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BOOK REVIEWS AND NOTICES\*

\* Stephen G. Kellison, *The Theory of Interest*, pp., 258 Richard D. Irwin, Inc., Homewood, Ill.

For some years now, members of the Education and Examination Committee of the Society of Actuaries have been searching for a satisfactory substitute for Donald's text on compound interest. The search ended with the selection of Mr. Kellison's text as the compound interest reference for Part 3 commencing in 1970. A thorough reading of the text reveals that it is extremely well suited not only to the task of providing thorough training to the aspiring actuarial student but to anyone who might have an interest in the theoretical and/or the practical aspects of such subjects as investments, rates of return, and "truth-in-lending."

The arrangement and content of the seven chapters are similar to most compound interest texts, the early chapters covering the basic elements of compound interest theory and the later ones covering various types of annuities, securities, and special topics. Kellison emphasizes the basic simplicity of the subject by pointing out that chapter 1 includes *all* the basic principles involved in the theory of interest. Chapter 1 is noteworthy for the way in which Kellison arrives at specific definitions and relationships by using a generalized "accumulation function" approach. A minor confusion could exist in the minds of some students because of the use of both  $A(t)$  and  $a(t)$  as the definitions of two closely related functions. In general, however, the first chapter is a model of clarity. The development of the concept of the force of interest is excellent, and the use of graphic representations throughout the chapter is very helpful. However, I believe that the student will be most thankful for both the quantity and quality of problems at the end of this (and every) chapter.

The next three chapters take the reader from basic principles into the various types of annuity formulas and relationships. Throughout these chapters Kellison emphasizes the role of the computer in solving compound interest problems by the use of algebraic techniques. These chapters are also notable for the meaningful verbal interpretations which Kellison gives to many of the standard relationships between annuity values. Similarly, he makes it easy for students to remember formulas by such devices as pointing out the relationships between the manner in which payments are made and the denominator of the formula for the present value or accumulation. For example, a denominator of  $i$  indicates an annuity-immediate;  $d$ , an annuity-due; and  $\delta$ , a continuous annuity. Another interesting development in these chapters is the way in which Kellison derives a general formula for the present value of an annuity by the use of finite differences.

\* Books and other publications noted with an asterisk (\*) may be borrowed from the library of the Society of Actuaries under the rules stated in the *Year Book*.

Chapters 5 and 6 cover the subjects of amortization schedules, sinking funds, bonds, and other securities. While the chapter on bonds and other securities is quite standard in its approach, the chapter on amortization schedules and sinking funds has several interesting aspects. One is the way in which Kellison shows that the outstanding principal on a loan may be calculated at any time, either on a prospective basis (present value of remaining payments) or retrospective basis (accumulated value of original principal less accumulated value of payments already made). Another is the very detailed demonstration of the close relationship between the sinking-fund method and the amortization method of loan repayment. But the most interesting of all is the section in which Kellison discusses the conditions under which a unique rate of return will or will not exist. Basically, he proves that a unique rate,  $i$ , will exist if and only if (1)  $(1 + i)$  is greater than 0 and (2) the outstanding investment at time  $t$  is greater than 0 for all values of  $t$ . This section should be most carefully read by those who have inundated *The Actuary* with letters expressing opinions (all different) regarding rates of return on various investments.

Chapter 7 is perhaps the most interesting chapter in the book, especially since it covers a number of subjects not ordinarily covered in standard works on compound interest. Some of the subjects covered are the following:

1. *Valuation of securities*.—A complex subject is introduced.
2. *Interest measurement of a fund*.—The standard formula used by life insurance companies is derived:

$$\frac{2I}{A + B - I}.$$

3. *Life insurance settlement options*.—The formulas for the standard options are derived.

4. *Installment loans*.—The various methods used to estimate the true interest rate, including the "Merchant's Rule" and the "United States Rule," are discussed. The latter is prescribed for use in conjunction with the Truth-in-Lending Act, and, as Kellison points out, is subject to some criticism.

5. *Depreciation, depletion, and capitalized cost*.—The parallel between buying bonds at a premium and purchasing depreciable property is pointed out. The various methods used in practice to determine depreciation charges are discussed.

Without a doubt this text will serve as a standard for actuaries and students for many years. I am especially pleased with the large number of excellent problems that he has added to the end of each chapter. The lack of "typical" problems was perhaps the greatest failing of the Donald text. Another failing of many compound interest texts has been overcome by the placing of appropriate stress on the importance of the force of interest and continuous functions. Besides forming a useful theoretical background, this subject is really quite practical if one is working with rates which compound very frequently (a number of banks now use daily compounding), or if one is working in a company which uses continuous functions in its premium and nonforfeiture values development.

Finally, the number of references to computers and other relatively new subjects will certainly make this book appealing to the students of today.

STEPHEN L. BROWN

\* Frank L. Griffin, Jr., and Charles L. Trowbridge, *Status of Funding under Private Pension Plans*, pp. xx, 106, Richard D. Irwin, Inc., Homewood, Ill., and Irwin-Dorsey, Ltd., Georgetown, Ont., 1969. \$5.00.

The basic objective of this Pension Research Council study is "to assemble information which will serve as a basis for an enlightened judgment as to whether employers and labor unions, as a group and in various categories, are pursuing financial policies that offer reasonable assurance that the benefit expectations of pension plan participants will be realized." The conclusion of the authors (p. 77) is that "as of the control date of this study, a very high degree of benefit security has been achieved by a vast majority of the plans included in the study."

In the pursuit of their objective the authors examined the degree of funding of accrued benefits, both vested and nonvested, under private pension plans in the United States. They also reviewed the provisions made for vesting of pension benefits for employees who terminated employment prior to retirement and the extent of the funding of those vested benefits.

