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GENERAL

- A. What methods have been developed to facilitate the calculation of deficiency reserves arising because of graded premiums or policy fees with respect to female lives and in other situations?
- B. To what extent are dividends and premium rates determined by a company's own mortality or morbidity experience?
- C. What problems do the recent increases in nonmedical limits pose for the smaller company?
- D. Have the High School Mathematics Contests helped the smaller companies to obtain actuarial personnel? What promotional or other activities are they undertaking in relation to such contests?

MR. LOUIS WEINSTEIN: The United States Life has a three-year setback for females and uses a band system for gross premiums. We use the seriatim method for valuation and all valuation punch cards have the male equivalent age in them.

The gross annual premium used in the calculation of deficiency reserves is the premium applicable to the particular band in which the policy falls. We do not make any special adjustment for mode and therefore assume all policies are payable annually.

The actual calculation of deficiency reserves is done in the normal way with liability factors, gross premiums, and net premiums taken at the set-back age for females.

MR. GEORGE E. IMMERWAHR: The valuation of deficiency reserves is complicated when gross premiums per \$1,000 vary by size of policy, and also when premiums vary by sex without a corresponding differential in reserves. Our method has its simplest application with net level and commissioners reserve valuation methods, but it may be adapted to other methods.

At Monumental Life, the break point, that amount of insurance above which the gross premium is less than the valuation premium, is determined and recorded in a reference table for each plan, sex, and age at issue. For each individual policy above the break point for its plan, sex, and age, a duplicate policy punch card is made. The essential information on each of these cards is carried over to a valuation file of corresponding cards, to each of which is added, before the end of the first year, certain simple constants appearing in the following valuation formula:

$$W_v = (P - G) (F_v - H_v \cdot N_s),$$

where y is the attained age, z the age at the end of the premium paying period, P and G are the net and gross premiums of the policy, and

$$F_v = \frac{1}{2} (\ddot{a}_{v-1} + \ddot{a}_v - 1)$$

$$H_v = \frac{1}{2} \left(\frac{1}{D_{v-1}} + \frac{1}{D_v} \right).$$

The valuation file must be kept up to date, or brought up to date at the end of each year, at which time the valuation is performed simply by totaling the constants $(P - G)$ and $(P - G) \cdot N_x$ for each attained age, and applying these totals to the variables F_v and H_v to obtain the company's deficiency reserve.

For a company which, as we do on certain plans, grades from CRVM into net level in fifteen years, the formula is quite a bit more complicated but nevertheless is still on an attained age basis.

MR. MELVIN L. GOLD: I have come across an interesting problem in deficiency reserves. The valuation went from CRVM to net level and instead of having deficiency reserves in the early years and none thereafter there were no deficiency reserves for about ten years and then they began. I wonder if any one else has encountered this problem.

MR. J. STANLEY HILL: As to section B, the Minnesota Mutual prepares its own mortality tables and, since the exposures at other than the middle ages are rather small, we use a credibility device for weighting into an accepted standard select and ultimate table. The resulting table is one which depends rather heavily on company mortality where there are statistically sound reasons for depending on it, and on intercompany mortality where the exposure is less. The credibility formula insures a smooth grading.

Concerning section D, the Twin City Actuarial Club has for three years sponsored the contest in the State of Minnesota jointly with the Minnesota Section of the Mathematics Association of America. Prior to that sponsorship the contest drew around 2,000 entries and it now draws over 10,000.

The results have been well worth the effort. The sponsorship is now financed by the Minnesota Academy of Science, but the club is still active in promoting it. It sends bulletins to every high school in the State. Members of the club are assigned to all of the high schools which can be reached conveniently. This is a very convenient method for becoming well acquainted with the principals and the mathematics instructors of the various high schools. This year the club is having a recognition luncheon for the top-scoring students in the Twin City area.

MR. RALPH E. EDWARDS: The Middle Atlantic Actuarial Club has worked with the Mathematical Association of America for about five years in promoting the High School Mathematics Contest.

The club offers 35 copies of some book to top ranking students. A student qualifies for a prize either on the basis of his individual score or by being among the top three students in a high school whose average top score is among the highest.

Each student taking part in the contest receives an announcement of the prizes being awarded. This announcement contains a brief description of actuarial opportunities and is sent to the school when the enrollment is acknowledged.

I think it is too early to know how effective this program is in enlarging the number of prospective actuaries.

MR. JOHN H. MILLER: The contests have very definitely helped the smaller companies in obtaining actuarial personnel. While the smaller companies may feel unable to offer elaborate summer work programs, fellowships and scholarships, or to engage in extensive campus recruiting, they can establish contacts with local educational institutions and reach high school students with the message of what the actuarial profession has to offer before these young people decide to become space ship engineers or nuclear physicists.

The Institute of Life Insurance is preparing a leaflet and a booklet for mailing in quantity to schools and colleges. We are much pleased with the assistance from the Institute but we mustn't rely entirely on this program. If the material prepared is to be fully effective, someone must use it in face-to-face talks with potential students, and with high school teachers, guidance counselors, and college professors.

High school mathematics teachers and counselors are usually most appreciative of our interest. As actuaries, we can help them in organizing mathematics fairs, and can encourage their interest in mathematics contests, give recognition luncheons for successful candidates, arrange visits to our companies, or give outstanding students an opportunity to participate in actual projects of applied mathematics in our offices.