

The Actuary

The Newsletter of the Society of Actuaries

VOLUME 11, No. 4

APRIL, 1977

THE SKANDIA INTERNATIONAL SYMPOSIA VOLUMES, 1967-1976

by Courtland C. Smith

David Garrick Halmstad was a very bright and special person who had the happy faculty of making his friends and associates feel valued just for being themselves. Before his recent death from a brain tumor, David gave us ten volumes from the Skandia Insurance Group's International Symposia on various medical impairments, with the simple request that we publicize them in *The Actuary* and then file them to permit ready accessibility. As ever with David, his manner was casual but his message conveyed a small treasure.

While most of the material in these volumes describes recent studies in the anatomy, physiology and related aspects of various physical and behavioral impairments which are of technical interest to life insurance medical directors, virtually every volume includes some papers on epidemiology and statistics that may be of interest to actuaries and concerned citizens generally. For example, the fourth volume, entitled *Alcoholic Cirrhosis and Other Toxic Hepatopathias* (Stockholm, 1970), includes information on alcohol consumption that is at least food—or if you prefer “drink”—for thought.

In the U.S. we tend to try to resolve social problems with legislation and then to offset any counter-productive effects with further legislation, and sometimes with outright repeal. We rarely study a problem or test a proposed solution on a limited scale first; therefore, we have no real consensus on the proper and most efficacious role of legislation in producing social change. Perhaps this is the price we must pay for having lawyers rather than scientists, physicians, engineers and/or businessmen predominate in

(Continued on page 3)

Halmstad Prize

David Garrick Halmstad died in February of this year at the age of thirty-nine.

The loss of one who had contributed so much to our profession in his brief span and whose promise for the future was even greater has moved a number of David's friends to attempt to extend the significance of his life beyond its untimely end. It is proposed to accomplish this by the annual award of a prize bearing his name as a memorial.

Since David's interests and accomplishments were most noteworthy in the area of research, it is proposed that the Research Committee of the Society of Actuaries screen the work in this field each year and submit the results of their screening to a Selection Committee consisting of the chairmen of the Society of Actuaries' Committees on Research, Computer Science, and Theory of Risk, and a representative of the Casualty Actuarial Society. This Committee would choose the recipient of the award.

It is expected that the wherewithal to pay the award would be obtained from the income of a fund to be built up from contributions by those who would like to join in this memorial. The Actuaries' Club of New York, whose programs over the years have benefitted so greatly from David's work, has made the initial contribution of \$200. The Society of Actuaries has agreed to receive the checks sent in by contributors. It is proposed that ultimately the accumulated contributions will be administered by the Actuarial Education and Research Fund. All wishing to join in this memorial should send their checks to the Society of Actuaries, indicating they are for the David Garrick Halmstad Memorial Fund. Such checks payable to the Society of Actuaries are deductible on U.S. Federal Income Taxes.

THE INTERNATIONAL ACTUARIAL NOTATION

by Frank P. Di Paolo

In an article on the same subject, in the March 1976 issue of *The Actuary*, it was reported that the Sub-Committee on Notation of the International Actuarial Association had circulated a questionnaire among the various national organizations to sound out public opinion on the issue of linearization and expansion of the International Actuarial Notation.

In the same article, it was pointed out that the Committee on Standard Notation and Nomenclature of the Society had replied to the questionnaire saying “NO” to linearization and “YES” to expansion.

During the course of the XX International Congress of Actuaries, a Special Meeting on the International Actuarial Notation was held on October 30, 1976 which was chaired by Prof. J. J. Engel-friet of the Netherlands.

At the beginning of the Special Meeting, the Chairman released the replies to the questionnaire on the International Actuarial Notation submitted by 14 national organizations.

The 14 national organizations included Argentina, Austria, Belgium, Finland, Germany, Great Britain, Israel, Italy, The Netherlands, New Zealand, The Society of Actuaries, The Casualty Actuarial Society, Sweden and Switzerland. Practically all national organizations replied “YES” to the questions dealing with expansion of the actuarial notation. Two organizations (The Society of Actuaries and Austria) opposed the introduction of the linearized notation. Six organizations (Argentina, Belgium, Great Britain, The Netherlands, New Zealand and Switzerland) favoured the introduction of a linearized notation as an alter-

(Continued on page 4)

The Actuary

Editor ANDREW C. WEBSTER Correspondence should be addressed:
 Associate Editors . . . COLIN E. JACK *The Actuary*
 FREDERIC SELTZER Mail Drop 13-2, 1740 Broadway
 JONATHAN L. WOOLEY New York, N. Y. 10019
 Tel: (212) 586-4000

Published monthly (except July and August) by the SOCIETY OF ACTUARIES.
 208 S. LaSalle St., Chicago, Illinois, 60604, Robert T. Jackson, President, Jean-Jacques
 Deschênes, Secretary, and Ms. Anna M. Rappaport, Treasurer.

