



The Actuary

The Newsletter of the Society of Actuaries

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REPORT OF THE DES MOINES ACTUARIES CLUB

by Julie C. Stenlund*

Joint speakers at the February, 1970, meeting of the Actuaries Club of Des Moines were Harold G. Allen, President of The Bankers Life Company, and Geoffrey Smith, President of American Mutual Life Insurance Company. Their topic: "The Actuary as President."

Mr. Allen began by speaking of the actuary as actuary rather than as president. He stressed that an actuary is a key man in an insurance company and that an actuary who enjoys being an actuary shouldn't entertain ideas of being the president. The position of actuary is by no means one of diminution; top management must often come to the actuary for the answers, and the actuary can serve a very useful purpose as a far-reaching adviser.

Often the actuary, with his specialized technical knowledge, enjoys a great advantage over others who may aspire to the presidency of an insurance company. No matter how great the actuary's technical qualifications, though, he must have a feel for personnel matters and be able to work well with people. Mr. Smith remarked that in his opinion the first requirement for an ideal president was the ability to pick talented people to serve beneath him. Often a president must make decisions based not upon his own personal knowledge of a situation, but upon whatever knowledge the people beneath him have presented to him. Mr. Allen added that there was a great deal of frustration in being forced to make a decision before things were wrapped up.

Miss Stenlund is a Student of the Society.

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CAMPUS CONTACT ACTIVITIES

by Samuel P. Adams

Under the wing of the Society's Public Relations Committee, the Subcommittee for Relations with Colleges and Universities is charged with the responsibility for promoting interest in the Society and the actuarial profession among students, faculty and placement officials of colleges and universities in the U. S. and Canada.

The subcommittee, first known as the Subcommittee for the Actuarial Aptitude Test, was originally established in mid-1962 when the test was first published. Its most important role was, and still is, to arrange to have the test personally presented to the appropriate staff members of as many colleges and universities as possible and to urge usage of the test.

This is accomplished by assigning a subcommittee member to each of about a dozen geographical regions of the U. S. and Canada. Each member works with the local actuarial clubs in his territory. Through the efforts of individual club members, presentations of the test are made. The name of each school contacted and of the staff member who agrees to administer the test are reported back for inclusion in a list of such names that the subcommittee maintains.

About two years ago the subcommittee's activities began to broaden and, shortly thereafter, its present more descriptive name was adopted. To promote interest in the profession, subcommittee members encourage actuarial clubs to invite mathematics faculty members to their meetings and arrange on-campus talks by actuaries to groups of interested students. Subcommittee members write personal letters to col-

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COMMENT ON AIFA REPORT ON EARNINGS ADJUSTMENT

by Thomas P. Bowles, Jr.

The Association of Insurance and Financial Analysts released, in December 1969, its "Final Report from the Committee on Life Insurance Earnings Adjustment." In the Foreword the Committee states:

"The problem of adjusting life insurance company earnings is highly complex. This stems from myriad reasons, some of which are:

"(1) Unavailability of precise data.
"(2) Frequent lack of comparability in the data available.

"(3) Lack of agreement within the industry and among accountants as to what adjustments are needed to improve reporting to shareholders as well as to conform with generally accepted accounting principles (GAAP).

"These and other adverse factors have precluded the Committee from devising a simple approach for adjusting life company earnings. In addition, the Committee has also come to realize that the needs of the security analyst in the area of adjusting statutory results may well exceed the requirements of the accountant."

Two Adjustments

The Committee has sought to adhere to a basic principle inherent in generally accepted accounting principles in that expenses should be matched "with income over the anticipated life of an earnings asset." To achieve this, the Committee recommends adjustments for two major items for individual ordinary life and individual annuity business: acquisition expenses and reserves.

The adjustment for acquisition expenses is made by capitalizing and

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The Actuary

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EDITORIAL

MOST actuaries have neither the time nor the inclination to help develop new frontiers in risk and ruin theory. However, a number of us are interested in applying some of the techniques; let's consider a few ways to go wrong.

A good way to waste time is to ignore possible "analytical" solutions to a problem. For example, a surprising number of Monte Carlo simulations are used where straightforward probability theory would suffice. We suggest that before any problem is simulated, the problem-solver offer free drinks to whoever of his Part 2 students can solve the problem analytically.

