tests 8-12 as "Stability Tests". Quotations indicated in the following descriptions are taken from the Users' Manual. Statement specifications refer to the 1975 NAIC Life and Health Blank.

#### Test 1: Change in Surplus

*Numerator:* Increase in Capital and Surplus, from prior to current year.

*Denominator:* Prior year's Capital and Surplus.

This test is described as "the most general measure of the improvement or deterioration in the company's financial position." *Exceptional Values* are those less than or equal to minus 10%, or greater than or equal to 50%.

#### Test 2: Net Gain to Total Income

*Numerator:* Net Gain from Operations after dividends to policyholders and after federal income taxes (Page 4, Line 31).

*Denominator:* Total Income (Page 4, Line 7).

"Net gain is a conservative measure of the company's profitability." *Exceptional Values* are those less than or equal to zero.

#### Test 3: Commissions and Expenses to Premium

*Numerator:* Commissions and Expenses (Page 4, Lines 21 and 22)

*Denominator:* Premiums and Annuity Considerations (Page 7, Col. 1, Line 20a)

"The ratio of total commissions and general insurance expenses to premium measures one of the key elements in profitability." *Exceptional Values* are those greater than or equal to 60%.

#### Test 4: Investment Yield

This is the ratio of net investment income to mean assets, as shown in Exhibit 2, Line 8. The Manual states that "The investment yield is another key element in the company's profitability." *Exceptional Values* are those less than or equal to 4%, or greater than or equal to 9.9%.

#### Test 5: Nonadmitted to Admitted Assets

*Numerator:* Assets Not Admitted (Exhibit 13, Col. 3, Line 26)

*Denominator:* Admitted Assets (Exhibit 13, Col. 4, Line 26)

"This test measures the degree to which the company has invested in nonadmitted assets, which may represent either nonproductive or risky investments." *Exceptional Values* are those greater than or equal to 10%.

#### Test 6: Real Estate to Capital and Surplus

*Numerator:* Real Estate (Page 2, Line 4)

*Denominator:* Capital and Surplus (Page 3, Line 30)

(Continued on page 5)

This is a new test (not used for 1974). It indicates the proportion of capital and surplus that is invested in real estate. *Exceptional Values* are those equal to or exceeding %.

**Test 7: Investment in Affiliates to Capital Surplus**

*Numerator:* Stocks and Bonds of Parents, Subsidiaries, and Affiliates (Schedule D, Page 29, Line 29, Col. 6; Line 47, Col. 3; and Line 65, Col. 3)

*Denominator:* Capital and Surplus (Page 3, Line 30)

This is a new test (not used for 1974). *Exceptional Values* are those equal to or exceeding 100%.

**Test 8: Change in Premium**

*Numerator:* Increase in Premiums and Annuity Considerations (Page 4, Line 1, current year minus prior year)

*Denominator:* Premiums and Annuity Considerations for prior year

"This test is the percentage change in premium from the prior to the current year." *Exceptional Values* are those greater than or equal to 50%, and less than or equal to minus 10%.

**Test 9: Change in Product Mix**

Results of the "change in product mix" test represent the average change in the percentage of total premium for each product line during the year. The product lines are those defined on Page 5 of the annual statement. To calculate this test result, the percentage of premium from each product line is first determined for the current and the prior years. Next, the difference in the percentage of premium between the two years is determined for each product line. Finally, the total of these differences — without regard to sign — is divided by the number of product lines to determine the change in the percentage of premium for the average product line. *Exceptional Values* are those greater than or equal to 3.0%.

**Test 10: Change in Asset Mix**

The "change in asset mix" test is calculated in the same manner as the change in product mix. The test result represents the average change in the percentage of total cash and invested assets for the classes of assets in the first 10 lines of Page 2 of the annual statement. *Exceptional Values* are those greater than or equal to 5.0%.

**Test 11: Change in Reserving Ratio**

*Numerator:* Increase in aggregate reserve for policies and contracts with Life contingencies (Page 5, Line 17, Col. 2 and 3).

*Denominator:* Single and renewal premiums and considerations (Exhibit 1, Lines 10d and 19d, Cols. 2 and 3).

The change in the "reserving ratio" is the number of percentage points of difference between the reserving ratio for the current and the prior years. For each of these years, the reserving ratio is equal to the aggregate increase in reserve for individual Life insurance expressed as a percentage of renewal and single premiums for individual Life insurance.

Positive test results indicate an increase in this ratio from the prior year; negative results indicate a decrease. *Exceptional Values* are those greater than or equal to 10 percentage points, and less than or equal to minus 20 points.

**Test 12: Change in Management**

*Numerator:* The number of officers and directors shown on Page 1 of the current annual statement who were not shown in the prior annual statement.

*Denominator:* The number of officers and directors shown on Page 1 of the current annual statement.

This is a new test (not used for 1974). If an individual is both an officer and director, he is counted only once. *Exceptional Values* are those equal to or exceeding 25%.

**Observations**

Some personal observations may be in order.

A study made by McKinsey and Company in 1974 with regard to the Life and Health Regulatory Tests had proposed adoption of a "priority companies" system, similar to one in effect for the NAIC Property and Liability Solvency Tests. Under this proposal, companies would be categorized as "priority companies" or "non-priority companies", based on a prescription identifying a priority company as one whose test results showed *Exceptional Values* for three or more tests.

The NAIC committee decided, at the time, not to adopt the proposed "priority companies" system for Life and Health companies. It was felt that the problem of identifying companies that may be approaching financial difficulty is much too complex to be solved by any mechanical procedure based on the number of *Exceptional Values* that may be indicated for a particular company.

