The Actuary

The Newsletter of the Society of Actuaries

VOLUME 15, NO. 2 FEBRUARY, 1981

ACTUARIAL NOMADS

Among our 8,000 present members there are a few who, having struggled like the rest of us to Fellowship or Associateship, have wound up earning their livings in ways quite unlike yours and mine.

Our Career Encouragement Committee's Subcommittee on Actuarial Opportunities has looked around for members who hold jobs in non-traditional areas. Subcommittee Chairman Gilbert V. I. Fitzhugh reports having discovered 27 of these.

This hunt's purpose was to find out whether there might perhaps be more such opportunities for actuarially trained men and women, whether those who have left the beaten path have found our brand of training useful in what they are doing—and whether our educational system might be adapted so as to become a yet better stepping-stone into diverse fields.

The Subcommittee asked these members what value they now think the actuarial course has been to them, with these results:

Exams Regarded As:

Mostly A Waste of Time	11 responses
A Suitable Path, But Not Uniquely So	9 "
The Preferred Way To Prepare	5 "
Special Cases	2 "

Verdict: "Waste of Time"

Among the eleven who evidently regret having strayed into our examination centers were 5 Fellows. One is now building restaurants for a fast-food chain; the others are a family physician, a farmer, a health care delivery consultant, and a divinity student and part-time preacher. The Associates include a chartered accountant, a systems ana-

(*Continued on page 2*)

QUESTIONS FOR E & E?

The Education and Examination Committee is introducing a periodic Question-and-Answer column. To get it started, we hereby solicit questions from readers.

Through this form of communication between the Committee and students, teachers and other interested members, we aim to remove mystique from the examination process.

Please send us questions that are of general interest to students writing any particular exam, to students in general, or to Society members.

We do not promise to answer every question, but we will respond in this column to questions of widespread interest, and we will reply personally to other enquiries. The first column is to appear in April.

Send your questions to: James J. Murphy, Director-Underwriting, Northwestern Mutual Life Insurance Company, Milwaukee WI 53202.

Peter Hepokski

FUNDING FLAT-BENEFIT PENSIONS IN AN INFLATIONARY ERA

by Lawrence N. Bader

The Problem

Consider a company that sponsors a final-pay plan for its salaried employees and a negotiated flat-benefit plan for its hourly-paid workers. Under the former, benefit increases due solely to salary increases are anticipated and pre-funded. But the corresponding increases under the latter take place only through plan amendments, are not anticipated in the funding, and create new unfunded liabilities. If both plans' benefits are held constant in relation to pay, the unfunded liability will gradually disappear under

(*Continued on page 4*)

1981: A VINTAGE YEAR FOR SOCIAL SECURITY LEGISLATION?

by Dwight K. Bartlett, III

There is reason to expect 1981 to be the biggest year for Social Security legislation since 1977, perhaps even since 1972. Between 1935 and the early 1970's Congress used to love Social Security legislation because of its opportunity to vote more benefits to more people. But Congress has come to loathe this task since it requires difficult choices—increasing revenues, reducing benefits—that inevitably anger a significant portion of the electorate. Witness the extreme difficulty in adopting last year's relatively minor disability insurance amendments.

Congress, in 1981, cannot avoid passing significant legislation to deal with financing. Present projections of the Office of the Actuary indicate that without legislative remedy the OASI Trust Fund will be unable to pay benefits, certainly in 1982 and maybe even in late 1981. Since Congress must do something it may be in a mood to try to do everything this year in the hope that thus it can avoid addressing Social Security financing problems for a while—certainly not in the election years 1982 and 1984.

Several questions are apt to receive serious consideration by Congress in 1981. These include:

(1) *Inter-Fund Borrowing.* This will permit the OASI Fund to borrow from the DI and HI Funds until the higher payroll tax rates scheduled for 1985 come on stream and permit the OASI Fund to recover and the loans to be paid back. This is the most likely of all provisions to be legislated since it requires no tax rate increases and no benefit reduction. Current projections, however, show that this by itself probably won't

(*Continued on page 3*)

The Actuary

Editor . . . . . . E. J. MOORHEAD
Associate Editors . . MICHAEL B. MCGUINNESS
FREDERIC SELTZER
Competition Editor . . CHARLES G. GROESCHELL
Editor Emeritus . . . ANDREW C. WEBSTER

Correspondence should be addressed:
The Actuary
Bermuda Run, Box 780
Advance, N.C. 27006
Tel: (919) 998-5335

Published monthly (except July and August) by the SOCIETY OF ACTUARIES, 208 S. LaSalle St., Chicago, Illinois, 60604, Robin B. Leckie, President, Kenneth T. Clark, Secretary, Robert J. Johansen, Treasurer, Robert E. Hunstad, Director of Publications. Non-member subscriptions: students, $4.50; others, $5.50.

