



The Actuary

The Newsletter of the Society of Actuaries

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CAPITAL ADEQUACY IN PROPERTY INSURANCE

A Simulation Analysis of Capital Structure in a Property Insurance Firm, by David J. Nye, S.S. Huebner Foundation Monograph Series, University of Pennsylvania, \$5.00.

by David J. Grady

Editor's Note: We are indebted to The Actuarial Review for permission to publish this review of the latest volume in the Huebner Foundation Monograph Series. Mr. Grady is a Fellow of the Casualty Actuarial Society.

Dr. Nye's monograph is a carefully constructed academic who-done-it in six acts. The victim is an apparently innocuous monoline insurance company with dreams of multiperiod survival. In order that we should not mistake the character of the victim for any company familiar to us in real life, the author reveals that the single line is automobile physical damage coverage. We are introduced with meticulous care to those who sustain close relationships with the potential deceased: the cheerful and optimistic common stock portfolio, the ever-faithful but possibly overvalued presence of long-term bonds, the uncertain support of the debt/equity ratio, and the brute strength of blind growth. As we become more deeply involved with these interrelationships, the suicidal tendencies of the victim are revealed to us. Suspense is heightened when we begin to suspect that the true culprit has been unmasked in a footnote on page 89. However, with the introduction of further complexities in the latter half of the work, the reader comes away with a feeling of relief that it has been, after all, only a simulation.

A careful perusal of the monograph should provide the reader with a much greater depth of understanding of the

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20TH INTERNATIONAL CONGRESS OF ACTUARIES

The deadline for final registration for the 20th International Congress of Actuaries in Tokyo this October has been extended to June 30. One hundred actuaries from the United States have already registered for the Congress and there are a number of registrations still available. United States actuaries can obtain information from Fredrick E. Rathgeber, Prudential Plaza, Newark, N.J. 07101. Canadian actuaries should contact Colin E. Jack, Tomenson-Alexander, 680 University St. W., Montreal, Quebec. □

ENCYCLOPEDIA SOCIAL SECURITY

Robert J. Myers, *Social Security*, pp. 691. Richard D. Irwin, Inc., Homewood, Illinois 60430. \$17.50.

by Geoffrey N. Calvert

For all of us who have to work with employee benefit plans that relate in some way to the Social Security system, this book by Bob Myers is a godsend. While it has been described by one of my actuarial friends as "a Niagara of detail", it does give all of us a marvelous reference source from which to draw in getting a fix on literally hundreds of the finer points relating to eligibility, the method of calculating benefits, in fact the whole background and evolution of these benefits and methods. Bob has a rare facility for communicating this detail in an accurate and readable form.

The Social Security system is not a static system. It is constantly evolving. And it has its quirks and anomalies. It is the product of forty years of political hassles.

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CARRUTHERS' REPORT ON INSURANCE IN THE PROVINCE OF ONTARIO

by L. Blake Fewster

In January 1973, the late G. E. Grundy, then Superintendent of Insurance for Ontario, appointed Douglas H. Carruthers, Q.C., as special legal counsel to review the relationship between insurers and the public and in particular, the role of insurance intermediaries.

Mr. Carruthers' final report was submitted to the Superintendent in July 1975 and was made public earlier this year. His review appears to have been extensive, providing an independent perspective of the insurance industry. The report may have gone beyond its original intent, but Mr. Carruthers feels that the insurance industry in Ontario has important problems to resolve with respect to licensing practices, policy wording, and cost disclosure. His report, will now be exposed for appraisal by knowledgeable persons and groups inside and outside the insurance industry.

Prior to the final report, there were some interim reports to the Superintendent: in December 1973, a report on the life insurance business and in February 1975, a similar report on the non-life business. These reports have now also been made public, although it is doubtful if they were intended to be more than working documents. A rather mysterious leak to the press several months ago concerning the 1973 report brought some unfavourable reaction from the life insurance industry.

In his final report, his main criticisms of the present legislation are:

(1) It is not clear to the insured in whose interest insurance intermediaries act.

(2) Inadequate information on cost and benefits is available to consumers.

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 articles, criticisms, and discussions in this publication.

TO MEMBERS OF THE SOCIETY OF ACTUARIES:

In recent years, the actuarial profession in North America has witnessed the emergence of a number of serious problems of importance to the profession. These include:

1. The increasing public involvement of the profession, and the need for the profession to respond to public issues.
2. The increased importance of pension actuarial work, both at the private level and the social security level.
3. The passage of ERISA and the emergence of the "enrolled actuary".
4. The emergence of consumerism as a major force.
5. Intensification of problems in the health insurance system.
6. The need for a major overhaul of the system of individual life insurance in terms of nonforfeiture and solvency requirements, as well as benefits.