The Society is not responsible for statements made or opinions expressed in the
 articles, criticisms, and discussions in this publication.

FROM time to time we have published articles and correspondence about *The Actuary in Literature* and although the references to the profession are few it was some comfort to know that the profession was not completely overlooked. Two of our readers drew our attention to the following poem which appeared in *The Times Literary Supplement*. Since this was an unusual, even if indirect, reference to the profession it seemed worthwhile to reproduce the poem for the benefit of our readers. Mr. Thwaite, with excellent analysis, credits the profession with more certainty than we probably have in practice. Nonetheless we are grateful for the recognition.

A.C.W.

Life and other contingencies *

*Here is the set text—neat tabulations,
 The bracketed asides of algebra.*

*Not that I understand them, but formulas exist:
 The actuary tells you what they are.*

*At age 46, this and this are known.
 Building societies have experience.*

*What happened earlier will recur, given
 Similar circumstances. It's common sense.*

*Two volumes on the shelf. Now take them down:
 Open at any page, at any line.*

*Portions of me are money. What I leave
 Will prove the logic, confirm the whole design.*

*What cannot be accounted for is not
 The text's concern. It tells you what is what.*

Anthony Thwaite

* "Life and other Contingencies" (two vols.), by P. F. Hooker, F.I.A. and L. H. Longley-Cook, M.A., F.I.A., F.C.A.S., A.S.A. (Cambridge University Press).

Reproduced by permission of the author and *The Times* (London)

LETTERS

Observations on the Funding Standard Account

Sir:

Maintaining the ERISA funding standard account will involve detailed calculations, but I believe the observations in the February issue overstate the complexity of the calculations in these respects:

(1) One observation suggests that the full funding limitation must be applied twice each plan year, once at the start and once at the end, with the result that the overfunded plan could have both a "full funding credit" and a "supplementary full funding credit." It is my belief that the full funding limitation can be determined once each year, as of the valuation date, with the same interest adjustments that have been permitted by Internal Revenue in the past (see subpart D of Schedule A, Form 4848).

(2) The alternative funding standard account was added to ERISA to "save" the entry-age-normal method. Its purpose is to avoid mandatory funding of the full amount of the entry-age-normal past-service liability and it is not useful under a plan with assets less than the value of accrued benefits (based on service and compensation prior to the valuation date). Even when the alternative funding standard account is used, the funding standard account must be maintained under the entry-age-normal method, and a deficiency therein will result as the alternative is used to avoid amortizing the entry-age-normal liability.

This deficiency in the funding standard account does not result in an excise tax, but if the employer abandons the alternative, the deficiency must be made up over five years. A deficiency under the alternative funding standard account does result in an excise tax, and presumably an employer will shift back to the regular funding standard account in such a year to avoid this tax. Moreover, the excise tax provisions of the law result in funding of any deficiency. I don't expect to see a continuing plan having a deficiency in the alternative funding standard account that will complicate the calculations in the subsequent plan year.

John Hanson

(Continued on page 6)

Symposia Volumes

(Continued from page 1)

our legislative assemblies. In any event, it is interesting — and perhaps surprising — to learn that selective regulation of alcohol distribution has actually proven to be effective in reducing cirrhosis mortality within certain cultural contexts.

In his opening address to the Symposium on *Alcoholic Cirrhosis*, P. G. Gyllenhammar, president of the Skandia Group, pointed out that until October 1, 1955, "the sale of hard liquor, wine and stronger beer in Sweden was rationed and registered. When this legislation was discontinued in 1955, there was an immediate increase in the consumption of (pure) alcohol . . . from 1954, 3.7 litres to 1965, 4.5 litres per head and year. The increase is most obvious among young people and women. Morbidity and mortality from cirrhosis of the liver and other alcohol-induced diseases have risen."

In "The Epidemiology of Cirrhosis of the Liver," G. A. Martini and Ch. Bode state that death rates from cirrhosis dropped impressively "during both world wars in Paris when the per capita wine ration was drastically reduced by authority to one half of one litre per week . . . It dropped from 35:100,000 in 1941 to 6:100,000 in 1947 . . . (But in) the following 10 years when wine became freely available . . . the cirrhosis death rate increased again to its former high level." Noting that these figures might have been influenced by other factors during the war period, e.g., shifts in population, age grouping, nutritional factors, etc., the authors go on to point out that the war period saw a rise in the total mortality rate and in the cardiovascular mortality rate despite the drop in cirrhosis mortality. Since alcoholic cirrhosis takes 20 years to develop, "The immediate decrease of death rates from cirrhosis during the war in Paris certainly cannot be explained by less cirrhosis morbidity, but by stopping the acute complications of alcoholism (e.g., infections, delirium, intoxications, accidents, etc.)"