The Society is not responsible for statements made or opinions expressed herein. All contributions are subject to editing.

EDITORIAL

MOUTHPIECE

"The job of U.N. Ambassador is to represent the policy of his/her government without qualifications or ambiguity, to do it as persuasively as possible . . . . (But) I am not a professional diplomat. I haven't signed over my conscience and intellect. If I didn't feel in good conscience I could represent the policies of the Reagan administration and the State Department, then the appropriate course would be to resign."

—*Jeane J. Kirkpatrick, delegate-designate to the U.N., quoted in The New York Times, Jan.* 12, 1981.

AFTER pausing to admire Mrs. Kirkpatrick's graceful description of how she sees her task, we turn to the question whether the role of an actuary who is appointed to an NAIC advisory group is expressible in parallel terms.

It seems that, to do so, we must make up our mind on three fundamentals:

First, whether such an actuary thinks of himself as an advisor in any broad sense—or whether he comes to the meeting with prior instructions, bent upon striking the best bargain he can in the narrow interests of his own company.

Having seen actuaries in action on this front, we conclude that in many cases closer attention to the meaning of that adjective "advisory" is called for.

Second, whether actuaries tend to be of greater use to the NAIC when they come to such meetings as appointed representatives of the Society or Academy rather than of a company association.

An actuarial observer, whose judgment we think warrants confidence, has said that he detects a material difference. When the actuaries are speaking for our profession the working relationship, says this commentator, "tends to generate a clear expression of the problem and to progress toward a solution consistent with the best deal for the public."

Third, how the actuary's behavior is affected by the presence, becoming more and more common, of committee members from outside the industry.

Beyond doubt their presence compounds the difficulty of the task. The actuary has to be sure to listen carefully, to expel jargon from his own discussion, and to give the so-called public interest member the benefit of the doubt when judging his motives and competence.

To the extent that an actuary in any of these forums must, like Mrs. Kirkpatrick, present "as persuasively as possible" the views of his own company people back home, surely he should limit himself to voicing supporting arguments that are tenable when subjected to the reasoning that his professional training enables him to apply.

E.J.M.

Actuarial Nomads

(*Continued from page* 1)

lyst, a theatre manager, a plumbing supply wholesaler, and a retirement fund administrator.

Mr. Fitzhugh comments that these eleven are mostly people who tried being actuaries, and didn't like it. These nevertheless have kept their Society membership; it would be interesting, said he, to interview some of those who left the Society, if they could be found.

Verdict: "Helpful"

This group of nine are mostly in investments, banking and finance, and perhaps are typical of a substantial number of us in those fields. They tend to see MBA's as their competition. Mr. Fitzhugh sees possibilities for syllabus changes that would increase its value for their successors. Indeed, the British experience where many F.I.A.'s and F.F.A.'s get into the investment field, appears worth examining.

Verdict: "I Needed That"

Here we find five members performing traditional jobs in non-traditional places. Four are in government, engaged in such as model office studies for FHA and reviewing private pension and insurance programs. The fifth is a self-employed Associate who calculates retirement plan shares upon marriage dissolution in a community property state.

The Special Cases

Two of the Subcommittee's quarry turned out to be chief executives of conglomerates that include insurance companies. Says Fitzhugh, "These men rose to the top of the ladder by climbing the actuarial rungs." One of them went beyond the fabric of the questionnaire to wax enthusiastic about the value of actuarial training to those who may eventually be picked to manage a broad enterprise.

We observe with interest that this newsletter's Competition Editor was somehow caught in the Fitzhugh net. The Subcommittee classified our Charles Groeschell in the "It Was Helpful" category because he responded that in preparing himself for the C.E. job, actuarial exams helped him to be patient and competitive, but a sense of humor had to be acquired elsewhere.

E.J.M.

Vintage Year

(*Continued from page 1*)

avoid exhaustion of the fund some time in the 1980's.

(2) *General Fund Borrowing.* If inter-fund borrowing seems inadequate, many will view general fund borrowing as the next best remedy. Present projections suggest that amounts borrowed from the general fund of the U.S. Treasury to permit continuing benefit payments during the early 1980's can be repaid in the late 1980's, though this is by no means certain. Clearly, general fund borrowing, likely to be recommended by the National Commission on Social Security, remains only a limited solution; the HI Fund is likely to be exhausted in the 1990's, and the OASI and DI Funds, even though combined, will apparently run out of money after the turn of the century.