This letter has reference to the following six actuarial organizations in North America: American Academy of Actuaries; Casualty Actuarial Society; Fraternal Actuarial Association; Canadian Institute of Actuaries; Conference of Actuaries in Public Practice; Society of Actuaries. Although each of these organizations was created to serve a specific purpose, overlapping membership, overlapping responsibilities, and differing standards have created confusion for the public and problems for the profession. Multiple committees working on similar assignments, and difficulties of co-ordination, have created a wastage of precious manpower.

In the special Supplement to this issue of *The Actuary*, several proposed solutions to these problems are outlined. These proposals are the work of various individuals or groups, and none of them has been endorsed by the Board of the Society. They are being described to you at this time to make you more aware of the issues.

The problems of reorganizing the profession are complex, because many interests are involved. However, I believe that it is essential that for any solution to be in the best interests of the members of the Society of Actuaries it must meet certain criteria:

1. It must preserve the Society of Actuaries as a strong, viable organization capable of meeting the needs of all of its members.
2. It must provide a means for the actuarial profession to respond to public issues.
3. It must maintain the educational standards set by the Society and the value of the ASA and FSA designations.
4. It must improve the organization of the profession by eliminating the wasteful overlap of services and assignments.
5. It must improve the identity of the profession to outside publics, particularly in the United States.

The issues involved require careful study. At its meeting on March 31, the Board of Governors of the Society authorized the appointment of a committee to study the problem and to report back to the Board at its October meeting. As reported in the Supplement this committee has now been appointed, with John Wooddy as its chairman. Members of the Society are urged to give their careful thought to this matter and to send their comments in writing either to Mr. Wooddy or to the Editor of *The Actuary* as soon as possible.

JOHN M. BRAGG, *President*

CHICAGO CORNER

What Makes A Meeting Possible?

Most of you have been to a Society meeting at one time or another, and many of you have attended a large number of these meetings. Have you ever wondered about the preparation required to make a meeting a success?

For a meeting as large as the Society's — an Annual Meeting may consist of 1,200 or more members, plus their spouses — it is necessary to reserve dates at hotels approximately five years in advance. The Society is under some very definite strictures as regards when and where it can hold meetings, particularly the Annual Meeting. In North America there are only a limited number of places where an Annual Meeting can be held, because of geographic and space requirements. Also, there are only certain weeks when the Annual Meeting can be held, because of fall holidays, because it cannot conflict with the fall actuarial examinations and because it must meet various other requirements regarding the Society's "year".

The first step in the process is to select a meeting site. Many factors go into the selection of a hotel, including past experience with that hotel or with the particular chain, suitability of geographic site, and, most importantly, whether the hotel has sufficient facilities for the various concurrent sessions and workshops which must be held simultaneously. Many hotels are fine places, but simply don't have adequate facilities.

Another important factor is that there must be an adequate number of sleeping rooms available, either in the hotel or reasonably nearby, so that members can be accommodated. This is perhaps the most difficult problem involved, since it is almost impossible to estimate five years in advance how many people will be attending a particular meeting.

As the date for the meeting grows closer Bern Bartels works with the hotel convention manager to lay out the requirements for the number of workshop and concurrent session rooms, as well as arranging for rooms for various committee meetings and other events. He also must work closely with the Program Committee on many matters. Prior to the meeting, a schedule is typed up

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ENROLLED ACTUARIES VS. THE F.S.A.

by Frank Longo

"Will the Enrolled Actuary replace the FSA?" "Maybe" was the answer to that question, which posed the topic for discussion at a recent New York Actuaries Club meeting.

Most of the comment centered on the future of the FSA in the pension field, supplemented by some lively discussion on the American Academy of Actuaries' apparently not very successful attempts to achieve recognition by both the Federal and State authorities.

Douglas C. Borton, a consulting actuary and a member of the Academy's Education and Examination Committee, predicted that the effect of enrollment on pension consulting would probably not be great. He suggested that the path to be taken toward professional designation by future students, however, would depend on the attitudes of the firms employing actuaries.

Noting that the Joint Board for Enrollment of Actuaries has not recommended future requirements (enrollment certificates currently being issued are valid only for a five-year period), he questioned whether students would seek the enrolled actuary designation by way of membership in the American Society of Pension Actuaries (ASPA), thereby avoiding the rigorous examination schedule of the Society of Actuaries.