In my own view, it would be more realistic to regard the finding of an abnormal or exceptional value for any test as cause for an examiner to study the reasons or circumstances for such a finding and to consider whether further scrutiny may be needed.

Since these Regulatory Tests are so relatively new, the efficacy of the Early Warning Systems for Life and Health insurers has yet to be demonstrated in practice. Be that as it may, the 1974 report by McKinsey and Company on "Strengthening the Surveillance System" appeared to place great reliance on these Early Warning tests. I think the tests can be very useful tool to the examiners to a limited degree, but it is important to be aware of the limitations of the tests.

None of the tests purports to reflect or detect dishonesty, presumably because no one has been able to devise such a test. And yet the McKinsey Report acknowledged that "Among Life companies, the main cause of insolvency has been dishonesty."

A basic weakness of the present program of Regulatory Tests is that no tests are included to evaluate the strength of the reserves held. It is because of the absence of such tests of reserve strength that the original characterization of the program as "Solidity Tests" was changed to the present designation of "Regulatory Tests".

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Letters

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Multiple Decrement Probabilities

Sir:

I was delighted to see the note by Walter B. Lowrie in your October 1975 issue.

It has puzzled me for some twenty odd years (not continuously), why anyone would want to use the formula

$$q_x^{(1)} = \frac{q_x^{(1)} (1 - \frac{1}{2} q_x^{(2)})}{1 - \frac{1}{4} q_x^{(1)} q_x^{(2)}}$$

and then in effect multiply the result by

$$(1 - \frac{1}{4} q_x^{(1)} q_x^{(2)})$$

so that  $q_x^{(1)} + q_x^{(2)}$  might equal

$$q_x^{(1)} + q_x^{(2)} - q_x^{(1)} q_x^{(2)}$$

In 1962, I submitted an actuarial note covering essentially the same ground as Mr. Lowrie did; but it was rejected by the Committee on Papers because, among other things, it did not contain "sufficient original new material of reasonable value"; of course, at the time there was only the *Transactions*, *The Actuary* not having been born (though conceivably conceived). Since in all cases at least one of the decrements was bound to relate to a force other than that of mortality, this was clearly not a matter of life and death, and so I pursued it no further.

In any event (as I pointed out in my note) the general formula, assuming uniform distribution of each single decrement over the year of age, was devel-

oped on page 32 of *Life and Other Contingencies* by P. F. Hooker and L. H. Longley-Cook (1957) as

$$q_x^{(1)} = q_x^{(1)} - \frac{1}{2} \sum q_x^{(2)} + \frac{1}{3} \sum [q_x^{(2)} q_x^{(3)}] \dots$$

where summations apply to all modes of decrement except (1) whence for two decrements only

$$q_x^{(1)} = q_x^{(1)} (1 - \frac{1}{2} q_x^{(2)})$$

Walter Riese

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Actuaries in Literature

Sir:

"If to make predictions by methods of scientific accuracy is illegal, then the actuaries of Amalgamated have been guilty for years in that they predict the exact percentage that will die each year in any given large group. I predict death retail; the Amalgamated predicts at wholesale," declares Dr. Pinero, hero of "Life-Linc", a short story written in 1939 which begins Robert Heinlein's recently-published anthology *The Past Through Tomorrow*. This science fiction yarn centers around Dr. Pinero's amazing discovery of a fool-proof method to determine a living person's date of death. If you are thinking this would be disastrous for the life insurance industry, Heinlein's fictional actuaries concur, refusing to underwrite anyone consulting the doctor. They can't control anti-selection on withdrawal however, and surrenders skyrocket.

Eventually the industry, unable to secure a favourable court ruling compelling him to cease, hires a gangster to murder him and destroy his machinery. Of course this behaviour could only occur in a science fiction story, as the Guides to Professional Conduct clearly proscribe such action.

Dennis Corrigan

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Sir:

For those interested in references to actuaries in literature, I submit the following, from a book of boyhood reminiscences, called *The Worcester Account*, by the late playwright S. N. Behrman.

"Before I even entered the synagogue, I began to visualize what was going on Above on the Day of Atonement: the All-Seeing, like a celestial Actuary, a kind of immense Mosaic statistician, graving prophetic casualties onto some vast double-entry ledger of stone, with a quill that was a gleaming and pointed pillar of quartz."

James E. Hoskins

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EDP

Sir:

"I sure would like to use our (valuation, pricing, modeling, etc.) system but I am not confident of the results" is a statement that I heard made by four different actuaries (three pension and one non-pension) at the Bal Harbour meeting of the Society of Actuaries. At that same meeting in an open forum on the Society's Syllabus of Examinations there was much discussion of attempts to incorporate EDP concepts in the Associateship examinations. One reason given for this not having been done is that no

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NAIC "Early Warning System" For Life and Health Insurance Companies

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If some convenient method of testing reserve strength could be devised that would be reasonably accurate but not too laborious, it would be a significant and valuable addition to a testing program designed to identify companies approaching financial distress. Unfortunately, there seems to be no simple way to test reserve strength from the data published in the Annual Statement. Various approximations based on data shown in the Annual Statement have been considered but have been found wanting as too crude and inappropriate for the purpose. Nevertheless, it seems important to try to

develop information which would enable an Insurance Department to make an informed assessment of the adequacy of reserves and the adequacy of surplus for the company under review.

I think it is very easy to exaggerate the significance and effectiveness of these tests in prognosticating insolvencies. I regard the tests as being primarily designed to alert the examiners to situations which may warrant further scrutiny. The success of the system will depend ultimately on the ability and determination of the examiners who will be using it. □