(3) *General Revenue Financing.* The 1979 Advisory Council recommended that HI be entirely financed from general revenues, and that half the tax rates presently scheduled for HI be added to that for OASDI. The rationale for general revenue financing of HI is that its benefits are not wage-related as are OASDI benefits. The National Commission is likely to recommend somewhat more limited general revenue financing of HI. There remains, though, powerful opposition to any general revenue financing of Social Security on the grounds that the payroll tax mechanism is an important element in deterring undesirable program expansion.

(4) *Raising Normal Retirement Age.* The 1979 Advisory Council recommended serious consideration of promptly enacting an increase in the normal retirement age, to become effective after the turn of the century. Both the National Commission on Social Security and the President's Commission on Pension Policy are likely to make similar recommendations. Most proposals being discussed call for gradual transition from age 65 to normal retirement at age 68, beginning for those reaching 65 around the turn of the century and completing 10-20 years later. The minimum early retirement age, now 62, is likely to be increased simultaneously to 65. This is a long debated change whose time may finally have come.

(5) *Change In Indexing.* There is growing recognition that a cause of short-range financing instability is that OASDI benefit cost grows proportionately to CPI increase, while revenues, except when tax rates change, grow in proportion to growth in covered wages. Historically, wages have grown faster than the CPI, but this has not been the case in the latter part of the 1970's and is unlikely to be so for at least several more years. It has been suggested that some cap be placed on the CPI adjustment for existing beneficiaries.

Perhaps the most palatable proposal politically would be to make the annual adjustment equal to the lesser of the CPI increase or the increase in covered wages per worker in the previous year; there might be a catch-up provision so that when wage growth resumed its traditional pattern of outstripping CPI increase, the lost CPI adjustments would be restored. Such a provision can be rationalized politically on the grounds that beneficiaries are being treated no less generously than current workers in terms of the purchasing power of their benefits.

(6) *Move Toward Universal Coverage.* Federal employees are not covered by Social Security; employees of state, county and local subdivisions and certain non-profit organizations are covered on a voluntary election. Requiring coverage for these groups has been advocated on grounds of equity, also to help meet the program's short-range financing problems. But the lobby opposing this is extremely powerful, particularly with respect to current employees, and the constitutionality of requiring political subdivision employees and the non-profit organization employees to be covered is in question. In my opinion, legislation bringing future Federal employees under Social Security stands a reasonably good chance.

Other possible changes undoubtedly will be discussed this year, but with less likelihood, I think, of being legislated. These include: (1) elimination of the retirement test, (2) switch from wage-indexing to CPI-indexing of wage records and of the PIA benefit formula, and (3) benefit formula changes designed to increase emphasis on individual equity as opposed to social adequacy. An example of (3) is phasing out spouses' benefits whose rationale is that increased female work-force participation will cause most spouses ultimately to be insured in their own right based on their own wage records.

For Social Security watchers, 1981 may be a banner year! □

Actuarial Meetings

Feb. 17, Chicago Actuarial Club
Mar. 17, Chicago Actuarial Club

CONGRESS KILLED "FICA-II"

by Robert J. Myers

A few years ago, some management firms began to tout the savings that an employer could make by reducing employees' wages by all or a portion of their Social Security payroll tax and then paying this tax for the employees. This procedure, which had been little used through the years except by householders employing domestic workers, was dubbed "FICA-II."

The catch in this was that although take-home pay was not decreased, OASDI earnings credits would thus be lowered, as also would other potential public benefits, and even in some cases employer-sponsored benefits. A major objection, affecting those not using the plan as well as those using it, was the resulting erosion of Social Security tax receipts, creating eventually a need for higher contributions than would otherwise have been sufficient.

All who testified at a House Ways and Means Committee hearing on this matter in late 1979 recommended that this loophole be elmininated, as also has the Advisory Council on Social Security, the National Commission on Social Security, and President Carter in his January 1980 Budget Address. All agreed that it should continue to be available for domestic workers. Finally, in December 1980, legislation eliminating FICA-II was enacted. Groups permitted to continue using it are:

- Domestic and farm workers;
- State and local governments, temporarily through 1983 if they had been using the plan on October 1, 1980.

As far as I know, all prominent actuarial consulting firms and many individual actuaries consistently viewed this iniquitous manipulation of Social Security with disapproval. □

List of Schools With Actuarial Programs

This year's List of Schools and Colleges That Provide Actuarial Science Programs is now to be had for the asking from the Chicago office. A copy has been sent to the chief actuary of each company in Canada and the United States that is on the Society's mailing list. Compilation was the last of many services rendered our profession by the late Robert N. Powell, chairman of the subcommittee that collects this information.