Mr. Borton said that many firms would still require a professional designation (such as membership in the Society), but that trustees of smaller pension plans being serviced by actuaries probably would not care and might lean toward the enrolled actuary for their needs. He felt that "Perhaps this will have competitive implications for firms consulting for small plans," and he said he foresees "serious attempts to recruit enrolled actuaries by big firms."

Harold G. Wiebke reported on the development of the Academy Standing Committee on Services to Enrolled Actuaries, of which he is a member. Noting the changes in the Academy's by-laws relating to the new Affiliate category, Mr. Wiebke summarized the conclusions of the task force (now a committee) as follows: ERISA has created a new standard for pension actuaries that could be conceived as more important than present professional designations; b)

the Academy has to embrace and support the new designation and should offer membership or create a new body solely for enrolled actuaries; and c) establishment of high standards in post-1975 enrollment procedures is essential.

Commenting on insurance company practices in the wake of the ERISA-enrollment reform, Mr. Wiebke said, "Fellowship will continue to be important in order to have a full unlimited career in a company." He mentioned that in Group departments, however, some former "para-actuaries" (not professionally designated) can now become enrolled by virtue of the ERISA experience requirements, and in Individual Policy-Pension Trust areas, certain field services formerly handled by agents who will not be enrolled may become centralized, possibly resulting in a "home office crunch."

There was a lively discussion with some speakers questioning the role of the Academy and others emphasizing the need to educate the public on the work and expertise of the actuary. There were those also who pointed out the advantages of the complete fellowship training.

The extent of the impact of the enrolled actuary on the Society is yet to be determined, but the knowledgeable presentations and spontaneous comments exchanged were evidence that Society members perceive that effect to be real, and are concerned about it. □

Capital Adequacy

(Continued from page 1)

capital adequacy problem than the previous frivolous paragraph would seem to indicate. Dr. Nye extends consideration of the problem beyond the narrow confines of the written-premium-to-surplus ratio by examining it from the far more informative viewpoint of capital budgeting. Resolution of the current capacity situation cannot be achieved by the pyramiding of capital according to untested rules of thumb; the solution lies in optimizing growth through efficient allocation of resources.

The author attempts to measure the effects of alternative capital structures on the probability of ruin, return on investment, and liquidity. He investigates the impact of growth and the distribution of assets on the performance of a

Actuarial Meetings

June 10, Baltimore Actuaries Club
 June 10, Denver Actuarial Club
 June 10 and 11, Actuaries Club of Southwest
 June 22, San Francisco Actuarial Club
 July 8, Denver Actuarial Club

model firm over a period of twenty years. Dr. Nye proposes that response function analysis of the interacting variables could provide regulatory authorities with quantitative criteria for supervision, and company management with optimal policies for long-range planning.

The major thrust of the monograph is the question of whether the issuance of senior securities is appropriate for an insurance company. Illustrating that debt tends to increase profit potential while only modestly contributing to the risk of insolvency, the author concludes that the use of debt is both feasible and desirable for an insurance enterprise.

The study contains several limitations. The most serious concerns appear to be the historical data upon which the conclusions of the model rest and the author's treatment of claim severity. In retrospect the period from 1951 to 1970 cannot be said to provide a conservative evaluation for stock market performance; consequently, investment risk is grossly understated in the simulations. Amazingly enough, lack of data causes the author to use claim severity as a balancing item to adjust the theoretical aspects of the model to fit aggregate historical patterns. While the claim severity distribution may be of less importance for automobile physical damage coverage than for other lines of insurance, the omission of any consideration of deductibles, trends, or catastrophe potential may have resulted in a sizable understatement of insurance risk. Nonetheless, the author is well aware of most of these limitations and treats them in a straightforward manner at the conclusion of the paper.

In spite of its limitations, the clarity of presentation and comprehensive treatment of a difficult problem area suggest that this monograph is of sufficient quality to be included as a case study in capital budgeting for examination readings. □

IMMUNIZATION

by L. N. Taylor and P. C. Hirst

In recent years there has been an increasing interest in the practical application of immunization theory to North American Funds. There is a lack of literature on this subject and this article is written to give a clear and concise description of the theory, and of its role in the framing of investment policy.