Information was collected from consulting firms and insurance companies to provide a sample of private pension plans qualified with the Internal Revenue Service at about March of 1966. The study was made in two parts. Part I included 3,983 plans covering 9,114,000 participants and surveyed the characteristics of those plans. Part II provided detailed financial data for a representative subgroup of Part I: 1,047 plans covering 4,562,000 participants. Out of the universe of end-1966 participants in private pension plans *adopted 1956 and earlier*, these data represented a substantial sample:

Part I—30 per cent of Taft-Hartley participants and 47 per cent of all other plan participants, a composite figure of 44 per cent;

Part II—7 per cent of Taft-Hartley participants and 24 per cent of all other plan participants, a composite figure of 22 per cent.

Profit-sharing and savings plans, unfunded pension plans, plans less than ten years old, and plans covering less than twenty-five employees were excluded from the study.

From a review of the data and methodology, it would appear that this is as unbiased a study as could reasonably be made. Chapter 3 of the book, "Characteristics of the Plans Studied," in addition to enabling the reader to verify the representativeness of the Part II subsample, provides a wealth of interesting information about private pension plans not previously available. Tables are shown comparing the Part I and Part II distributions by numbers (and per cent) of plans and by numbers (and per cent) of participants in the following categories: by years plan had been in effect; by size of plan (number of participants);

by class of coverage (hourly vs. salaried, etc.); by type of pension formula; by funding instrument (allocated vs. unallocated, etc.); by current funding practice; and by coverage and funding instrument. Data are also provided about the vesting characteristics of the plans studied (early, intermediate, or late), the effective period of past funding, patterns of benefit increase, degree of equity investment, and the distribution of the valuation dates involved in the study.

One of the basic measures of the study is the benefit security ratio (BSR) which is the ratio of assets at market values to the amount of the fund that would be necessary to provide for all the benefits that have been accrued to the participants up to the date of the study. Average nonparticipating insurance company rates in March, 1966, for deferred and immediate annuities were used for valuing the accrued pension benefits. Another measure is the vested benefit security ratio (VBSR), which is the ratio of assets at market values to the fund that would be necessary to provide the accrued benefits that were vested with the employees at the date of the study.

Benefit security ratios and the vested benefit security ratios were analyzed (chapter 4) according to the size of the ratio, effective period of past funding, size of the plan, type of employees covered, type of pension formula, funding instrument, vesting classification, current funding practice, and the per cent invested in equities. Comparisons were also made in terms of indices of BSR and VBSR which "equalize" for duration.

Benefit security ratios were measured against two different bench marks or targets for funding which were established by the authors: a thirty-year bench mark for use with initially mature plans and a forty-year bench mark for use with initially immature plans.

As noted above, the general conclusion of the study is that sound funding of private pension plans has been the rule, resulting in a high degree of benefit security for the participants in these plans.

For example, assets were sufficient, on the average, to cover 94.4 percent of all accrued benefits under plans whose effective funding periods were 15 years or more. (This is on the basis of adjusted weighted averages which limit each plan's BSR to a maximum of 100 percent [p. 77].

In regard to vesting, the authors state: "Vesting therefore appears to be at a reasonably advanced stage in its evolution, with liberalizations continuing to occur as other benefit priorities are satisfied" (p. 13).

The authors are to be complimented on the care that they have taken to analyze the data and to discuss the precautions which were necessary in reporting results of this study. Questions that might be raised regarding the validity of the study have been reviewed, commented upon, and, where appropriate, adjustments have been made in the results. Of particular interest in the authors' discussion of the validity of results is their review of plan groups they believe may be underrepresented in Part II data.

One such group is the small plan financed wholly or in part through individual life insurance policies. These plans are underrepresented because of the difficulty

of identifying among all other individual policies the necessary data in the required pension plan groupings. The authors conclude, however, that this particular underrepresentation is of little significance in the over-all picture, particularly since plans with fewer than twenty-five participants were otherwise excluded. In any event, since these plans tend to be more heavily funded than the larger plans at the shorter funding durations, if they had been included, the effect would have been to show even higher degrees of funding than those favorable ones reported in the study.

The second class known to be underrepresented is the bargained, multi-employer (Taft-Hartley) plan. For such of these plans as are included, the study shows (Table 4-4B) a substantially lower degree of funding than other plans: a benefit security ratio index of 0.71, compared with a BSR index of 1.01 for all other plans.

The authors also point out that, in comparison with private plans, "it would appear that public plans are on the whole rather poorly funded; in fact, there are some public plans which, after having provision for employees already retired, fail to have sufficient assets to cover even the participants own contributions" (p. 86). Although they observe that somewhat different considerations apply to public than to private plans, they believe that, nevertheless, there are certain funding procedures which must be regarded as appropriate for all employers, public or private. Any actuary who has participated in a review of the funding status of a state, local, or other public plan will concur.

With respect to private plans, the authors believe further studies should be undertaken in a matter of five to ten years to provide a second snapshot in what may eventually prove to be a series of snapshots designed to determine important funding trends. They also suggest studies of the extent of benefit coverage under pay-as-you-go plans.

Consideration of measures to regulate private pensions will soon require the development of a public consensus as to what constitutes adequate pension security. The achievement of such a consensus will require new actuarial skills and diplomacy of a high order. The techniques and results of the present volume will be of great assistance in developing those capacities. The book is thus important reading for all actuaries, not only for the pension specialists but for the concerned citizen. Its value will be greatest to the actuary who, resisting the temptation to stop with the useful summary of results at the end of the first chapter, reads the entire book.