BRIGHT LEXICON OF YOUTH

We have reports of a brace of early achievers.

David R. Godofsky passed all of the Associateship exams before age 21, putting Part 5 behind him in May 1979 at age 20.

Nooruddin S. Veerjee, born in Pakistan December 29, 1958, became a Fellow in May 1980, making him just under 21½ years old when he wrote his last exam. His achievements include completing the Institute of Actuaries Associateship in May 1977 at age 18½. He started actuarial work in a Karachi consulting firm in 1976, and came to the United States in 1978. □

Social Security

John C. Wilkin, *"United States Population Projection by Marital Status for OASDI Cost Estimate*, 1980." Actuarial Study No. 84, Social Security Administration, Baltimore, Maryland, October 1980, pp. 40.

Presents the 75-year population projection by marital status used to analyze potential financial commitments of the OASDI Trust Funds appearing in the 1980 Trustees Report. Tables give estimated future marriages, divorces, and new widowhoods by year. The projection presented here is consistent with the Alternative II population projection in Actuarial Study No. 82.

Bruce D Schobel, *Administrative Expenses Under OASDI*, Actuarial Note No. 101, Social Security Administration, Baltimore, Maryland, November 1980, pp. 20.

Presents a summary of OASDI administrative expenses, 1940-1979. Expenses are measured by several denominators: contribution income, benefit payments, taxable payroll. An administrative expense index is developed and used to analyze the changes in expense levels, 1960-1979. □

Funding Flat-Benefit Pensions

(Continued from page 1)

the final-pay plan but will steadily increase under the flat-benefit plan.

Example

Assume a flat-benefit plan under which the liability for active employees remains constant except for annual amendments that increase these benefits by 6%. The plan is funded over 30 years on a 7% interest assumption, and there are no gains or losses.

The resulting active employees' funding ratio will stabilize after 30 years at 37%. That is, assets will cover the full retired life liability and 37% of the active life liability, under the plan's funding method.

Higher interest rates or benefit increases would worsen this funding ratio dramatically. An 8% interest rate would lower the ultimate funding level to 35%; a 7% benefit increase rate would lower it to 32%. If current rates—say, 12% interest and 10% benefit increases—became the norm, the funding ratio would stabilize at just 16%. On the other hand, funding over 10 years helps greatly; on the 7% interest and 6% benefit increase assumptions, the funding ratio would improve from 37% to 76%.

Comments

Assuming that serious inflation is here to stay, these results are disturbing for several reasons:

(1) Rational funding practices should not result in fully-funded pay-related plans and weakly-funded flat-benefit plans, when the two plans are just different ways of achieving the same benefit objectives. As this difference in funding becomes more widely recognized, it may become a significant social issue for our critics.

(2) Despite its phase-in rules, the Pension Benefit Guaranty Corporation may be at greater risk in flat-benefit plan terminations. Participants clearly are.

(3) The sponsoring companies may not be getting sufficient negotiation credit for improvements in flat-benefit plans, since substantial unfunded liabilities will always exist and may have to be written off upon plant closing or sale, a cost not recognized when the plan improvements are negotiated.

(4) The size of the problem is not recognized by many clients, who believe that our funding schedules must lead to well funded plans. Those who notice that their salaried plans tend to be the better funded of the two types may think that this is a temporary aberration rather than the inevitable outcome of the funding practices. While they recognize that plan improvements continually create unfunded liabilities, they may not consider 30% or 40% a satisfactory ultimate funding level.

What Can Be Done?

First, shorten the funding period. Extended funding periods work satisfactorily for non-recurring changes, but changes that merely keep up with pay are more reasonably funded over the expected period to the next increase. Ten-year funding is of course the practical limit.

Second, adopt a strong funding method, e.g., the entry age normal method.

Third, choose assumptions carefully. The risks inherent in a final-pay plan are usually thought to require conservatism, but this need seems even greater in frequently renegotiated flat-benefit plans.

Fourth, even when anticipated increases are not pre-funded, tell the sponsor how much prefunding would cost, thus giving him a useful funding benchmark.