If we start with a simple liability, being a single sum of \$1,000 due in, say, 10 years time, there being no further obligations on either party, then investment policy can be framed as follows:

Ideally: Find a risk-free no-coupon bond, without options, maturing for \$1,000 in 10 years time. This will give an absolute match and the fund is free of investment risk; current yield is then locked-up for the life of the liability.

But: Since all bonds carry coupons, find a risk-free bond, without options, of a somewhat longer term than 10 years. If interest rates move, the shift in market value of the asset will be offset by the change in the rate of interest that can be obtained when the future coupons are re-invested. This will give an immunized position, which is potentially active since the term of the bond must continually be changed. The equations necessary to locate the immunizing asset at any point in time were given by Reddington, and again, *current yield* is locked-up for the life of the liability.

Nevertheless: The investment manager is expected to seek investment situations which go beyond the risk-free position, in the expectation of a higher return. For example, if he is of the viewpoint that interest rates are going to go up, he would forego the 10-year risk-free bond in the above example and move money into the short end of the market.

Furthermore, he may seek anomaly positions in the market: he may invest his funds in lower grade bonds or in bonds with wide options, or in less marketable or even illiquid assets. And he may go into real estate and common stocks. All of these and other decisions rest on the two basic premises: (i) the investment manager feels he can improve upon the basic immunizing position and (ii) such investments are relatively more attractive than alternative

risks.

All of which: Can be summarized by saying that, with known liabilities, the immunized position is free of risk; but, unless there is complete negation of the investment function, there will be, and should be, departure from this position, in search of more attractive situations, constrained only by the freedom allowed to the investment manager. In turn, this freedom is restricted by the amount of surplus which is placed at risk by his actions.

Correspondingly, an actuary evaluating a non-immunizing fund is, in his treatment of the investment element, quantifying these very same risks, and this is true whether the fund is deliberately not immunizing out of choice, or out of ignorance, or because the required immunizing assets are not available.

Now the above analysis fits most U.K. Life Funds very well, since the obligations for sums insured are not cluttered by guaranteeing surrender values. In the event of policy termination the office will quote an amount which reflects the market value of the assets underlying the policy. Thus any projection of liability flow in these funds can be made without allowing for withdrawal, and errors in this projection are of a statistical nature only. Similar comments apply to the typical North American immediate annuity fund.

Turning to the typical North American life fund, there will be guaranteed surrender values. It would be nice if we could assume that withdrawal is also statistical in nature since we can then project liability flow on multiple decrement bases and take that projection as the basis for being immunized. But this is obviously unrealistic; the decision to surrender for a guaranteed value is potentially much influenced by rates of return elsewhere, and if interest rates move to very high levels, surrenders occur at a time when the assets are least able to cope with the guaranteed values. To some extent this concern may be mitigated by the presence of blocks of business where there are no surrender values if the related funds stand to gain from high rates of interest on re-investment; also by the presence of riders on basic policies without further surrender value. But on the other hand this concern must be accentuated by the possi-

bility of mortality anti-selection, and this may well be one reason why not all policies surrender.

We must conclude then, that there is no risk-free investment position for business with guaranteed surrender values. For if we hold short notes against surrender tomorrow, there is risk of the policy remaining in force (through a long period of low interest rates), and if, on the other hand, we hold the long immunizing assets on the presumption that the policy does not terminate, there is risk of surrender in a period of low market values.

Between these two extremes we can estimate, using a multiple-decrement projection, a more reasonable position, which represents a mix of the short and long positions on some assumed termination basis. There is still risk, and there is still a need for surplus protection, but, with these qualifications, it is an acceptable basis for framing investment policy.

Having introduced the principles of risk-free funding, we turn now to pension funds. Can immunization theory be applied to these funds? Well, in most cases the pensioner and deferred vested liabilities can be regarded as a known liability with corresponding risk-free funding patterns. Furthermore, the accrued benefits in flat benefit and career-average type plans also give rise to known liabilities, but, just as the insurance fund with guaranteed values is subject to the uncertainties of termination, so the pension plan is buffeted by the various consequences of termination.

Pension plan members can terminate service, entitling them either to no benefit at all, or to a cash refund (generally on a guaranteed basis), or to a deferred pension. Since employee turnover is affected by economic conditions, we cannot presume that this element is statistical, but again we can estimate, on some assumed basis for termination, the qualified-risk funding patterns. In fact, contrary to popular belief, these patterns can sometimes be achieved in practice.

Some contributory career-average and flat benefit plans can have surprisingly short liability mean terms when valued on an accrued benefit method, using "realistic" valuation assumptions, and

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Immunization

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using *current* interest rates as is required in applying immunization theory. This is because a major part of the benefits paid will simply be refunds of contributions on termination of service. Even non-contributory plans, where actual employee turnover is high, can have short liability mean terms.