"A similar trend," the authors note, "has been seen in the United States and England. In the United States the cirrhosis death rate lay between 13 and 15:100,000 from 1900 to 1914, then fell to 7:100,000 during the war time . . .

(and) post-war prohibition period and remained so low until 1933. When prohibition was loosened in 1933 a steady increase can be noticed . . . In 1958 it reached 11.5 and went up to 12.1 in 1964."

In England, there was ". . . a steady decrease in both per capita alcohol consumption and cirrhosis death rate from 14:100,000 in 1900 to a low level of 2:100,000 in 1945 . . . However, the post-war increase is very slow and it appears that rationing of alcohol consumption by high taxes and restriction of hours of sale for alcoholic beverages is an efficient tool to prevent cirrhosis. Even in 1965 the cirrhosis death rate for England and Wales was as low as 2.9:100,000." This is one of the lowest national rates in the world.

Evidently selective regulation has proven tolerable and effective in England. It seems that England's experience is unusual in one further respect. "It has become the privilege of the upper class to die from cirrhosis and Oscar Wilde's saying that 'work is the curse of the drinking classes' is no longer true for England." In most other countries with reliable statistics on cirrhosis mortality by socioeconomic level, Wilde's dictum seems still to apply. Unfortunately no figures are presented to compare the level of cirrhosis mortality among the upper classes in England with the level elsewhere.

Variations in alcohol consumption and cirrhosis mortality are graphed and discussed by country, region, year, age group, sex, specific pathological findings, etc., in the Martini and Bode article, and also for some of these variables in "Wine and Cirrhosis" by S. Moeschlin and P. Righetti. As always in reading scientific material, it is advisable to begin with the abstract or Summary and Conclusions and the graphs and tables in order to determine which are the key findings and what, if any, content seems worthwhile to pursue in the text.

I believe we owe the Skandia Group a debt of gratitude for assembling the material in the International Symposia Volumes, which by the way are nearly all in English. To David Halmstad we owe a belated vote of thanks for bringing the volumes to our notice.

Until final arrangements have been made for a permanent home for the Skandia Symposia Volumes and similar

ARCH

Issue 1976.2

This issue is the *Proceedings of the Ann Arbor Actuarial Conference* held in September 1976.

Introduction to Clustering, John A. Hartigan

Methods of Discriminations with Applications, Robert V. Hogg

Underwriting Individual Disability Income Insurance with Discriminant Analysis, Carol C. Shall and Mark L. Shall

Predicting Policyholder Behavior by Discriminant Analysis, Richard Zioc

An Econometric Model of Worker's Compensation, Jan Lommele

Pedoe Analysis Using Multivariate Statistics, Joseph Brzezinski

Canonical Correlation Applied to Life Insurance Market Research, Robert G. Miller

Analysis of Insurance Data using A.I.D. and Multiple Classification Analysis to Insurance Data, Frank M. Andrews

Overview of the Ann Arbor Conference, James C. Hickman

Subscriptions may be sent to Donald A. Jones, Ann Arbor Actuaries Inc., 321 South Main Street, Ann Arbor, Michigan 48104. □

medical reference material, please contact Dr. Richard B. Singer at New England Mutual or me at Cologne Life Re if you wish to see one of the volumes. Some additional sets may be available from the Skandia in Stockholm. A full list is given below of the Symposia Volumes in our possession currently:

Stroke, Stockholm, 1967

Cancer and Aging, Stockholm, 1968

Aging of Connective and Skeletal Tissue, Stockholm, 1969

Alcoholic Cirrhosis and Other Toxic Hepatopathias, Stockholm, 1970

Regional Enteritis (Crohn's Disease), Stockholm, 1971

Suicide and Attempted Suicide, Stockholm, 1972

Early Phases of Coronary Heart Diseases: The Possibility of Prediction, Stockholm, 1973

Rehabilitation After Central Nervous System Trauma, Stockholm, 1974

Drug Dependence — Treatment and Treatment Evaluation, Stockholm, 1975

Health Control in Detection of Cancer, Stockholm, 1976. □

U.S. Decennial Life Tables for 1969-71

The National Center for Health Statistics announces the publication of the following volumes:

Vol. I, No. 2, *Actuarial Tables based on United States Life Tables: 1969-71*,

This presents the most current tables in the series of U.S. Decennial Life Tables based on the U.S. Censuses, and registered deaths during the three-year period surrounding the year of the particular census. It gives 66 commutation function tables, showing all combinations of three color categories (total, white, and negro), both sex categories, and 11 interest rate categories from 3 to 8 by $\frac{1}{2}$ percent increments.