Formula For Funding Ratio

The funding ratio discussed in this article, which is independent of the cost method used, is of course the complement of the unfunded liability. The unfunded liability may be calculated by the formula

$$\frac{bu}{1-v^n}\left(\ddot{a}_{\overline{n-1}|} - v\cdot\frac{v^{n-1}-u^{n-1}}{v-u}\right)$$

where

- b = the annual benefit increase percentage,
- n = the period for funding plan change liabilities,
- u = reciprocal of (1 + b)
- ä is calculated at effective rate b.
- v is calculated at the selected interest rate assumption. □

COMPETITION NOTES

This month and next we introduce an intriguing variant on Graham Deas' popular ACTUCROSSWORDS. Because of the nature of their clues we are calling them SYMBOLIC ACTUCROSSWORDS. Their composer is a member in the Philippines, Alexander T. Brooks, to whom go our warmest thanks.

Also, we announce a mini-contest for lovers of our ACTUCROSTICS. Please send to the C.E. (at his Year Book address) quotations that you'd like him to make into Actucrostics. You needn't work out the clues unless you insist, but your text should contain at least 250 letters, and your submission must fully identify the author's name and the source. The C.E. will award an album of Crostics to the three readers whose submissions we use in April, May and June.

C.G.G.

A FUNDING BOOK FOR THE NON-ACTUARY

We welcome a book by our own Daniel F. McGinn, *Pension Funding: Actuarial Primer for Corporate Management*, published by Charles D. Spencer & Associates, Chicago. The book's chapter titles are:

- Pension Funding: Introduction to Basic Concepts
- Actuarial Assumptions
- Pension Funding Techniques
- Asset Values for Pension Funding
- Funding Policy
- Unfunded Actuarial Liabilities
- The Actuarial Report
- Dynamic Actuarial Forecasting—A Management Tool
- Important Questions Management Should Ask The Actuary

A review will appear in the *Transactions.*

SOCIETY FINANCES

In our April 1980 issue we printed the considered opinion of our then Treasurer, L. Blake Fewster, that the Society would show excesses of income over expenses of $25,000 for the fiscal year ending July 31, 1980, and $36,000 for the year after that. Mr. Fewster, in his swan-song at Montreal in October, had the satisfaction of announcing an excess of $53,000 for the former, and now we learn that the budget for August 1980 - July 1981, the responsibility of newly elected Treasurer Robert J. Johansen, calls for an identical margin of $53,000. Here are the figures:

Income and Expenses
(rounded to thousands of dollars)

	Year ending July 31		
	1979	1980	1981 (*Budget*)
Income			
Membership Dues	$ 515M	665M	
Meeting Registration Fees	185	370	
Examination Fees & Material	569	682	
Sale of Publications	82	107	
Income from American Academy	58	75	
Investment Income	42	79	
Other Income	25	70	
	1,476	2,048	2,245
Expenses			
Membership Activities	141	243	
Meeting Expenses	174	271	
Examinations & Materials	387	362	
Cost of Publications	30	42	
Salaries	331	428	
Other General & Administrative	575	649	
	1,638	1,995	2,192
Excess, Income over Expenses	−162	53	53
Membership Equity, end of year	425M	478M	531M

Mr. Fewster attributes the change from the large 1978-79 deficit to the comfortable 1979-80 surplus to increases in meeting and seminar fees, together with some hard work by both members and staff. □

GOLDEN ANNIVERSARIES 1981

This year's celebrants of fifty years' standing are 12 Fellows and 3 Associates:

Fellows

A. Edward Archibald
Wray M. Bell
W. Harold Bittel
Earl F. Bucknell
Douglas S. Craig
Joseph B. Glenn
Harry F. Gundy
John Haynes Miller
Eugene H. Neuschwander
George Ryrie*
Theodore A. Stemmerman
James M. Woolery

Associates

F. Edward Huston
Ronald J. Martin
Melvin G. Wyatt

All these gentlemen except Messrs. Bittel and Miller are listed in the "We don't know what they're doing" section of the 1980 *Year Book*. If those of them who see this will write to the Editor remarking on their present activities, a composite account of interest to the rest of us will be printed.

The Society's computer, ranking authority on this subject, says that these additions bring the total number with 50 or more years of service in their present status to 114—86 Fellows, 28 Associates. □

*We do not plan to repeat these congratulations to Mr Ryrie in 1982 despite the events he related in our February 1980 issue.

SOCIAL SECURITY

Copies of all the following are available free from Office of The Actuary, Social Security Administration, 707 Altmeyer Building, Baltimore, MD 21235.

Steven F. McKay, *Long-Range Cost Estimates for Old-Age, Survivors, and Disability Insurance System* 1980, Actuarial Study No. 83, Social Security Administration, Baltimore, Maryland, September 1980, pp. 82.