One of the most disastrous errors that can be made in this kind of work is to abuse the independence assumption. We have seen work in catastrophe reinsurance where the probability of 4 common carrier deaths in a year is approximated by taking the probability of one such death to the 4th power. This arithmetic indicates an independence assumption which is clearly unsupportable; an additional (incalculable?) term is needed for the probability of selling common carrier insurance to the Atlanta Art Club. This topic is worth an article by itself; the important thing to remember is that one cannot work on the right tail of the distribution without spending a lot of time thinking through the validity of the sometimes hidden independence assumption.

If one is using Monte Carlo simulations, a common error arises when the practitioner doesn't know how to test his random number generator. (Problems in this area are most pronounced when one is generating n-tuples.) A good deal of work is underway in developing better generators; in the meantime it is important that any user understand the potential headaches that can arise.

As a last step, one should back away from all the detail and use a little common sense on the results of the study. For example, if a given event is supposed to happen one time in a thousand and the study shows it happening much more often something is wrong. If in a model a key event has a probability of .002 per year, then ten simulations of a 20-year period are clearly inadequate. If study ignores compound interest in studying ruin probabilities 50 years at a time, something is wrong. If a calculation compounds probabilities whose original estimate was highly suspect the end result may be of little value.

LETTERS

About Social Security

Sir:

The past several issues of *The Actuary* have contained considerable correspondence directed toward an attempt to define the role that actuaries should play in developing a national philosophy concerning the proper metes and bounds of the Social Security system.

We are properly concerned that the Social Security system, originally conceived as a minimum benefit floor, and having outgrown that concept, is on the threshold of relegating to secondary positions, or worse, the private sector of the insurance and pension industry. The concept of an omnivorous Social Security system is no fantasy, or bogey man, but, as our colleague Bob Myers has pointed out with eloquence and courage, a real objective sought by many people, some of whom are not without power to move the country in that direction.

Let us recognize, as a starting point, that we are dealing with a political matter that is going to be decided in a political environment. Our technical talent, as actuaries count for little in such circumstances. No appeals to reason, no invocations of the spirit or intent of the 1937 legislation, no analogies between OASDI and group insurance or individual annuities, no projections of ultimate cost, no present value comparisons between taxes and benefits, are going to make the slightest difference.

The decision will be made by men dependent upon the electoral process for their jobs and their status. These men with few exceptions lack the background, the capacity, the interest, and the time to immerse themselves in technical matters. Long range consequences or ultimate costs are, at best, of the most marginal concern to them.

Furthermore, neither they nor their constituents are the least bit moved by consequences of public encroachment on the private sector. The public couldn't care less who provides their pensions and, as soon as OASDI is financed out of general revenues, whatever vestigial cost consciousness they may possess will vanish. As for our elected representatives, they would far prefer a federal system that would enable them to pose

—P.L.H.

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Letters

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as public benefactors in the even numbered years.

Going beyond that, I would suspect that in the future the relationship between income to and disbursements from the Trust Fund will be determined to a diminishing degree by Mr. Myers' actuarial projections and to an increasing degree by the fiscal policy then being pursued by the administration in power. Increasing reliance on the public sector will enable the government to exert a far greater leverage effect on the economy. If Social Security operates on an expanded scale, deferment of FICA tax increases or acceleration of benefit liberalization, or vice versa, would have a correspondingly expanded effect on governmental stimulation or retardation of the economy.

Is the issue entirely hopeless? Must we accept the inevitability of reduction or elimination of the role of life insurance and private pension industries? Not necessarily. But to defeat the proper rhetoric must be employed. And the proper rhetoric, deflating as it may be to our professional egos, does not consist of actuarial data or free enterprise appeals. It consists of concentration on "gut" issues.

The life insurance industry invests \$7.9 billion (1968 *Fact Book*) in residential mortgages. Weaken its capacity to do so and who will fill the gap? The federal government as mortgage banker? Well, perhaps. But have all the consequences been considered? The life insurance industry bought \$461 million of state and municipal bonds. Is Washington going to invest in the cities and counties and states? At what price? Will the OASDI trust fund provide venture capital in the form of equity investment? Or debt for the purpose of increasing productive capacity? Is the American public prepared to live with the social and political consequences of the shift to the federal government as both the provider of the full spectrum of insurance and annuity benefits and the underwriter of the economy?