PRESTON C. BASSETT  
A. CHARLES HOWELL

\* N. Keyfitz, *Introduction to the Mathematics of Population*, pp. xiv, 450, Addison-Wesley Publishing Company, Inc., Reading, Mass., 1968. \$13.50.

Dr. Keyfitz has presented to his reading audience a stimulating description of many of the mathematical methods used in the study of the growth of population. He is Professor of Sociology at the University of Chicago, where he received

his Ph.D. in 1952. He has also served on the faculty of the University of Toronto. Among his professional affiliations is membership in the Society of Actuaries.

Part I of the book is a description of life tables, their construction, and the stationary population interpretation. The material in this part of the book should present no particular problem for the actuarial reader with his background in these areas.

The author's interest is, however, with nonstationary populations. In Part II he looks at a model which considers only the female population divided into five-year age groups. The basic tool is a matrix which projects the female population in each five-year age group ahead five years per step. Required for the construction of the matrix are survival probabilities and data on female births based on the age of the mother. *Elementary matrix algebra is used to determine the characteristic roots and stable age distributions.* The characteristic roots and corresponding characteristic vectors allow one to project the population ahead many steps directly. The author also discusses varying the basic death and fertility rates and works out several examples indicating the effect of certain changes in these rates.

Models for the female population with age as a continuous variable are considered in Part III. A basic integral equation for the rate of births to descendants of females now alive is developed, and the general form of the solutions is determined. Several methods are employed—one using numerical techniques, one using Laplace transforms, and one using generating functions and partial fractions. Graduations of the basic mortality and maternity functions are presented which lead to simple solutions of the integral equation. The author then indicates interrelationships between the various variables—birth and death rates, age-specific birth and death rates, distribution of present population, and so forth. One striking example is a section discussing the consequences of an assumption of zero mortality. Finally the author shows that the techniques developed with discrete age intervals are closely related to approximate solutions of the problem set in continuous terms.

The discussion of various approximation devices and numerical techniques is continued in Part IV of the book. Much of this material will be familiar to the actuary from his study of finite differences.

Interacting populations, situations where changes in one population affect another population, are discussed in Part V. Predation, scavenging, and competition between species are considered. The device used in these discussions is a system of differential equations. Attention is then turned to human population, and two-sex models are constructed. The model is elaborated to take into account the age distribution of the males and females in the population. When age distributions are considered, the matrix methods used early in the book are again employed.

Deterministic models dealing with expected population size predominate, but the author does turn to some probabilistic questions in the last part of the book, Part VI. Some statistical problems related to the construction of the life

table, an introduction to birth and death and branching stochastic processes, and the effects of individual choice and behavior on family size are the main topics considered.

The book presumes some mathematical equipment, primarily skills in calculus and in the manipulation of matrices, and uses a good deal more. As mentioned above, matrix algebra plays an important role in the exposition. Differential and integral equations and numerical solution of equations are some of the other techniques employed. The author includes discussion of these tools as they are used, and he has attempted to make the book as self-contained as possible. With a large number of calculations and numerical examples worked out, it is possible for the reader to follow the mathematical development of the theory. The main mathematical requirement to the full enjoyment of the book in addition to the calculus and matrix manipulative skills is the confidence to attack the parts of the exposition involving mathematical techniques new to the reader or only dimly recalled.

As the author points out, this book is primarily designed to be read by the lone reader. It does not contain problems at the end of each chapter typical of a classroom textbook. There are questions directed to the reader throughout the book asking for verification of some statement or expansion of some idea. In many places in the text a point of theory is illustrated by a numerical example worked out from actual population data. This helps to bring the ideas to life and provides motivation for the further development of the theory.

The book is not of uniform interest. In particular, I find chapters 10 and 15—"Interpolation and Graduation" and "Sampling Variance of Demographic Characteristics," respectively—of less interest. The effort to make the book as self-contained as possible raises the problem of deciding which peripheral material should be included. The subject matter of these two chapters does not seem to be very directly connected with that of the rest of the text. Other readers with different tastes or backgrounds might easily have a different reaction to these and other parts of the book. There are high points, too. First is the high level of motivation in much of the book. Another is the attempt (successful in my view) to tie together the several different formulations of the growth of population in the one-sex model. The close relationship between the characteristic roots of the projection matrix and the roots of the integral equation is noted and reasons for the differences are explored. These differences turn on the various finite approximations that are made.

Our profession is concerned with funding benefits in the future contingent on uncertain events. Projections are used repeatedly by us to estimate the magnitude and incidence of these costs. The problems discussed in this book are nice applications of some mathematical techniques not too frequently used by actuaries. These projection techniques open new approaches to the solution of other actuarial problems. In fact, it is my opinion that the mathematics of population projection might be a more appropriate subject to include in actuarial education than, for instance, problems on the collection and adjust-

ment of census statistics or vital statistics or, in another area, problems having to do with stationary populations. All in all, this is a book which should be of great interest to many actuaries and a useful addition to an actuarial library.

NEWTON L. BOWERS, JR.

\* Donald J. Bogue, *Principles of Demography*, pp. 917, John Wiley & Sons, Inc., New York, 1969. \$16.50.

This book is intended to be a comprehensive treatise on population study and was designed to serve both as a textbook and as a reference work. It is, indeed, very comprehensive in regard to its coverage, particularly in regard to its references. The extensive bibliography listed at the end of each chapter should prove valuable to many actuaries, biostatisticians, and demographers. As the author stated in the preface, "in a sense, it is a 'demographic encyclopedia.' " I believe, however, that its detailed coverage of many of the subjects reduces its usefulness as a textbook.