Describes the latest long-range cost estimates prepared by the Office of The Actuary, which were included in the 1980 Trustees Report. Assumptions, methods, and results of the cost estimates are discussed. Also shown are results of sensitivity tests for selected assumptions, and cost estimates under alternative assumptions. □

MINORITY RECRUITING

This Subcommittee expresses appreciation to the companies, consulting firms, foundations and individuals who responded so warmly to our 1980 fund drive with contributions totalling $32,970.

During 1980 we approved $31,650 in scholarships, as follows:

- $15,350 for regular scholarships to 13 minority students;
- $ 6,300 for minority students at Lebanon Valley College (Pa.) summer institute;
- $10,000 for students in Howard University's fledgling actuarial program.

To enhance our recruiting effort, we seek to establish a network of Fellows, Associates and actuarial students (specially but not exclusively those who themselves are in a minority group) who would be willing to address groups of minority students, perhaps interview potential scholarship applicants, and lend encouragement to minority students within their locale. If helping in any of these ways interests you, please get in touch with Bernard Bartels at the Society's Chicago office.

Our warmest thanks to Mr. Bartels and his staff, to the editors of *The Actuary*, and to 1980 Presidents Vogel and MacGinnitie for their efforts and support—also to so many who have sent us encouraging responses.

Marsha M. Bera

A CONTEST OF ACTUARIAL INTEREST

From Madrid has come the announcement of THE KING JUAN CARLOS PRIZE. Its first award, in 1981, is to be for "monographic works of investigation on those technical, juridical, commercial, economic or insurance themes that endeavour to offset the effects of inflation in life insurance in particular and in savings in general." Entries must be at least 150, but no more than 500, double-spaced pages in length. Eligible participants are persons related to the world of insurance in particular or to the world of the economy in general. Entries must be sent through an organization, e.g., the Society, we suppose, to which the author belongs.

The prize is five million pesetas, which we figure to be equivalent to US $65,000. The deadline, March 31, 1981, is too close for readers not already aware of the contest but this competition seems well worth watching. Details from: Secretaia del "I Premio REY JUAN CARLOS," Alcala 39, Edificio Metropolis, Madrid-14, Spain. □

Exam Seminars At Georgia State

Seminars for Spring 1981 exams will be offered in Parts 2, 3, 4, 5A, 5B, and 6. Also, if there's enough interest, for CAS Part 6. Dates between April 6 and May 1. For details: Prof. Robert W. Batten, Dept. of Insurance, Georgia State University, Atlanta, GA 30303.

SOCIETY SEMINARS MARCH & APRIL 1981

Dates of the first three one-day seminars that were announced in December 1980 are:

GAAP Accounting	Atlanta, March 25 Chicago, March 30 New York, April 6
Actuarial Appraisal of a Life Company	New York, March 30 Chicago, March 31 Anaheim, April 8
Pension Fund Gains and Losses	Chicago, March 30 New York, April 6 Anaheim, April 8

Individual brochures for these have been, or very soon will be, sent to all members. Some have already signed up through the pre-registration sheet that went with the general announcement.

Linden N. Cole
Director of Education

LETTERS

Grading Multiple-Choice Exams

Sir:

Messrs. Radcliffe and Nicodemus (Supplement, November issue) convincingly demonstrate that a candidate's rank on a multiple-choice exam is the same if the scoring method either (1) adds one-fifth of the omitted answers to, or (2) substracts one-quarter of the incorrect answers from the correct answers.

But it is noteworthy that the author's conclusion that "exactly the same candidates will pass or fail under either method" does not hold true if the exam contains both multiple-choice and essay questions.

Consider two candidates in a mixed multiple-choice and essay exam whose performances are these:

	Multiple-Choice Questions			Essay
	Correct	Incorrect	Omitted	Point Score
A	60	40	0	35
B	70	0	30	26

Treating each multiple-choice question as worth one-half point, A ranks higher under Method 1, B ranks higher under Method 2.

By general reasoning it is evident that Method 1 favors the indecisive candidate who does well on essay questions, while Method 2 is the clear alternative for the inarticulate multiple-choice whiz.

Peter S. Kornya

* * * *

Sir:

If the essay scoring remains unchanged, the change of method will give greater weight to multiple-choice in the total. Since a given student rarely does equally well on both essay and multiple-choice, the result of changing to Method 1 is to favor students who do well on multiple-choice.

Among students near the pass mark (grades 3 through 8), the correlation between essay and multiple-choice scores is often strongly negative. My personal view is that essay questions require a quality of integrative thinking that is important to the practicing actuary and that it is not well tested through multiple-choice questions.