It will be found in these situations that the old rule of thumb that "an increase in investment return of 1% will reduce liabilities by 25%" is way off target, the reduction being closer to 10%. Also, in these situations the actuary must of course beware of the mean term of the assets being longer than the mean term of liabilities, in which case prudence would lead him to contemplate the effect on the fund if interest rates were to *increase*.

Final average plans are a completely different matter. The benefits themselves are very sensitive to future economic conditions just as interest rates are. Immunization can in theory protect a fund with fixed benefits from future changes in interest rates, but when the benefits themselves are subject to the same economic forces as interest rates, immunization in its traditional form is not applicable. That is not to say that immunization theory cannot be applied to certain categories of liabilities under a final average plan, the pensioner and deferred vested liabilities being the most obvious candidates for risk-free funding. However, the risk-free position for a final average plan can be shown to be investment in assets which will give a rate of return correlated with salary escalation, and one type of asset that will do this is money-market notes if there is a constant difference between rates of interest and salary escalation.

Nice in theory, but for any fund we would like to caution against the indiscriminate application of immunization theory, and to stress that there are significant differences between pension and insurance funds. Generally speaking, pension funds can live with deficiencies where insurance funds cannot. Furthermore, an insurance fund is never in a position to take credit for the profitability of its future new business.

This discussion demonstrates that precision in the application of immunization theory is not appropriate, but as with any actuarial theory it is extremely important to be precise about the theory itself. It should also be clear that, as actuaries, we must be aware of the relative structures and therefore volatilities of the asset and liability portfolios we meet with in practice. Perhaps the most important practical application of immunization theory is not to say whether a fund should be investing shorter or longer (that's the job of the investment manager) but to point out and quantify the implications of and risks involved in adopting any particular investment strategy and policy. This very clearly is the job of the actuary. □

Actuarial Notation Errata

In the table on page 5 of the March issue it was not clear from the printing that in the linearized symbols the bracketed (x) should appear on the same line as the parameter symbols a and A. Only in the Halo notation is x a subscript. Further, the word "Synthesis" (corrected) belongs with the line below and the second author's name should be spelled "Engelfriet." □

Encyclopedic Social Security

(Continued from page 1)

Interwoven with the technical detail from the book the author has many an insight into the legislative process involved in its development. Here and there he provides justifiable and pointed criticism of a defect or inconsistency that needs correction. There have been many critics of the system holding diverse and at times opposite viewpoints. In presenting their sometimes conflicting arguments, Bob shows the consideration of a good moderator, incidentally at times showing up the weakness of a demonstrably unsound position.

The vast coverage of the book includes a treatment of basic concepts, present provisions of the system, its evolution, financing, directions of change and many of the various issues which presently exercise its critics and advocates.

Medicare is covered with careful attention to detail, principles, evolution, financing, and future change. Actuarial costs and statistical summaries are provided.

In the latter part of the book, Bob covers various related programs, including public assistance (food stamps, SSI, state public assistance, and proposals for a Family Assistance plan), the Railroad Retirement plans, Unemployment Insurance, Workmen's Compensation, Cash Sickness, and other special programs for government employees and veterans. Finally, some foreign social security programs are briefly covered. Appendices include material on early basic concepts and a most valuable summary of the Social Security system as it exists today.

This is the author's own special field. He is uniquely qualified to write this book, and we are all deeply indebted to him for placing his wealth of knowledge in such compact and useful form. This book is a must for anyone seriously involved with employee benefits.

It is inevitable that in writing about a subject as fluid as the Social Security system, the wisdom of today is superseded by the research and new perspective of tomorrow. This book was printed in 1975, which seems recent enough. But even as these words are being written only a few months later, the report of the Consultant Panel appointed by the Congressional Research Service is nearing completion. This will certainly present new perspectives and point to new directions of change with a view to stabilizing the finances of the system and restoring a measure of control over benefit levels by Congress.