The author has prepared a volume of simple reading exposition with little technical material which should prove useful to students and beginners. The simplicity of reading has been accomplished by making limited use of mathematics and by describing and explaining most of the technical subjects with a considerable amount of details. This involves a significant accomplishment, since we know how difficult it is to write in simple terms about technical subjects. The quality, however, of the limited amount of mathematical presentations leaves so much to be desired that I would recommend to the mathematically inclined reader that he avoid trying to obtain mathematical insight from this volume. Instead, he should wait for the publication of the companion volume, *A Manual of Demographic Research*, or refer to some other elementary books on demography—for example, Spiegelman's *Introduction to Demography*.

A large number of mathematical statements, formulas, and equations lack rigor in their notation or presentation (examples may be found on pp. 35, 40, 124, and 628). Their discussion shows a lack of insight on the subject. On page 148, for example, the author states: "Some older censuses (and a few contemporary surveys and censuses) mistakenly report age to the nearest birthday; this creates analytical difficulties and damages the conception of age as a continuous variable." The truth is that, to practically all actuaries and to a large number of demographers and biostatisticians, it makes no difference whether age is reported as age last birthday, age nearest birthday, or age next birthday as long as there is uniformity and consistency in all the data. That portion of the author's statement that concerns the damage to the concept of age as a continuous variable is untenable.

A similar lack of acquaintance with mathematico-demographical concepts is demonstrated on page 556. There the first chart shows a United States male as having, through his entire life span, lower mortality than a Peruvian female, but the second chart shows a higher life expectancy for Peruvian females after about age 30. This is an obvious impossibility.



Scattered throughout the book are various proposals as well as various ideas presented by the author that are not necessarily generally accepted. I strongly believe in the presentation of individual ideas and proposals; this is one of the best ways to make progress in practically all fields of human activities. However, a volume that is intended for use as a textbook and reference is hardly the place for them.

The book represents a truly international presentation of the various demographic subjects, but it contains many excellent detailed descriptions of the situation in the United States. The voluminous amount of national as well as international data that are presented enhances its value as a reference book.

In summary, I would recommend this book to the members of the Society of Actuaries for a simple and detailed discussion of demographic subjects with the caution not to rely on its description of mathematical concepts.

FRANCISCO BAYO

\* *The Princeton Symposium on the American System of Social Insurance: Its Philosophy, Impact, and Future Development*, pp. x, 255, McGraw-Hill Book Company, New York, 1968. \$7.95.

This volume contains the papers, together with a summary of the discussion, presented at a symposium on the American system of social insurance held at Princeton University on June 1 and 2, 1967, under the sponsorship of the Industrial Relations Section and the Woodrow Wilson School of Public and International Affairs. The invited participants in the seminar were persons from government, business, labor, universities, and research organizations with a professional interest in social insurance. A major objective of the seminar was an appraisal of the philosophy, impact, and future development of the American system of social insurance at a time when it was expanding into new areas and undergoing substantial changes. Another reason for holding the seminar at the time was to pay tribute to the contributions made by J. Douglas Brown (Provost and Dean of the Faculty Emeritus—Princeton University) to the development of social insurance during the past three decades.

The chapters in this book deal with specific programs of social insurance as well as with the impact and philosophy of the system as a whole. In the first chapter, Wilbur J. Cohen gives an overview of the social insurance system with particular emphasis on the issue of federalism. The next chapter, by Richard Musgrave, examines the role of social insurance in an overall national program for social welfare. Otto Eckstein in Chapter 3, analyzes the critical aspects of financing the system. The focus then shifts to individual programs in the next chapter on old-age, survivors, and disability insurance written by Robert J. Myers. This is followed by a chapter on Medicare by Herman M. Somers and another on the uses of unemployment insurance by Richard A. Lester. In Chapter 7 the emphasis shifts again to impacts of the social insurance system on private benefit plans, by Robert Tilove, and then to a comparison of America's philosophy of social insurance with that of European countries, by Gaston V. Rimlinger. In a final brief chapter Robert M. Ball comments on the present stage and future prospects of development of social insurance in this country. In the various chapters, the comments and criticisms of the principal discussants are presented in full along with summaries of the highlights of the general discussion which took place at the symposium.

I have had a close association from time to time on matters involving social insurance with six of the ten named in the above extracts from the Foreword of the book. While often holding differing economic, social, and political views, I developed a great respect for their "expertise and wisdom" in their respective professional fields, coupled with their willingness to engage in dialectic ("the art or practice of examining opinions or ideas logically, often by the method of question and answer, so as to determine their validity") discussions. I readily admit, therefore, that the following comments probably reflect a bias ("mental partiality").

This volume is a much needed addition to the very select group of books that are "classics" in United States social insurance literature. It is amazing how much is covered in depth in about 250 pages. Despite the fact that the authors and discussants are of different academic disciplines and backgrounds, it is cohesive, with a minimum of the technical language of a particular discipline.

Very unusual for social insurance literature is the adherence to the dialectic approach, with a minimum of dogmatism or polemics. Repeatedly an author who presumably has decided views on a particular issue gives a well-balanced summary of opinions and views of others so that the reader can make, with assistance often of comments by other contributor(s) to the volume, his own determinations of their validity.

Noteworthy also is the apparent consensus as to the desirability, if not necessity, of taking pragmatic ("practical," "dealing with historical facts in their interrelations") considerations into account in the original design of a specific program and later changes.