To the extent feasible, the E. & E.

(Continued on page 7)

Letters

(*Continued from page 6*)

Committee should continue to maximize the value of essay questions in selecting which students will pass the Fellowship examinations. Continued use of Method 2 is consistent with this objective.

Bruce E. Nickerson

* * * *

Sir:

Although Method 2 decreases the mean score in the multiple-choice section, it increases the range of scores ($-.25T$ to T, where T is the total), and thereby increases the difference between two papers. In order that the scoring system grant equal weight to both parts, the mean scores of the multiple-choice and essay portions should be about the same.

Ronald S. Levin

On behalf of both authors, Mr. Radcliff replies:

We intended our analysis to cover only solely multiple-choice examinations. The three responders have added an enlightening new perspective.

If E_a and E_b are the essay scores of candidates A and B, it can be shown that the scores under Methods 1 and 2 will be reversed if the following condition holds:

$$.8 < \frac{E_a - E_b}{S_b^2 - S_a^2} < 1,$$

where S is as defined in our article.

As the above inequality shows, Method 1 does not necessarily favor candidates who do well on essay, and Method 2 does not favor the multiple-choice whiz. For example, even if

$$E_a - E_b > S_b^2 - S_a^2$$

(the case of the good essay candidate), the rankings will not be reversed by the change in methods.

The Examination Committee decided to stay with Method 2 on the mixed multiple-choice and essay exams because it is more consistent with the grading of an essay test. No partial scores are given for omitted answers to essay questions, so no credit should be given for omitted answers to multiple-choice questions. The Committee felt fortunate to have chosen Method 2 because that method had been used on all previous examinations; so, by electing to stay with Method 2, there was no problem of candidates' rankings changing from one exam administration to the next.

* * * *

Reflections On La Verité

Sir:

That classic probability problem (November issue) was accorded one solution in the 15th Century, another in the 17th. Your readers may prefer a late 20th Century "solution" arrived at by thinking like an actuary.

As actuaries we like to view the future by projecting past experience. Might it not then be said that Player B has a 3/8th chance of winning the ninth game; if he wins, a 4/9th chance of winning the tenth game; and if again successful, an even chance of winning the eleventh, the final game? Hence his chance of winning all three is 1/12th, and the stakes should be divided 11: 1.

Matthew Rodermund, F.C.A.S.

* * * * *

Sir:

The answer given by Fermat and Pascal seems not to be the best available. It can be argued that in the absence of information to the contrary (e.g. that the game is pure chance), we must assume that in *each game* the best estimate of A's chance of winning is 5:3. Hence the probability of A winning overall is 485:27, which is closer to 95% than to the 87½% stated.

But this argument is not entirely sound. Using the same logic, if A wins the first game, then the best estimate of A's chance of winning each subsequent game is 1:0. Hence immediately after the first game the stake should be 1:0, and obviously he should take it rather than play on.

However, if we assume that the underlying probability of A beating B in any game is p (where $0 \leq p \leq 1$), then for each value of p we can calculate the chance that a 5:3 score would arise, and multiply this by the subsequent probability of A winning overall. Integrating from 0 to 1, I get an answer that A should take about 91%.

Kenneth J. Fagg

Ed. Note: We welcome this contribution from an overseas member.

* * * * *

Fairmindedness and Self-Interest

Sir:

The keen interest of private organizations in funding pension plans for their employees can hardly be expected to continue in the face of the prospect that the purchasing power of the benefits will be eroded by inflation at anything like current rates. In his carefully worked-out plan outlined in your October issue (℞ For The Inflation Sickness"), Elmer Benedict offers a practical way to protect private pension plans against the mortal threat of inflation.

Mr. Benedict's proposal will appeal to fair-minded people as promoting equity among our various population groups in sharing the burdens of inflation. But the stake of actuaries, and others who run the pension business, in the continuing health of that business is even greater; self-interest here counsels strong support.

Henry S. Huntington

* * * *

Anti-Disparagement

Sir:

Your June editorial and its responses in October prompt the following observations on the admittedly troublesome problem of making private pensions do their job amidst inflation.

First, our detractors should understand that today's initial retirement benefit arising from the combination of a private pension, Social Security, and even modest personal savings, is proving in many cases to be more than ample to maintain the individual's pre-retirement living standard. The numerous people in this condition are well able to elect a reduced starting benefit in exchange for an increasing, rather than a level, benefit.