Though this will not detract from the value of Bob Myers' excellent book, it may serve to remind us that nothing in this field remains up-to-the-minute for very long. The Social Security System, if it is to survive, will have to be stabilized, strengthened, and brought into line with social changes such as the rise in the proportion of married women in paid employment. When these changes are made we will all have to hope that Bob Myers will follow them with a new edition. For now the present one does very well. □

LETTERS

Society Examinations

Sir:

In the past few years lots of discussions have been going on regarding the Alternate Route. I would like to raise another question concerning the dates of the Society examinations. It seems to me that with the increasing number of colleges offering actuarial science courses we ought to give some thought to coordinating the timing of the examinations with the regular school terms. The Spring examinations are fine but why don't we give the Fall examinations in December rather than in November? Maybe there is some good reason why this is not feasible but I know such a change would be greatly appreciated by many.

Marianne Baeckstrom

* * * *

Alternate Route

Sir:

As a Part 4 student and former math professor, I am distressed by the Alternate Route proposal.

The academic climate is changing, and today many students believe that paying tuition and attending class are sufficient to entitle them to an "A" or "B." Schools hurting for those tuition dollars are inclined more than ever to go along with them. As one dean put it to me, "After all, they're the customers."

While teaching "Math for Elementary Teachers" at a small college and again at a large university, I had students who couldn't add fractions and didn't want to learn. I must admit that I gave them a "C" as a compromise between the "F" I felt they should have gotten and the "A" I knew several of my colleagues would have given them. Most of these students are now certified as competent to teach in the elementary schools.

Lest you think this sort of thing is restricted to lower level courses, I also sat in on the defense of a dissertation which made no reference to math above the sophomore level and yet earned its writer a Ph.D. in mathematics.

Partly as a result of the inner conflict this sort of thing produced, I decided to change fields. I chose the actuarial

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ACTUARIAL NOTE

by Thomas H. Shelby III

An algorithm for calculating a life contingent annuity providing m equally spaced payments per year of \$1 each.

Let us say the desired annuity is given by:

$$m \cdot \ddot{a}_x^{(m)} = \sum_{t=0}^{\infty} v^{t/m} \cdot {}_t/m P_x = \sum_{t=m}^{\infty} v^{t/m} \cdot {}_t/m P_x + \sum_{t=0}^{m-1} v^{t/m} \cdot {}_t/m P_x$$

$$= v P_x (m \cdot \ddot{a}_{x+1}^{(m)}) + m \cdot \ddot{a}_{x:\overline{1}}^{(m)},$$

a familiar recursion formula.

Examining the one year annuity:

$$m \cdot \ddot{a}_{x:\overline{1}}^{(m)} = \sum_{t=0}^{m-1} v^{t/m} \cdot {}_t/m P_x = \sum_{t=0}^{m-1} v^{t/m} \frac{l_{x+t/m}}{l_x}$$

Let us assume "linear" deaths, that is

$${}_t/m q_x = t/m \cdot q_x = \frac{(t/m) \cdot d_x}{l_x}, \text{ and } l_{x+t/m} = l_x - (t/m) \cdot d_x$$

Substituting

$$m \cdot \ddot{a}_{x:\overline{1}}^{(m)} = \sum_{t=0}^{m-1} v^{t/m} \left(\frac{l_x - (t/m) \cdot d_x}{l_x} \right) = \sum_{t=0}^{m-1} v^{t/m} - \sum_{t=0}^{m-1} v^{t/m} \frac{(t/m) \cdot d_x}{l_x}$$

$$= m \ddot{a}_{\overline{1}}^{(m)} - m (I^{(m)} a)_{\overline{1}}^{(m)} \cdot q_x$$

Let:

$$F = m \cdot \ddot{a}_{\overline{1}}^{(m)}, \quad G = m (I^{(m)} a)_{\overline{1}}^{(m)}$$

Substituting, we have the useful recursion formula:

$$\underline{\underline{m \ddot{a}_x^{(m)} = v \cdot P_x \cdot (m \cdot \ddot{a}_{x+1}^{(m)}) + F - G \cdot q_x}}$$

By induction, we also see that:

$$m \ddot{a}_x^{(m)} = \sum_{m=0}^{\infty} v^m \cdot {}_m P_x (F - G \cdot q_{x+m})$$

If we redefine F and G such that:

$$F = v^{k/m} \cdot m \cdot \ddot{a}_{\overline{1}}^{(m)}, \quad G = m (I^{(m)} a)_{\overline{1+k}}^{(m)}$$

then $k = 0 \Rightarrow$ annuity due,

$k = 1 \Rightarrow$ immediate annuity.

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Actuarial Note

(Continued from page 6)

This recursion formula has been used in evaluating pension benefits and life insurance policies where they have modal—non-annual—characteristics. It lends itself to use in computer programs, particularly with (annually) varying interest since only v , F and G change.