These are the questions that should be asked, and not the narrow technical ones. And we should be asking them and getting our colleagues in investments

and agency and legal, and our policy-holders and the bankers and trust officers and mortgage correspondents we work with, to ask them also. And while we are asking them, let's ask ourselves a few more. Is the industry weakening its ability to present such an argument by its development of equity products and by its increasing disdain (relatively, of course) for single family mortgages, municipal bonds, and debentures lacking in convertibility features?

Or, asking the same question another way, do we enjoy some protection by virtue of being deemed a quasi-public utility and are we giving up some of it by concentrating on higher yields, i.e., asking our investment department to bring in more money to offset our unwillingness to charge a realistic premium, or to do something about astronomical marketing costs? And again, would private pension funds be in a stronger position to justify their existence in a political environment if, even at the expense of higher costs (I shudder to think of the ultimate cost of an all-encompassing Social Security system) they, for example, liberalized vesting rules, or allocated more assets to mortgages, to urban renewal, or to investment in urban core areas?

The insurance industry demonstrated its capacity to mobilize popular support for its position during the recent premium sales tax fiasco in Pennsylvania. It's the job of all of us, actuaries and others, to meet the challenge of elephantiasis in the Social Security system by responding to its threat in terms most likely to be effective.

Peter F. Chapman

Des Moines Club

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Both speakers emphasized that insurance was fast becoming a young man's business. Mr. Allen reported the interesting statistic that of approximately 400 men in executive positions (both as officers and as high-level supervisory personnel) at The Bankers Life, only 30 started with the company before World War II.

The insurance industry has always been the bulwark of conservatism, and the investment area of the industry even

more so, but the fast-moving equity philosophy developing today is one example of the move toward younger men with more progressive ideas. Furthermore, the sales arena—always filled with young combatants—is becoming more and more important as the emphasis shifts to giving the customer what he wants rather than what we think he needs.

Mr. Smith pointed out that more pronounced and more profound changes have occurred in the insurance industry than in any other. These innovative trends have been partly a reaction to the creation of new companies with a profit motive. Also, banks have brought keen competition to the insurance company in its capacity as a financial institution.

Both speakers felt that the insurance industry was one of the last to adopt the "science" of management. However, it was generally agreed that the manager was going to be the one looked to in years to come. One attraction of the actuarial position is a movement toward management. Right or wrong, structurally, the one who has passed the most exams is pushed into the management position. But the actuary gets very little exposure to management during his school and study years, and thus may approach his new responsibilities ill-prepared. General discussion revealed that it was felt a broad liberal education with particular emphasis on economics was the optimum career preparation an actuary could make and that it was the company's responsibility to provide him with management experience.

Most people present believed the mechanical side of management could be taught, but the ability to deal with people was a gift rather than a skill that could be learned. Mr. Allen agreed that an actuary could probably be taught to be an effective manager, but he also stated that an actuary's adjustment to a managerial position would depend on him as an individual.

In this industry of specialists with its painful scarcity of actuaries, an actuary cannot really be sacrificed, if "sacrificed" is the word, to fill the position of president, and in the years to come, it appears insurance companies will be looking toward managers for their presidential timber. □

AIFA Report

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amortizing (a) the total first year commissions and (b) certain expense items usually associated with new business; e.g., medical examination fees and cost of inspection reports. These items are taken from Exhibits 1 and 5 of the Convention Blank.

The method of amortization is "relatively straightforward." It was determined by the Committee that there is a correlation between Moorhead's lapse rates and the sum-of-the-digits method of depreciation. Because the latter is familiar to and readily understood by most financial analysts, it was chosen as the most desirable method for amortizing the first year ordinary life, industrial, and individual annuity costs. The selection of the period of amortization is to be determined for each company according to its average lapse experience over the last five years, with lapse rates being computed by the use of the A. M. Best Company lapse formula.

The adjustments required for reserves arise from varying methods and assumptions used for interest and mortality. The Committee states that it "has not been able to find a suitable basis for recomputing life reserves to reflect more realistic mortality assumptions; accordingly, it suggests that the AIFA and other interested parties pursue the topic further." With regard to the method problem, "due to the lack of the necessary information and technique to adjust reserves to a common denominator, the Committee, therefore, has no recommendation to make concerning a reserve method adjustment at this time."