Copies (stock number 017-022-00380-5) may be obtained at \$1.40 each from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

* * *

Vol. I, No. 3, *Methodology of the National and State Life Tables for the United States: 1969-71*

This describes the methodology used in the decennial life tables for 1969-71 for the U.S. The topics discussed are: (1) preliminary adjustment of data, (2) data used for calculation of life table values, (3) numbers of survivors at ages 2 and under, (4) mortality rates at ages 2-94, and 95 and over, (5) calculation of the remaining life table values, and (6) the special adjustments in the state life tables.

Copies (stock number 017-022-00381-3) may be obtained at 45¢ each from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

* * *

Vol. I, No. 5, *United States Life Tables by Causes of Death: 1969-71*

This presents the most current tables in the series of U.S. Decennial Life Tables based on the U.S. Censuses, and registered deaths during the three-year period surrounding the year of the particular census. It gives 20 tables, showing all combinations of 5 color categories (total, white males, white females, males other than white, females other than white) and 4 causes of death topics (abridged life tables for all causes of death combined and eliminating specified causes of death, number of life table deaths from specified causes, probability of eventually dying from specified causes, gain

in expectation of life due to elimination of specified causes of death). The introduction adds verbal as well as mathematical meaning to the above concepts.

Copies (stock 017-022-00383-0), may be obtained at \$1.30 each from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Note: A detailed review of these Volumes will appear in the Transactions. For Vol. I, No. 1 *United States Life Tables 1969-71* see *The Actuary*, November 1975. □

I. A. N.

(Continued from page 1)

native to the present halo notation. Three organizations (Finland, Germany and The Casualty Actuarial Society) favoured the introduction of a linearized notation as a replacement of the present halo notation. One organization (Sweden) preferred the introduction of a linearized notation but they were not certain whether the linearized notation should be a replacement of or an alternative to the halo notation. Finally one organization (Italy) could not decide whether to be in favour of or against the introduction of a linearized notation and one organization (Israel) was silent on the issue of linearization.

After some discussion the group of actuaries attending the Special Meeting passed a resolution recommending to the Council of the International Actuarial Association the establishment of a permanent technical committee on the International Actuarial Notation for the purpose of:

- i) considering the extension of the present notation into the fields of pension, sickness, social insurance and demography, and
- ii) defining alternative forms of notation that might be desirable in order to facilitate communication among actuaries of different countries.

The group also recommended that the technical committee report on all matters concerning the International Actuarial Notation to the national organizations and to the Council of the International Actuarial Association. Finally, bearing in mind the need to develop grass roots interest in the various countries, the group concluded by suggesting "that the technical committee should work through

(Continued on page 5)

SOCIETY RESPONSE ON REFORMS OF U.S. FEDERAL STATISTICS URGED

If you use government statistics — if you would like data to be available to you before they are outdated — if you have doubts about the quality or accuracy of data and/or analyses — if you are concerned about costs to industry and taxpayers of information gathering — if you have ideas on how to improve any phase of government statistics — here is your chance to speak out.

The Society of Actuaries has been invited to be one of four new members on the Joint Ad Hoc Committee on Government Statistics (JAHCOGS). Other organizations represented include:

American Political Science Association
American Public Health Association
American Sociological Association
American Statistical Association
Federal Statistics Users' Conference
National Association of Business Economists
Population Association of America

George L. Hill and Robert J. Johansen have been named Society representatives on the committee. The Casualty Actuarial Society and the Academy have been invited to submit comments to the Society's representatives.

As noted in *The Actuary*, December 1976 page 6, JAHCOGS has issued a report that includes six recommendations relating to improvement of the Federal statistical system. Briefly these recommendations are:

- (1) Statistical planning and coordination should be brought into realistic accord with the current volume of Federal statistical activities.
- (2) Public access to statistical data at a reasonable cost should be improved.
- (3) A thorough review is needed of procedures for awarding Federal contracts for statistical work to nongovernment groups.
- (4) More resources should be applied to analyzing statistical data and developing better methods of presenting data.
- (5) Professional associations should find more effective ways to represent data user needs through Federal advisory committees, and Federal agencies should develop improved ways to use these committees.

(Continued on page 5)

Society's Response

(Continued from page 4)

(6) Better means must be found for monitoring the Federal statistical system, especially to make both Congress and the Executive Branch of the government as well as the public aware of what affects statistical quality.

A copy of the full report which appeared in the *Statistical Reporter* may be obtained from the Society's office.

The JAHCOGS group will meet once a month through August 1977, at which time its final report will be released. Since lack of time and personnel will not permit detailed analyses of substantive and technical problems in the area of Federal statistical programs, the JAHCOGS group is focusing its attention on the broader subject of organization and control of the statistical functions of various units of the Federal government. The work of the committee has a potential for widespread and lasting benefit for users of and contributors to government statistics.