It is sufficiently general to include temporary life annuities with obvious modification. The results will of course differ from traditional values by a percent or so due to the difference in approximating assumptions.

This "linear" assumption would seem to be a reasonable, practical one even at the clouture of a table. Double life annuities are easily found by first generating a joint life mortality table using actual ages. □

Letters

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profession because, among other things, I was attracted by its tradition of practical on-the-job training for those entering the field. I was also attracted by your nationally administered, uniformly graded actuarial exams which I felt would be recognized anywhere I went. To me this is vastly preferable to a series of almost meaningless grades received from beleaguered professors whose cost of living raises frequently depend in part on how well they fare on "faculty evaluations" by their students. Most of my former colleagues agreed that these evaluations correlate with the professor's liberality in grading.

While it is conceivable that a single comprehensive examination could serve to equalize between the associateship exams and the academic route, my feeling is that it would have to be 19 hours long before I'd really have confidence in it.

I beg of you: Please maintain the rigorous standards that led many of us to enter the actuarial profession!

E. Torrance

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Actuarial Notation

Sir:

Mr. Di Paolo's article in the March *Actuary* on actuarial notation is excellent but, as to the Halo Notation, I am reminded of the old gray mare: She ain't what she used to be and never was.

I admit that the Halo Notation "... is very concise and unambiguous and ... easily read and quickly understood."

I suppose you can write an expression for the net annual premium for a k -year deferred, n -year, t -pay, endowment. This makes me feel like the school-boy Churchill when he was obliged to decline *mensa*. The vocative, *mensa*, means "O Table", and is used when speaking to a table. "But I never do", Churchill is said to have replied.

The Halo Notation is all right as far as it goes but it doesn't go very far. How do you say "gross premium" in Halo Notation? "Policy fee"? "Conversion rate"? "25% of either the adjusted premium for the first policy year or the adjusted premium for a whole life policy of the same uniform or equivalent uniform amount with uniform premiums for the whole of life issued at the same age for the same amount of insurance, whichever is less"?

How do you handle unit expenses? Interest rates varying by duration? The premium for the renewability provision in term insurance? Stochastic analysis of risk?! GAAP reserves?!!!

The list is endless.

Mr. Di Paolo asks whether we should extend "... the scope of ... actuarial notation ... to cover fields such as pensions, disability, demography, social insurance, and non-life insurance?" I would like to propose that the Halo Notation be extended to cover modern ordinary life insurance — if it can be.

Kenneth T. Clark

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Sports Section

Sir:

I would like to make two points relative to the tennis tournament in Miami.

Chicago Corner

(Continued from page 2)

showing the exact description of each session, the number of persons estimated to be at the session, the arrangement of chairs and tables required, and other information needed by the hotel to make its arrangements.

Throughout the meeting, the Society staff is in constant touch with the hotel convention personnel in order to handle any problems which may arise. For example, an unexpectedly large number of persons may turn up at a luncheon, requiring additional tables and chairs to be set on a moment's notice, or someone may have failed to set up a particular room the way it was supposed to be set.

Not all meetings go as well as others. Some hotels are better than others in planning conventions, and sometimes problems develop which no one could have foreseen. For example, in Cincinnati last year, a great many more persons registered for the meeting than had been anticipated.

Although we work hard to give the members of the Society the best possible meetings, we recognize that there is always room for improvement, both in the content of the programs and in the hotel arrangements. Readers are encouraged to send their suggestions to the Executive Director.

P.W.P.

First, recognition of Gerry Levy's outstanding job of organizing and running the tournament. I enjoyed it a great deal, despite getting beaten so badly that I needed four days in Puerto Rico to recover. Without Gerry's effort (and his company's sponsorship), the event would not have been possible.

Second, a south-of-the-border viewpoint of R. A. Nix's request for "equal time" for golfers (March 1976). In the U.S. (if Boston in the 60's and Chicago in the 70's are typical), golfers have been rather well taken care of at the Club level. (I have never seen an announcement for an annual "Tennis Outing"). With bridge tournaments at both Club and Society levels, it has been the tennis player who has felt out in the cold. Until Miami! Thanks, Gerry, for the breakthrough.

C. M. Underwood

Carruthers' Report

(Continued from page 1)

(3) The claims settlement process, particularly in non-life insurance, is hard to predict and often unnecessarily frustrating.

(4) There would be substantial long-run cost benefits to the consumer from more price competition.