The Committee does, however, make an adjustment for interest. The Committee states:

"The increase in reserves that is charged against income is treated as an expense in accounting terms. Therefore, a clear mismatching of income and expense results when the income (premiums) is calculated on a basis substantially different from the expense. A company that calculates its premiums on a basis that assumes interest will be earned at a rate of 4%, but calculates its reserves on the basis of interest at 3%, will be understating its reported earnings by an amount equal to that part of the actual increase in life in-

surance reserves that would not be needed if it were assumed that reserves will accumulate at 4% interest instead of 3%."

The Committee further states: "If the actual interest rate assumed when the premiums were calculated for each policy presently in force were known, it would be possible to calculate the proper reserve increase to be charged against earnings. Lacking this information, it is necessary to estimate the difference between the statutory increase in reserves and the increase that would be required if assumptions used in calculating the premiums were employed. The Committee believes that this estimation can be made by using a 10 year moving average of each company's average yield on invested assets."

The acquisition expense adjustment on industrial business will be handled together with, and in the same manner as, that proposed for individual ordinary business. The reserve interest adjustment for industrial business is computed in the same manner as that for ordinary.

Group Life, Group Annuities

The Committee recommends that no adjustments be made for group life and group annuities with the exception of group permanent. The Committee states:

"This business carries decidedly heavier first year costs than the regular group (term) business; it represents long term individual contracts which require meaningful life reserves, and it creates an understatement in reported earnings. Several of the major life companies have offered group permanent plans for many years, and a growing number of companies have instituted such plans in recent years.

"It is the Committee's view that an adjustment should be made for group permanent life insurance. Unfortunately, at present none of the companies offering group permanent insurance provides first year commissions and reserve figures on this business separate from the regular group business. Unless such figures are made available, it will not be possible to make an adjustment for group permanent business on the same basis as discussed for individual lines."

Accident and Health

An acquisition expense adjustment is made in a similar manner for noncan-

cellable and guaranteed renewable accident and health insurance, except that only those first year commissions in excess of renewal commissions are to be amortized. To be eligible for an adjustment the lapse ratio (based on premiums) must be less than 19%, the first year commission rate must be at least 1.5 times the renewal commission rate, and this line of business must form a substantial part of a company's operations. An interest adjustment is also made for noncancellable and guaranteed renewable accident and health insurance reserves.

The Committee makes an adjustment in both individual and group accident and health insurance for prepaid acquisition expenses relating to the increase in unearned premium reserves. It points out that this type of adjustment has become widely accepted in fire and casualty insurance accounting.

Participating

Statutory earnings on participating business without charter limitations will be recognized as reported, after deducting dividends to policyholders. Similarly, adjustments to participating earnings not restricted by charter limitations will be calculated in the same manner as for nonparticipating earnings.

All adjustments made are to be taxed at one-half the corporate rate.

To recognize the distortions which might result in the case of a company with a large common stock portfolio with a relatively low income return, the Committee recommends that "large common stockholdings be excluded from the calculation, in the same manner as subsidiary companies, when the company's yield on assets is less than 80% of the average yield on assets of the 75 largest stock life companies."

The Problem

Among actuaries there is no agreement as to what adjustments should be made or how to make a particular adjustment. There does appear, however, to be a consensus that reported statutory earnings do not necessarily reflect true underlying earnings and that price/earnings ratios based on such statutory earnings cannot be compared to the P/E ratios of companies in other industries. The purpose for which adjusted earn-

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A NEW DERIVATION OF THE TABULAR INTEREST FORMULAE

by Richard G. Driskell

In this article, we will derive two troublesome formulae in the Gain and Loss Exhibit of the Statement using techniques developed in Measurement of Mortality. The formulae in question are those for Tabular Interest.

In each case, we will add two different representations of the denominator ("exposure"); one is net units = potential units less cancelled units while the other is net units = possible units less impossible units. For practice, here's how to show $i = 2I / (A + B - I)$. First we disperse entrants (N) and withdrawals (W) to the end points. Then:

- 1) Potential less cancelled is:
 $(A + N/2)$ less $(W/2)$
- 2) Possible less impossible is:
 $(B + W/2)$ less $(I + N/2)$
- 3) Hence, twice the denominator is:
 $A + B - I$; twice the numerator is
 $2I$ and the ratio is as given above.