In his chapter, Bob Myers lists, "not necessarily in order of importance," and comments on "a number of major interrelated issues in the OASDHI program . . . under discussion these days." They are the following:

1. What is, and what should be, the basic function of the program?
2. Does the program treat the younger worker fairly?
3. Does the program treat the woman worker fairly?
4. What is the proper benefit level?
5. What should be the minimum retirement age?
6. Should the earnings test be eliminated?
7. Should the scope of the disability program be extended?
8. How should benefits be adjusted to economic changes?
9. What is the proper level for the earnings base?
10. What is the feasible maximum contribution rate?
11. Are the employee contributions regressive?
12. Who really pays the employer contributions?
13. Should there be a government contribution?
14. Should the program be used as an economic tool?
15. What funding principles should apply?

These issues are also discussed in other chapters.

Sir Alfred Watson—the first British government actuary—was the outstanding authority of his time on health insurance. Decades ago he stressed that

health insurance was much more a managerial problem than an actuarial one. Professor Somers' chapter, "Medicare and the Cost of Health Services," makes an almost unanswerable case that this is still true today—whether the insurance is in the social insurance arena or is one of various types of voluntary insurance. It is "must reading" and rereading for any member directly active or otherwise interested in hospital and medical care insurance. After commenting on why he feels Medicare had a "smooth launching," he then concentrates on some formidable difficulties that he sees ahead. The following extracts will give an inkling of his thinking:

[He] indicates some large issues confronting not only Medicare, but the whole medical care economy as well.

Major weaknesses, however, are serious and of a cumulative character. They will be difficult to resolve because they do not derive primarily from the program itself but from maladjustments in the health service industry on which it must depend.

In the hospital field (as in education) there appears to be a widely held fetish that efficiency and concern for productivity are enemies of quality. The contrary is true. In fact, effective quality control is one of the most important means to cost control, and vice versa.

The symbol of Medicare looms far larger than the program . . . its functions cut across and influence every aspect of medical care.

Rightly or wrongly, it will probably be accorded the lion's share of praise or blame of what happens to the entire medical-care economy during the next decade. It is a heavy burden on Medicare's administrators, the Congress, and all others with responsibility for its future.

The chapter gives strong support for the following convictions that I have long held:

1. Programs such as Medicare which pay for hospital care and medical services "should be entirely separate from the old age and survivors insurance (OASI, which pays cash benefits for loss of earnings), except to the extent, and only to this extent, that it is desirable to use (OASI) administrative procedures in tax collecting, record-keeping and other areas in the interest of economy and simplicity for both beneficiaries and contributors."

2. Medicare contribution rates "should be separate and distinct from those for OASI and DI—with the schedule for each determined independently from the others."

3. Actuarial estimates for Medicare "should be given for a period certainly not more than 25 years," and not "on the perpetuity or 75-year basis" used for OASI. They should also take into account that while the OASI contribution and benefit formulas provide a safety margin as wage levels rise, the reverse is true for Medicare.

Apparently the House Ways and Means Committee reached similar conclusions in its 1965 consideration of H.R. 1 and drafted legislation accordingly.

References to the advisory councils prompted me to refresh my recollection of the extent to which actuaries outside government service were called in as advisers or consultants on social insurance to the Executive Branch and/or Congress. The original (1934) Cabinet Committee set up by President Roosevelt

to draft a social security program brought in six actuaries as staff members or consultants. In 1945 the House Ways and Means Committee created a social security technical staff of six to make an investigation in depth on OASI, unemployment insurance, and public assistance. Two were actuaries. Every advisory council, including the current one, has included at least one actuary as a member.

Actuaries have also been called in over the years by state executive branches and legislatures for advice on unemployment insurance and temporary disability benefits.

The chapter (including Eveline Burns's discussions) that examines "the development of American social insurance in the perspective of European ideas and experience" fills, to a large measure, an important gap in social insurance literature. It would have done so completely had Canada also been included.

To induce those interested in social insurance to read this chapter, at least, some extracts<sup>1</sup> follow:

*The needs which give rise to social insurance are similar in all countries, but the responses to these vary widely. A fundamental factor in this variation is the degree to which intervention by society, when the individual's income fails, is consistent with prevailing ideas and attitudes.*

In both England and Germany the original programs were justified in terms that specifically recognized the existence of "economically weak" social classes. The initial English and German programs were therefore designed primarily to assist these classes. They were workmen's insurance programs, from which nonmanual workers above a certain income level were excluded. Americans on the other hand were loath to recognize class distinctions, and class-oriented legislation was repugnant even when it was not unconstitutional. The guiding American social insurance concept was always protection for the citizen, regardless of social status or income level. Of course, this meant that many persons would be subject to compulsory coverage who had neither need nor desire for social insurance. The principal reasons for excluding certain groups, aside from successful lobbying, were primarily administrative and constitutional.

The adaptation of old-age insurance to the American environment harbored serious problems. Once more the resolution of one conflict created a new one. In this case . . . in the form of conflict between equity and adequacy.

Decisions on the further extension of social insurance in the United States can be viewed in terms of alternative restrictions on the economic and political freedom of individuals. This freedom can be restricted by the intervention of the state or by the force of circumstance. The social security system increases the first kind of restriction but significantly decreases the second. The discussion concluded that the United States should and would extend the scope and amount of social insurance programs but that the role of the Federal government would be a function of pragmatic necessity rather than of general principle. Attempts to solve the problems of poverty in the United States through European methods of state control were felt to be antithetical to American traditions of social organization, but European programs of social insurance were judged to be valid and valuable models for extending and developing American social insurance programs.

REINHARD A. HOHAUS

<sup>1</sup> To paraphrase Bob Myers, "The opinions expressed are those of the author and discussants and are not necessarily those of the reviewer."