He sets forth a model regulatory system which might solve the problems he perceives. He redefines the roles of intermediaries. One element of particular interest is the dual concept of (1) a sales representative serving one insurer whose remuneration is determined between him and his employer, and (2) a broker who serves only buyers of insurance with remuneration being set between the broker and the buyer.

A suggestion that insurance companies might then need two sets of rates, one for business sold by sales representatives and one for business sold by brokers, would seem to play havoc with cost comparisons and be of doubtful practical acceptability.

Mr. Carruthers expresses concern about the indiscriminate use of the word "consultant" and suggests it should be restricted to those who have the attributes of independence and the highest level of competence. While he suggests that the use of the term "consultant" be prohibited for three or four years after the start of his proposed new system, he does make an exception for consulting actuaries "because the qualifications are already established and tested."

He recommends the establishment of a self-regulatory council made up of representatives of the industry and the public to (1) make and administer rules of conduct for its members, (2) establish and test qualifications for licensing, and (3) organize educational programs.

On disclosure Mr. Carruthers makes his biggest pitch. He is in step with the times but will likely get many arguments on the nature and degree of disclosure. Ideally, he feels that in most cases all technical details should be shown since, even if the consumer cannot understand them all, his qualified professional advisors can.

For product disclosure, he feels there is a need for standard terms of com-

mon contracts and a need to make the contracts more readable and understandable. His comments about policy language are well taken, even though most existing contract wording has been developed by members of his own profession who are aware of the kind of scrutiny that policy wording has experienced in courts of law. He would make some changes in terminology such as "insurance contract" for "policy"; "contract charge" for "premium"; and "rebate on contract charge" for "dividend".

On price disclosure, Mr. Carruthers feels it is essential to separate the charge for the contract into two components—the estimated financial benefit and the insurer's markup. The formula used for calculating expected values would account for payments by the insured and possible receipts, modified by the probability of the receipts and the time value of money. The recently popular interest-adjusted indices would not seem to fit the suggested requirements. He also hints at the need for evidence of past performance to assist in evaluating the insurer's claims, promises and forecasts.

The timing of disclosure would also be important and should be made before a purchase is made and before renewal premiums are paid. Mr. Carruthers does not develop actual disclosure rules but suggests this would be the responsibility of the Department of Insurance.

Mr. Carruthers' first public appearance after the release of his report to the public was as a luncheon speaker at the March meeting of the Canadian Institute of Actuaries. During his talk he stressed the role that actuaries should play in price disclosure. He suggested that actuaries possess the most expertise in this area and that if they do not come forth they can expect to have a small voice in the final result. He did imply, in a somewhat more moderate tone than his report suggests, that no single set of figures would serve everyone and too much detail could lead to confusion. It will, therefore, be an industry responsibility to make sure the buyer can understand, that he will understand and that he can make use of what he understands. We can only hope that the benefits will equal the cost.

Mr. Carruthers' talk at the Institute meeting was very helpful in setting the perspective for his report, because a

mere private reading of the written report can invite negative and defensive reaction. Dialogue with Mr. Carruthers would doubtless help considerably in better understanding his report. There can be little argument about the developing need for more disclosure, partly because of the wave of consumerism and partly because the cost of adequate insurance protection has been going up and leaving more to disclose.

Some closing observations:

(1) As is often typical of an exhaustive study the solution recommended or suggested involves a complete restructuring of the present insurance legislation. Such all-inclusive changes in the past have proved to be costly ventures often with unexpected and some unsatisfactory results, e.g. changes made in Canadian income tax laws in the past decade.

(2) The report does not distinguish between life insurance and general insurance. In actual practice these two lines of business are quite divergent and legislation appropriate for one line could create unnecessary complications for the other.

(3) The distribution system for insurance is costly often because insurance, particularly life insurance, has to be sold rather than being bought. Mr. Carruthers' proposed system, which admittedly is just in the discussion stage, may or may not be less costly.

(4) Mr. Carruthers' report was prepared for the Province of Ontario. It contains many new and interesting ideas, but it would be desirable to maintain as much uniformity as possible across Canada. Unilateral action by Ontario or any other province cannot be prevented unless the industry itself helps to solve mutual concerns.

(5) The future of the Carruthers' report is not clear at this time. It is now being perused by industry groups who will report back to the Superintendent of Insurance for Ontario. Mr. Carruthers himself has returned to private practice. The model legislation suggested is still too ideal for implementation and will require considerable massaging before acceptable changes can be determined. Even if it serves only to highlight areas of the business that need to be improved, the Carruthers' report may have served its purpose. □