Let's move on to tabular interest for life insurance. The following assumes deaths at the end of the (calendar) year and other events at the middle of the year. RROT and RROD refer to reserve released on termination and on death respectively.

- 1) Potential less cancelled is:
 $(\text{Reserve last year} + \text{Premium}/2)$
less $(\text{RROT}/2)$
- 2) Possible less impossible is:
 $(\text{Reserve this year} + \text{RROD} + \text{RROT}/2)$ less $(I - C + \text{Premium}/2)$
- 3) Hence, twice the denominator is:
 $\text{Reserve this year} + \text{Reserve last year} + \text{RROD} + C - I$

The rest follows easily.

Now we direct our attention to required interest for life annuities. The fund equation is $\text{Reserve this year} = \text{Reserve last year} + \text{Premium} + I - \text{Pay'ts} + (T - A)$. Assuming mid-year payments we have:

- 1) Potential less cancelled is:
 $(\text{Reserve last year} + \text{Premium}/2)$
less $(\text{Pay'ts}/2)$

- 2) Possible less impossible is:
 $(\text{Reserve this year} + \text{Pay'ts}/2)$
less $(T - A + I + \text{Premium}/2)$.
- 3) Hence, twice the denominator is:
 $\text{Reserve last year} + \text{Reserve this year} - (T - A + I)$.

Of course, $(T - A)$ can now be computed by deducting I from: $(T - A + I) = (\text{Reserve this year} + \text{Pay'ts}) - (\text{Reserve last year} + \text{Premium})$.

The above discussion has yielded no new results but merely was intended to draw upon actuarial theory learned before studying life insurance accounting, viz., exposure formulas, to derive and hopefully help to remember the Annual Statement instruction formulas for Tabular Interest. As a teacher of actuarial science, I feel that the more interrelationships we can discover among the sometimes seemingly disjointed syllabus for the Society's examinations, the more unified and comprehensible we can make the study of actuarial science to the student. \square

AIFA Report

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ings are computed might influence the method of obtaining such adjusted earnings. The purpose of the financial analysts is to make recommendations of "buy," "sell" or "hold" based on earnings performance related to the earnings of other life companies and to the earnings of companies in other industries. The analysts make subjective judgments as well as mathematical adjustments.

Many actuaries object to a number of the Committee's proposals. The major criticisms are: (1) the use of the moving average interest rate has been demonstrated to be theoretically deficient, (2) the expense items selected from the Convention Blank are arbitrary and may give misleading results among companies due to different accounting practices, (3) the use of the A. M. Best Company lapse formula for determining the number of years over which to amortize expenses is subject to question, and (4) not recognizing the reserve method in determining the amount of expenses to capitalize and amortize will distort the adjusted earnings considerably. \square

Capitalizing acquisition expenses as defined could result in distorting a company's underlying earnings if more is actually paid for the business than was assumed would be paid. Generally speaking, it would be preferable to capitalize "formula" acquisition expenses in order to relate the expense to the "allowable" provided for in the calculation of gross premiums.

The use of the A. M. Best Company lapse ratio would cause a fast growing company to amortize expenses over a much longer period than may be justified. This is the result of including the insurance issued during the preceding year in the denominator of the lapse ratio formula.

Failure to take into account differences in reserve methods among companies may give rise to a major distortion in the adjustments.

The investment community does recognize the need for a standard, reliable method for adjusting statutory earnings since the investing public (institutional investors, at least) are becoming aware of the fact that reported statutory earnings do not always reflect true underlying earnings of a life insurance company. The complex problem of adjusting life insurance "statutory earnings" has not escaped the notice of actuaries, accountants and the life insurance industry, and various groups have been seeking a "consensus" solution. There appears to be a need for even more cooperation among all interested parties, if the adjustment to reported earnings is to be generally accepted. \square

Campus Contact

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lege and university students who pass either of the Preliminary Examinations encouraging them to give serious thought to actuarial careers.

There are a great many colleges and universities in the U. S. and Canada—far more than the subcommittee will ever be able to reach effectively. Success in this work is dependent on the volunteer activities of many individual actuaries—and the more the better. Any Society member or any actuarial club interesting in helping is invited to contact Russ Smith, Subcommittee Chairman. \square

XCERPT FROM X CANTOS

By courtesy of the author and the Michigan Quarterly Review, we continue to bring to our readers Kenneth E. Boulding's X Cantos which appeared in the Review Vol. VIII (1969) pp. 29-31.