During its term, JAHCOGS will work with two experienced consultants on drafting a report on options for improving the coordination of the present decentralized Federal statistical system. In addition, JAHCOGS plans to frame a set of proposals to be implemented by the committee's constituent associations or any other interested body. The purpose of these proposals will be to focus continued attention on the issues discussed by the committee. It should be noted that all committee reports will include a clear disclaimer with regard to responsibility or endorsement of the sponsoring associations.

Society members are urged to send their JAHCOGS representatives any opinions, suggestions, or problems relating to Federal statistics, including their recommendations as to postures the Society representatives might adopt. In view of the fact that the committee must accomplish its work within the next two or three months, an early response is most important.

I. A. N.

(Continued from page 4)

national or regional organizations, whose function should be to assist in carrying out the detailed investigations and experimentations necessary to achieve the aims of the technical committee."

TOTAL GROUP

Bruce F. Spencer, *Group Benefits in a Changing Society*, pp. 330, Charles D. Spencer & Associates, 222 W Adams St, Chicago, Ill. 60606, 1976, \$17.50.

by William Schreiner

As might be expected in a business as dynamic as group insurance, few textbooks have been available to the group insurance consultant which provide an up-to-date survey of the design and direction of employee benefit programs. Bruce Spencer, associate editor of "Employee Benefit Plan Review," has set out to fill this void with "Group Benefits in a Changing Society." This is a formidable task and this reader judges the result to be only partially successful.

The book's greatest strength lies in its comprehensive description and an explanation of life, disability, and medical care benefits currently available in the marketplace. The material on ERISA and non-insured approaches also provides useful reviews and checklists for these subjects. In addition, although the text is punctuated with what appears to be a lifetime supply of exclamation points, the writing is generally clear and effective. Unfortunately, however, the book contains a significant number of errors and misinterpretations which detract from its credibility.

Two factual errors are offered as examples. In Chapter 2 the author indicates that Section 79 of the Internal Revenue Code "prohibits the use of medical underwriting to determine benefits or rates for group term life coverage for cases under 10 lives." Rather than prohibiting medical underwriting below 10 lives, Section 79 withholds favorable tax treatment in such situations — a distinction of considerable importance to a benefits consultant who might be tempted by the text's statement to tell his client that an insurer could not legally request such underwriting. In Chapter 3 the text states that Maine currently has a minimum first year group term insurance rate law in effect. The law was repealed in 1975.

More seriously, the text also shows an incomplete understanding of the mechanics and objectives of premium setting and experience refund practices. An example of this is the concern expressed that "the risk that the older employee working for a small company may die might be greater than can be offset by

reasonable premiums." Actually it is the existence of financial risks that cannot be safely absorbed by an individual or small group that is the basis of the insurance enterprise. Also, a statement that "many insurance companies are happy" to have a claim ratio below 95% for small groups suggests a higher tolerance for suffering than one should believe exists in the industry.

There is also a surprising benefit omission in the text. In the description of major medical deductibles, there is no reference to medical care deductible accumulation periods of less than 12 months.

Considering the difficulty of the task the author undertook, it is not surprising that he does not successfully negotiate all of the pitfalls. Nevertheless, the book is welcome and deserves the attention of those interested in the current state of employee benefit plans even though it has to be read critically.

Social Security

Orlo R. Nichols and Steven F. McKay, *The Effect of the 1976 Automatic Increase on Dynamic Projections of Benefits*, Actuarial Note No. 90, Social Security Administration, Baltimore, Maryland, August 1976, pp. 6.

This Note analyzes the effect that the Social Security automatic adjustment provisions enacted in 1973 will have on future benefits based on actual increases through 1976 and projected increases thereafter. Five alternative sets of economic assumptions are used regarding future increases in annual earnings and in the Consumer Price Index. Projections are presented of future earnings, benefits, and replacement ratios (benefits at retirement compared with the previous year's earnings).

Copies of this note may be obtained free of charge from the Office of the Actuary, Social Security Administration, Baltimore, Maryland 21235.

To Determine Best Milk Givers

Model Developed to Apply Actuarial Principles to Cows

Animal science and computer experts at Brigham Young University (BYU) here are going to apply to Dossie the actuarial principles used by insurance companies on people.

Computerworld

Moos in place of μ 's?

Letters

(Continued from page 2)

Sex and the Single Table

Sir:

Tom Walsh in his review in *The Actuary* and Barbara Lautzenheiser in her original article properly point out the inconsistencies and logical fallacies in recent governmental attempts to forbid sex differentials in the pricing of pensions. I feel, however, they have given too little weight to the fact that the ultimate decision rests with the people and their elected representatives and not with actuaries and other experts. Certainly we do have a role to play in pointing out what type of prohibited differentials are impractical and unworkable, or perhaps even fundamentally wrong, and which are not.