\* Spencer L. Kimball and Herbert S. Denenberg (eds.), *Insurance, Government and Social Policy: Studies in Insurance Regulation*, pp. 487, published for the S. S. Huebner Foundation for Insurance Education by Richard D. Irwin, Inc., Homewood, Ill., 1969. \$8.00.

This book consists of a series of articles and reprints of supplementary papers, reports, and addresses relevant to the status of insurance regulation in the United States. The editors of this book are Spencer L. Kimball, Dean and Professor of Law, University of Wisconsin, and Herbert S. Denenberg, Harry J. Loman Professor of Insurance, Wharton School of Finance and Commerce, University of Pennsylvania.

As described in the Foreword by Dan M. McGill, Executive Director, the editors have "persuaded a distinguished group of academic, legal and regulatory authorities to prepare papers on various topics." The editors have also included material from existing literature on the general subject matter.

#### REVIEW OF CONTENTS

##### *Part I: "The Purposes of Insurance Regulation"*

*Chapter 1.*—In this chapter Kimball presents "a general or theoretical approach to the subject of insurance regulation." He recognizes certain internal as well as external objectives of such regulation. As internal objectives he cites the solidity of the insurance enterprise (the preservation and enhancement of its solvency) and the goals of fairness, equity, and reasonableness. As external objectives he recognizes freedom from excessive governmental restraint (leading to constitutional, statutory, and common-law limitations on official actions); local protectionism (leading to discriminatory tax structures and counter-signature laws for agents); and a preference for the dispersion of decision-making powers as opposed to a national regulatory system.

The author cites other external objectives—compulsory insurance and quasi-compulsory extension of coverage; freedom to license new insurance companies and enforcement of investment laws relating to capital accumulations in certain areas, for example, public housing.

He notes the possible conflict inherent in the above list of objectives. He cites the following incident as an example:

A distinguished insurance executive from the midwest recently expressed shock at New York insistence that he be fingerprinted when he wanted to organize a company in New York. Here are conflicting objectives to be weighed and balanced: the maintenance of solidity on the one side, and on the other the importance of freedom from harrasing government investigation and the value of permitting people freely to enter the insurance business, unless they have proved themselves to be incapable of it.

Kimball refers to the inability of insurance departments to shoulder the extra burdens periodically heaped upon them without providing them with additional money and competent help. He notes that such actions have impaired the functioning of these departments, particularly in the areas of policy-form approvals, rate regulations, and insurance company examinations.

The author concludes:

We do not ask often enough, nor persistently enough, what it is we are trying to seek in insurance regulation, and how we can best achieve what we want without unfortunate side effects.

*Chapter 2.*—This chapter consists of a talk, entitled "The Purposes of Insurance Regulations," by William Jennings Bryan, Secretary of State of the United States, as printed in the *1914 Proceedings*, National Convention of Insurance Commissioners. As related by Bryan, the two important objectives of insurance regulation are (1) the security of the insured and (2) the maintenance of a reasonably low cost of his insurance.

*Chapter 3.*—This chapter consists of an address, entitled "Ritual and Reality in Insurance Regulation," by Richard E. Stewart, Superintendent of Insurance of New York at the 1968 Joint Convention of the National Association of Casualty and Surety Agents and the National Association of Casualty and Surety Executives. He asks:

To what areas do the rituals of regulation tend to confine the attention of government? Often to matters internal to the regulated industry, such as restricting entry to the market, attenuating competition, preserving the institutional structure of the industry, and balancing competitive advantage among entities of different form, sponsorship, or regional allegiance. As a result, too much regulatory energy is diverted into policing the status quo in the regulated industry and into refereeing contests within it.

He asks further, "In simple words, what is the public purpose of insurance regulation? What is government trying to accomplish that justifies all this activity?"

He answers these questions in one sentence: "A good simple answer is that government is trying to help people get the most insurance for their money."

In this frame of reference, Stewart discusses questions applicable to the property and liability insurance lines, related to the availability of insurance, quality, and reliability of insurance and price of insurance. His proposed legislative program, which will contain "four changes—easier access to needed auto insurance, protection against cancellation, security in case of company insolvency, and open competition in rating—will help the property and liability insurance industry serve the public better and will focus our regulatory energies on real current problems."

*Chapter 4.*—In this chapter Stewart discusses the social responsibility of insurance regulation as it has developed over the years. The chapter is based on his remarks at the American Management Association Spring Conference on Government and Insurance, May, 1968.

He makes the following statement:

Consider, for example, the deep and durable belief that the sole purpose of regulation is to protect the policyholder. Not surprisingly, this maxim places the regulator in exactly the same world as the industry; his constituents, as it were, are those people already in a contractual relationship with insurers.

He questions whether the above maxim is currently sufficient, adding, "Today government has an additional responsibility to encourage and guide and to require the regulated industry to respond to the current needs of society at large where it is important and necessary."

Stewart cites three areas in which action by the New York Insurance Department was prompted by social responsibility—making insurance available in the central city, revision of rating laws in the property and liability lines, and improved regulation for solvency.

He concludes with the following words:

These are just three of many areas where the evolution of thinking in and outside the field of insurance impresses on us the social responsibility to be sure that what we are doing is a relevant and desirable contribution to the well-being of society as a whole. The abiding question is whether we are doing what is important now and not distracting ourselves with what is not important any longer. The main social responsibility of insurance regulation may be the willingness to keep asking that question and to act on the answers.