Second, about 75% of the employees polled in a 1979 Harris survey said they would be willing to make personal contributions to a plan for post-retirement inflation protection. Employees who are not yet close to retiring should be en-

(*Continued on page 8*)

Letters

(Continued from page 7)

couraged, e.g., by offering to match such contributions, to participate in this arrangement.

Third, whenever, as frequently happens these days, net gains emerge from high current and projected investment earnings after making allowance for more rapid salary growth, employers should be advised to apply those gains to fund a well considered system of inflation protection rather than as a full bonus offsetting their pension outlays.

If steps such as these are taken, much will have been done to overcome a problem which, although serious, isn't as drastic as some observers say. Furthermore, critics need to wrestle with at least three philosophical questions before they reach a verdict:

> Should private corporations be required to bear the whole burden of protecting employees against inflation that has, in large part, been caused by government actions?
>
> Should retired people be fully protected against inflation when the productive (working) people often are not?
>
> Has the passage of ERISA slowed the solving of the inflation problem by drawing away much of the energy and resources that the pension industry would otherwise have brought to bear upon it?

Joseph R. Zatto

* * * *

Overlap Theory

Sir:

Robert J. Myers (December issue) says that the fallacy in the "overlap theory" supported by Prof. Jewell is obvious to any qualified actuary. But does Mr. Myers understand the auto insurance overlap theory?

I believe that theory was first used by Commissioner James M. Stone in setting 1978 auto insurance rates in Massachusetts; my role in that innovation was to edit the paper by Joseph Ferreira, Jr. (now an M.I.T. professor) that developed the theory.

Auto insurance differs from life insurance, because a person dies only once but can cause an accident several times. Thus, study of auto accident statistics can lead to expected distributions of numbers of accidents per driver; these distributions can be shown to demonstrate greater propensity for accidents among those who have had one or more. If there is considerable overlap when the frequency distributions of two classes are plotted, pricing each class at the class mean (the traditional practice) may be unfair to the large percentage of the higher frequency class that can be expected to have no accidents. The Massachusetts decision was to diminish the price differences between such classes.

Opponents argue, in effect, that the degree of homogeneity within a class is irrelevant in pricing the class; this theory has tradition on its side, but isn't the only respectable theory. One's choice, I suppose, depends on whether one holds that auto insurance pricing ought to be left entirely to the free market. In any event, the notion of giving consideration to within-class homogeneity of data strikes me as one of the significant actuarial innovations of recent years.

Finally, a confession: my explanation of the overlap theory isn't obvious to me.

James H. Hunt

* * * *

A Precious Jewell

Sir:

I second your suggestion (*Actuarial Blueprint* October 1980) that Prof. Jewell's International Congress paper be made available to members interested in it and be discussed at our 1981 meetings. Even if some of his opinions are fallacious by our traditional standards—even if they would be judged so by any standards—we shouldn't refuse to listen to him. In fact, a good reason for inviting him to a Society meeting is that he has opinions that differ from ours.

David A. Jeggle

* * * *

Computer Pioneer

Sir:

"Ahead of His Time" (November issue) gives thoroughly deserved recognition to a man who contributed much to the development, as well as to the source, of what is now the wonder of our generation, the computer.

It is my understanding that during the development of the computer during World War II, William Phillips was consulted by the people working on the American version as well as those working on the British version. It is rumored that he convinced both groups that attempts to use denary numeration in these machines were doomed to failure, and persuaded them to stick to the binary system.

Alfred N. Guertin

* * * *

Bravo!

Sir:

About that recurring decimal question on the 1850 actuarial exams (Editorial, January issue): My math teacher taught us that a problem in repeating decimal can be solved by, first, moving the decimal place to the end of the first repeating block, then, subtracting the original figures from the result of that multiplication. In the 1850 example, the result is that $99n = 27$, the repeating decimals have all disappeared, so the answer is 27/99, or 3/11.

Bruce R. MacKinnon
7th grade

Ed. Note: The writer, not a member of the Society, is the nephew of one F.S.A. and the grandson of another. Enquiry of a small sample of members showed that there was a tendency to resort to infinite series for the solution.

* * * *

Another Actuary Televised

Sir:

I once spent ten minutes debating Michael Lynch of the Federal Trade Commission on a Boston talk show. After that time on the FTC Report we were summarily cut by the director, who then switched to a segment featuring two Harvard coeds, who had posed for *Playboy*, debating a member of the Women's Commission Against Pornography.

Mike Lynch and I spent the next three hours very pleasantly in a bar, so I didn't consider the occasion a total loss. But the experience convinced me that my future still lies in a Home Office, not as a TV star.

John A. Fibiger

* * * *