Some differentials in insurance or pension costs in the past were more a matter of convenience to insurers than of fundamental risk differences. Let me construct a hypothetical example. Statistics might well show that members of one religious faith show consistently higher mortality than members of another. More careful examination of the individuals on the basis of acceptable risk criteria would undoubtedly enable insurers to sort them into risk-equivalent classes without reference to religion. In any event, it seems that risk classification based on religion could properly be prohibited by the government. Similar arguments apply to racial differentials formerly used by insurance companies but now prohibited by law.

Mr. Walsh argues that the Overlap Theory leads to unsound results, such as "age-blind" tables. Here again he ignores the possibility of risk classification based on criteria other than sex.

If the final decision is that sex differentials in pension plans should be permitted, then it seems logical to apply this principle to other aspects than pricing — for example, any mandatory retirement age should be higher for women.

Robert J. Randall

* * * *

Opting Out

Sir:

It is with much interest that I read the article in the January 1977 issue of *The Actuary*, "Opting Out".

As the article noted, various public

employee units in Louisiana have opted to withdraw from Social Security. We have been hired by many of those units to study the pros and cons of such actions, and the following comments are a result of such research.

Most of the comments in the article have merit; however, a number of observations have been omitted which would substantially change the conclusions. First, the present Social Security system cannot support itself with 11.7% contributions, even if benefits were "decoupled." The actuary for the Social Security Administration has recommended an immediate increase of 3.4% to 15.1%. Therefore, any consultant studying Social Security should consider this contribution level for cost comparison. Although it is possible that Congress may find means of financing this extra cost other than payroll taxes, such means would require a change in the philosophy of the Social Security system.

Secondly, I do not understand how most consultants have concluded that private plans cannot fund the benefit of Social Security. Perhaps they are missing the point that, when a system pulls out of Social Security, most of the people in that system will draw some sort of Social Security benefit. Therefore, the system has to fund only the amount that is lost, not the entire benefit. We have created models duplicating sample situations in order to calculate these "lost benefits." Although this is a rather complicated calculation, it should be done to get the true story.

Probably the best reason for pull-out is that the local public agency can control the design and cost of their entire retirement and fringe benefit program. The complicated arrangements of offsets and steps can be avoided. This not only eases the communications to the employees, but many public employee plans, ignorant of exactly what Social Security pays, are paying combined retirement benefits exceeding 100% of final pay. It is easy for pressure groups to raise benefits when much of the benefit is not well understood. For example, in another southern state, considering the contemplated increase in Social Security contributions, the state will be contributing 27% of payroll, of which the employees contribute 12.55%. This is an exorbitant cost for retirement benefits. Further, better benefits, in the sense that they better

fit the needs of the individual, can be designed through a plan which controls all the costs.

Finally, there is the appeal to the social good. Social Security has exceeded its philosophy of providing a base plan. If the formulae continue unchanged, Social Security will indeed become the major part of any retirement program of every citizen in the United States. Personally, I believe that the only way this trend can be stopped is to allow the private enterprise system to exert its influence, whereby everyone pursues those options best for him. If it is indeed in the best interest of a state to pull out of Social Security, because of the way that Social Security benefits are constructed, then that is for the Congress to correct, not the state. I believe that if enough public employee bodies study the problem closely, they will find that it will be to their advantage to withdraw from Social Security, and that such withdrawals will force Congress to take a new look at the system and correct its deficiencies.

I agree with Mr. Robertson's comments that groups cannot be prevented from withdrawing from Social Security. Although it has not been given as much publicity as it should have, perhaps one solution would be not to resist withdrawal, but to provide a fairer formula for sharing of benefits. It is the present formula's giving higher benefits to lower average monthly earnings that is creating the problem for the Social Security Administration. That agency is actually paying for more than its share.

Richard F. Camus

* * * *

Valuation and Non-Forfeiture Laws

Sir:

The purpose of this letter is to bring some significant new information to the attention of your readers in connection with the article "Valuation and Non-forfeiture Laws," written by John K. Booth that appeared in the March, 1977 issue of *The Actuary*.

Probably subsequent to the editorial deadline, the Board of Directors of the American Council of Life Insurance modified the ACLI position with regard to the NAIC Model Bill described in the above article. The ACLI position is now to support a valuation interest rate of 4½% (instead of 6½%) and a nonfor-

(Continued on page 7)

Letters

(Continued from page 6)

feiture rate of 5½% (instead of 6½%) for single premium life insurance. Legislation already in the legislative process with the higher interest rates is not being modified. Legislation being introduced by the ACLI in states subsequent to this change in position incorporates the lower interest rates.