*Part II: "The Process of Legislative Reform: From General Purposes to Specific Statutes"*

*Chapter 5.*—In this chapter Kimball and Denenberg discuss the philosophy and procedures of the Wisconsin insurance law revision now in progress. They commence with the statement that follows:

An insurance code, like other statutes, should be made to say "the right thing in the right way, in language that is as clear, simple and accessible as possible," despite the great complexity of insurance as a contract, as a technique, as a business and an instrument of social planning, and the diversity of pressures that play upon the legislature.

The authors record the assistance received from the University of Wisconsin, the Wisconsin Insurance Department, the University of Pennsylvania, the University of Michigan, the University of Michigan Law School, and the NAIC in connection with the research project involved in the revision.

They refer to their plans for preserving the underlying basis of the proposed draft of the revision for legislative history as an aid in determining the intent of the law and as an aid for other states interested in similar revision. They believe that the ideas presented in connection with the Wisconsin experience should be equally useful in any other state where valid.

The authors close with these words:

The work of revision is still continuing at this writing. In the meantime, the staff is determined to keep the principles here announced as effective working principles and not mere theoretical pronouncements. Perhaps for many readers the most attractive of those principles would be that of "democratic participation in the revision." Readers are a part of the public to which the revision is addressed, and suggestions of all kinds on the substance or procedure of the Wisconsin insurance code revision are welcomed.

*Part III: "Financial Structure, Reserves, and Other Methods of Ensuring the Solidity of the Insurance Enterprise"*

*Chapter 6.*—In this chapter the editors observe that insurance statutes regulating capital and surplus requirements confine themselves, generally, to the initial phase of a company's existence. They thus do not later answer the emerging question, "What amount of capital and surplus is necessary to support safely an insurance operation with given characteristics?" This question has become acute with the development of insurance holding companies intent on "diverting from the insurance operation as much surplus as possible in order to employ it in other enterprises deemed by management to be more profitable."

The first of the two selections studied in this chapter is an extract from the report of the Special Committee on Insurance Holding Companies which reported to Stewart in February, 1968, and on which committee Kimball served. This extract is entitled, "The Concept of Surplus Surplus."

It presents the following definitions:

The "required surplus" is one that will be adequate to cover for a reasonable period of time any losses and expenses larger than those predicted and any declines in asset values, including all chance variations in the crucial factors of the operation. Any surplus beyond this cover is "surplus surplus" which, by definition, is unneeded; it may be treated quite differently in the process of regulation.

This selection refers to rules of thumb which have been used, such as a ratio of 2 to 1 or of 3 to 1 of premium writings to surplus, in seeking to answer this question only roughly. Also, such ratios would apply to the company as a whole, irrespective of the nature or relative volume of its lines of business. It regards the question as more acute for nonlife insurance companies and hopes that it will be answered by studies now under way.

The second selection discusses this requirement from the viewpoint of a multiple-line insurance company, as contained in an article entitled "Minimum Capital and Surplus Requirements for Multiple Line Insurance Companies: A New Approach," by Alfred E. Hofflander, Associate Professor of Finance and Insurance, University of California at Los Angeles. His technical presentation seeks to ascertain the comparative risk characteristics for each major line of business in order to arrive at the amount of policyholders' surplus required for a particular company's operations. The author's approach appears to be illustrative and tentative rather than definitive and conclusive. Casualty insurance actuaries will find this paper of special interest.

*Chapter 7.*—This chapter consists of an article entitled "Life Insurance Reserves and the Regulatory Process," by Joseph M. Belth, Professor of Insurance, Graduate School of Business, Indiana University. Belth favors a reappraisal of the use of a gross premium valuation method instead of current net premium valuation methods. He notes that the gross premium valuation method is generally used in determining the selling value of an insurance company. He recognizes the additional complexity involved in the introduction of future rates of expenses, face amount payments, surrenders, and dividends. He



also recognizes that his suggestion involves the use of the company actuary's estimates of such future payments, which utilize the rate of lapsation as well as interest and mortality rates. In view of the traditional attitudes of the state insurance departments in the area of policy reserves, it appears doubtful that any insurance department will soon adopt the gross premium valuation method.

*Chapter 8.*—In this chapter Kimball and Denenberg discuss problems in regulating insurance company investments, from the viewpoint of the Wisconsin insurance law. They summarize the defects in the present Wisconsin law, and they outline newly proposed solutions.

They note that a company's assets constitute the security behind its policy contracts and that such assets also bring investment income into the insurance company. They distinguish between the need for investment income by a life insurance company, especially when a rate of return is assumed and guaranteed, and by a property-liability company, which does not introduce such rate of return into its premium charges. They add that, nevertheless, investment income is important to the property-liability company also and that this question has become "a fruitful source of misunderstanding, disagreement, and controversy in the area of regulation of rates."

It is generally agreed that some regulation of investments is necessary in the public interest. Investment laws prescribe minimum standards of quality and diversification of the portfolio among broad classes of investments, individual investments, and as related to the insurance company's assets and surplus. Other considerations, such as avoidance of concentration of economic power and the promotion of social objectives (public housing, for example), have also influenced the terms of the investment statutes.

The authors describe the present Wisconsin investment law as resembling the New York law, with, however, a number of exceptions. They then describe the changes proposed in the Wisconsin law. These suggestions embody two important procedural changes and six substantive changes. The first procedural change is described as follows:

To ensure that investment laws permit application of sound but recent trends and that new investment insights can be promptly utilized, the proposed revision is content to outline investment principles and objectives, leaving it to rules of the commissioner to spell out the details and to implement needed changes more expeditiously. In particular, the authorized list is retained in form, but the list is stated with great generality and the commissioner has wide discretion to add to it.

The act would also provide for rules to be promulgated by the commissioner to implement the statute.