CANTO IV.

Between two points lie lots of stations
Called convex linear combinations,
Like intermediate stops that lie
Between two railroad termini
(With three points, now, the
combination
Defines a neat triangulation)
And generalizing this, we get
The notion of a convex set.

CANTO V.

The extreme point, like young Jack
Horner,
Sits lonely in a kind of corner,
And therefore has no points as
brothers
That sit with it between two others.

Actuarial Meetings

May 14, Baltimore Actuaries Club
May 18, Chicago Actuarial Club
May 19, Twin Cities Actuarial Club
—North Oaks
May 21, Nebraska Actuaries Club—
Lincoln
May 21, Actuarial Club of
Indianapolis
May 21-22, Actuaries Club of the
Southwest, San Antonio, Texas
May 22, Actuaries Club of New
York—Spring Outing, Maplewood,
N. J.
May 25-26, Middle Atlantic Actuari-
al Club—Spring Meeting, Mariner
Motel, Virginia Beach
June 3, Fraternal Actuarial Associ-
ation—Drake Hotel, Chicago
June 11, Baltimore Actuaries Club
June 11-12, Southeastern Actuaries
Club—Hollywood Beach
June 17, Seattle Actuarial Club
June 18, Chicago Actuarial Club—
Annual Golf outing
June 18, Actuarial Club of
Indianapolis

CANTO VI.

Take any set, or thing, or crowd,
And wrap it in a kind of shroud.
Then when the shroud is tight and full
We see it as a *Convex Hull*.

CANTO VII.

If S and T are convex sets
Their *intersection* then begets
Another set of convex kind.
(Not so, their union, we find
For unions, strangely, may beget
A wholly unparental set.)

CANTO VIII.

These theorems are neat and true,
But do they have an end in view?
They do indeed, so let us sing
The Praise of Linear Programming!

CANTO IX.

There is a field a point is on
Surrounded by a polygon,
The sides of which, he plainly sees,
Are linear inequalities.
For these expressions (more or less)
Are fences that he can't transgress.
Within the polygon we get
The *feasible* (well-corralled) set.
The problem now, if not the moral,
Is where, within the fence, or corral,
A roving point (or wandering beast)
Can get the farthest north-north-east.

CANTO X.

I do not want to spend my days
In writing out the i's and j's,
Yet i's and j's are an enigma
When squashed into a double sigma.

CANTO XI.

Both reason and convenience yield
The Ten Commandments of a Field
Not Sinaitic laws archaic—
And yet a Field is a Mosaic.
Its elements can only rate if
They're closed, unique, and
commutative,
Association and Distribution
Add an essential contribution,
And we must find before we're done
A kind of Zero and a One,
Two converses, to make provision
For some subtraction and division
And the tenth commandment (or
operation)
Is the helpful law of cancellation.

Social Security Notes

Note No. 21, 1969, Workmen's Compensation Payments and Costs, 1968.

"Paralleling fairly closely the level of business activity in 1968, cash and medical payments under workmen's compensation programs rose 8% during the year to a new high of \$2,345 million. The increase was not as great as the 11% registered for the previous year and reflects offsetting factors. While the advances in covered employment and wage levels were greater in 1968 than in 1967, the costs of hospitalization and medical services rose less rapidly in 1968. Work-injury rates, after several years of successive increases, showed no change from 1967 to 1968, but this was balanced by statutory liberalizations in benefit provisions, which had a much greater effect in 1968 than in 1967." An accompanying table shows the trend of benefits and costs since 1940.

ERRATUM

We are informed by the Chicago office that a material misrepresentation was made with respect to cost of the booklet "So You're Good at Math." (Apparently we're not.) The schedule is as follows:

Number of Copies	Cost per Copy
0-19	10¢
20-99	8¢
100 or more	5¢

With exam time approaching, readers might wish to try some practice questions based on the above schedule.

- (1) a. What formula underlies the above price structure? (2 points)
- b. Explain the expense assumptions consistent with this formula. (8 points)
- (2) a. What is the marginal cost of the 100th copy? (1 point)
- b. Estimate the probability of an actuary placing an order for 17-19 copies; for 63-99 copies. (3 points)
- c. Estimate these probabilities with respect to a programmer; a systems analyst; an underwriter. (6 points)