There no doubt could be very long and passionate discussions about this change in position on the part of the ACLI. As an uninformed outsider, I would opine that they probably decided they had gone a little too far in this one relatively minor area and fixed it.

Dale R. Gustafson

* * * *

Estimating Social Security Benefits in an Actuarial Valuation

Sir:

Mr. Bader's article in the January issue concerning Social Security estimates raises some excellent points. I find the constant replacement ratio method justifiable from a conceptual point of view and apply it by choosing Social Security projection assumptions which will approximate that result. My only problem with Mr. Bader's method is that he does not discuss how Social Security is handled where an individual's wages increase more rapidly than the wage base.

In general, the replacement ratio is dependent upon the relationship between earnings and the tax base at retirement, not upon the present relationship between earnings and the tax base. We cannot always safely assume that earnings will increase at the same rate as the wage base. Usually a realistic valuation salary scale will produce expected pay increases in excess of expected tax base increases because pay increases from promotions are not reflected in the tax base increases. These reflect changes in the cost-of-living and increases in collective (not individual) productivity.

If an individual now earns \$11,000 but by retirement his earnings are equal to or greater than the taxable wage base, then the projected replacement ratio for him should be approximately 30% of the wage base at retirement, not 40% of his projected pay at retirement as described

in the article. Similarly an individual whose current earnings equal the taxable wage base but whose projected earnings equal 1½ times the wage base will have an expected replacement ratio of 30% of the wage base at retirement not 30% of pay at retirement. Ignoring this refinement may result in a serious overstatement of Social Security offsets relative to pay and consequently an understatement of long-term pension plan costs.

I will mention something quite simple but not immediately apparent. It is possible (likely?) for the earnings of all individuals in a group to increase more rapidly than average earnings for the entire group. It is a simple matter to conceive of a stationary population where average wages increase at only 5% from one year to the next while all individual wages increase at a greater rate (7% or 8% for example). In this population the number of retirements and terminations at higher wage levels are replaced in number with low wage earners. (The actual replacement for the job of a retired person is assumed to be a person who is promoted from within the group).

Data from one large client indicated that over a twenty-five year period a large identifiable group had a consistent pattern of salaries at retirement being approximately twice the salary for a newly hired person; and wages for each job level had increased at an average rate of 5% per year. The doubling of relative pay implied promotional increases averaging 2% to 2½% per year over an entire career with total individual salary increases averaging 7% to 7½% each year. An assumption of constant replacement ratios could greatly understate the percentage of pay to be provided under an offset plan in this situation, and an assumption that earnings would increase at the same rate as the wage base would understate both pay at retirement and the percentage of pay to be provided by the plan.

Allan B. Keith

* * * *

How Accurate Are Approximations?

Sir:

The article by Mr. Edelstein in the January issue prompted us to communicate some further information on problems using approximations that may be of interest or use to others.

We used Jordan's approximation

$$n|\ddot{a}_x^{(m)} = n|\ddot{a}_x - \frac{m-1}{2m} nE_x$$

combined with the 1971 IAM table projected to 1978 and an interest assumption of 7¼%. Running our program in double precision the anomaly occurred

$$\text{that } m\ddot{a}_x^{(m)} > m\ddot{a}_{x:\overline{n}|}^{(m)}$$

for certain ages and values of n, and also that the differences, although not large, were significant. The discrepancies were confined to the very young ages; afterwards the expected pattern prevailed. Following this, however, we prepared joint and survivor rates and the problem persisted for ages up to the high 50's. After an exhaustive check, we decided the problem might be the approximation and not the programming. Using our generated commutation values to check temporary life annuities compared to period certain annuities there were no discrepancies in the relationships for either single or joint and survivor rates if the payment frequency was annual (m=1). But for other payment frequencies (m=2, 4 and 12) we consistently found examples of

$$m\ddot{a}_x^{(m)}:\overline{n}| > m\ddot{a}_{\overline{n}|}^{(m)}$$

at the troublesome ages, thus confirming our suspicion. Functionally we solved our problem by reprogramming the computer to make comparison checks and use a consistent value.

We feel that the combination of values of p_x unusually close to 1 and substantial interest assumptions is sufficient to cause the standard approximation to produce inconsistencies. The effect of p_x being close to 1 is dramatically shown by the span of ages where the problems occur using single life rates compared to joint and survivor rates. Finally, a test was made to see if including the next term of Woolhouse's expansion (assuming uniform distribution of deaths to estimate μ_x) would improve the situation. This did not happen.

Dave Becker
Imen Bojrab
Lee Buckele

* * * *

(Continued on page 8)

Letters

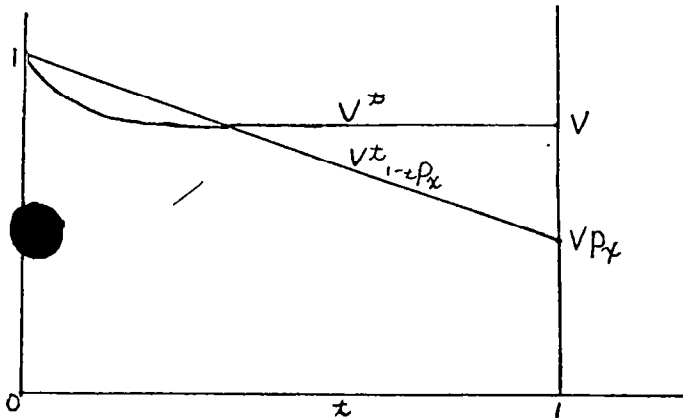
(Continued from page 7)

Accurate Are Approximations?

Sir:

I was intrigued with the anomaly described by Hermann Edelstein in his letter published in the January edition of *The Actuary*.

The common approximations for $\ddot{a}_{x:\overline{n}|}^{(m)}$ which he used can be derived by assuming that $V^t \cdot {}_tP_x$ is a linear function in the range $0 \leq t \leq 1$. At the same time he used an exact value for $\ddot{a}_{\overline{1}|}^{(12)}$ and hence for the underlying values of V^t . The following graph shows both V^t and $V^t \cdot {}_tP_x$ for the type of situation which produces inconsistencies.



Whenever $V^t \cdot {}_tP_x$ is greater than V^t we imply that ${}_tP_x > 1$ and that mortality has been negative in the range $0 \leftrightarrow t$. The underlying expression for ${}_tP_x$ can be shown to be ${}_tP_x = (1-t)(1+i)^t + t \cdot V^{1-t} \cdot P_x$ $0 \leq t \leq 1$

Actuarial Cost Methods and Projections

Sir:

Keith Gibson's letter in the March 1977 *Actuary* about the fundamental equation for expressing the normal cost of a pension plan as a level percentage of payroll, brings to mind the appropriateness (or lack of appropriateness) of expressing the normal cost as a level percentage of payroll.

As a matter of fact it appears downright inappropriate when the pension itself is not a flat percentage of pay, for

example a pension integrated with Social Security, such as a monthly pension of 20% of the first \$600 of last five year average monthly pay plus 50% of the excess over \$600 of such pay.

Wouldn't it be more natural in such a plan to calculate the normal cost individually the first year, and as an aggregate level percentage of the total of such first year normal costs thereafter?

Why isn't this method mentioned in any of the pension funding texts?

Stuart J. Kingston

* * * *

This takes on correct values for $t=0$ and $t=1$ and approximate values in between.

Under what circumstances will the VP line lie above the V curve in part? Taking derivatives at $t=0$ and setting them equal we obtain the condition

$$-(1-V\rho) = -\delta V^t \quad (t=0)$$

$$1-V\rho = \delta$$

$$g = \delta(1+i) - i = Q_1$$

Mr. Edelstein has shown the condition leading to the distortion in the monthly annuity due. For the continuous annuity situation it can be shown that annuity distortion occurs if $g < Q_2 = i - 2 \frac{i-\delta}{\delta}$. Note that Q_2 is very close to one-third of Q_1 .

The following table shows for a number of interest rates the critical values Q_1 , when the phenomenon of negative mortality emerges, and Q_2 and Q_3 when annuity distortions arise for the continuous and monthly annuity due situations.

Interest Rate	Q_1	Q_2	Q_3
.05	.00123	.00041	.00044
.06	.00177	.00058	.00063
.07	.00240	.00079	.00086
.08	.00312	.00103	.00111
.09	.00394	.00129	.00140
.10	.00484	.00159	.00172

A remedy to the annuity distortion discovered by Mr. Edelstein would be to use a different approximation for

$\ddot{a}_{x:\overline{n}|}^{(m)}$. Assuming uniform distribution of deaths in each year of age the following formula can be derived..

$$\ddot{a}_{x:\overline{n}|}^{(m)} = \frac{i \cdot d}{i^{(m)} \cdot d^{(m)}} \cdot \ddot{a}_{x:\overline{n}|} - \frac{i - i^{(m)}}{i^{(m)} \cdot d^{(m)}} (1 - {}_nE_x)$$

John A. Mereu

Actuarial Meetings

May 25, Joint meeting — Boston and Hartford Actuaries Clubs

June 7, Twin Cities Actuarial Club

June 9, Baltimore Actuaries Club

June 9, Actuaries' Club of the Southwest

June 15, Joint Meeting — Portland-Seattle Actuarial Clubs.

July 26, Seattle Actuarial Club