The second procedural change would impose special restrictions on all new insurance companies during their first five years of existence and on such older companies that may justify more restrictive regulation. Such a restricted classification of an insurer by the commissioner would be subject to judicial review. It is expected that restricted companies would operate under what amounts to the present law and that for most other insurers greater freedom and flexibility would be available. In dealing with companies which require close

surveillance, the commissioner would seek the advice of "investment men from sound insurers to help him."

The six proposed substantive changes involve essential unification of life and nonlife requirements, liberalization of common stock investments for life insurers, liberalization of investments in real property, requirement of substantial compliance with the investment laws by all admitted insurers, provision for investment freedom for surplus in excess of "optimum surplus," and provision for investment fluctuation reserves to be established by the commissioner. Establishment of such fluctuation reserves would reduce the amount of "optimum surplus."

The authors state, "'Optimum surplus' is a newly coined term used to describe the amount of surplus that ideally should be available as a minimum to support the insurer's operation."

Actuaries will question the following observation:

For life insurers the concept would have only limited application. The valuation of life insurance reserves is generally done on such a conservative basis, that to be sound a mature insurer does not really need surplus beyond its reserve.

This statement should be contrasted with the following corresponding paragraph in the report of the Special Committee on Insurance Holding Companies, of which committee Kimball was a member:

Because of the limits upon, and the relatively small size of, surpluses in New York life insurers, this concept of "surplus surplus" has less immediate importance for that branch of insurance operations. Accordingly, we do not recommend its application to life companies at this time.

*Chapters 9-14.*—In these chapters the respective authors deal with practices and procedures essentially affecting property and liability insurance companies. As indicated by the descriptions of their contents, this material is of special value to persons interested in the casualty insurance lines.

*Chapter 9.*—This chapter consists of an article entitled "Ensuring the Solvency of Property and Liability Insurance Companies," by Allen L. Mayerson, Professor of Insurance and Actuarial Mathematics, University of Michigan.

*Part IV: "Rate Regulation in Property and Liability Insurance"*

*Chapter 10.*—This chapter consists of an article entitled "The Real Issue: State versus Federal or Regulation versus Competition?" by Donald P. McHugh, Vice-President and General Counsel, State Farm Mutual Automobile Insurance Company.

*Chapter 11.*—This chapter consists of an article entitled "Unfair Rate Discrimination in Property and Liability Insurance," by C. Arthur Williams, Jr., Professor of Economics and Insurance, University of Minnesota.

*Chapter 12.*—This chapter consists of an article entitled "Multiple Line Insurance Regulation," by William B. Pugh, Jr., Assistant General Counsel, Insurance Company of North America.

*Chapter 13.*—This chapter consists of an article entitled "Statistical Agencies," by LeRoy J. Simon, General Manager, National Insurance Actuarial and Statistical Association.

*Part V: "Nonadmitted and Unauthorized Insurance"*

*Chapter 14.*—This chapter consists of an article entitled "Nonadmitted Alien Insurers and Insurance Regulation," by Keith Brown, Attorney, LeBoeuf, Lamb, Leiby and McCrae, New York.

*Chapter 15.*—This chapter consists of an article entitled "Control of Unauthorized Insurance: The Ministers Life Case in Historical and Legislative Perspective," by Robert D. Haase, Commissioner of Insurance, State of Wisconsin. Haase describes one facet of the tug-of-war between state and federal regulation as portrayed in Wisconsin's efforts to control mail-order insurance.

In 1961, Wisconsin enacted its current law seeking to control such business. In 1967, the United States Supreme Court refused to review the decision in the Wisconsin case of "Ministers Life and Casualty Union vs. Haase," upholding the constitutionality of this law.

Haase presents a historical review of the efforts of the states individually and collectively, particularly in the NAIC, to control mail-order insurance. He describes events leading to the introduction and passage of this bill and the difficulties encountered on its journey from bill to law.

Haase concludes his article with the following summary:

So after 16 years of uncertain but steady toil, the final tools for comprehensive and effective state regulation of the business of insurance were at last forged and ready at hand. To the credit of those who in good faith fought so determinedly against the harness, it may be said that they accepted their defeat, on the whole gracefully, and have cooperated both in observing the law and in the department's efforts to enforce it. Those who feared untoward consequences have, up until this time at least, been proved wrong. No report of any retaliatory action on the part of any sister state against a Wisconsin company on account of any provision in S. 245 has been received by the department in the six years since the bill became law. Nor has the surplus lines market "dried up," as some had predicted. On the other hand, mail-order insurance conducted without sanction of law has virtually ceased. Under proper regulation and control of the Wisconsin department, reputable mail-order companies do a flourishing business with Wisconsin citizens. The others no longer do business at all. And in intervening years it has become manifest that fair regulation, fairly administered, is of special benefit to no single insurer or group of insurers but rather of general benefit to the industry as a whole and to the public which it endeavors to serve.

*Part VI: "Federal Interest in Insurance Regulation"*

*Chapter 16.*—This chapter consists of an article entitled "The Direct and Indirect Effect of Federal Programs and Regulations on Insurance Operations and Markets," by Glendon E. Johnson, President, Great Southern Life Insurance Company. Johnson traces the growth of federal regulation of, and federal competition with, life insurance companies. As a regulator, the federal government exerts its authority over the life insurance business to regulate trade

practices through the Federal Trade Commission and the Department of Justice. It regulates the sale of insurance to servicemen through the Department of Defense. The Department of Labor affects the company's operations as an employer and also affects the company's operations through the Welfare and Pension Plan Disclosure Act and the Taft-Hartley Act. The Securities and Exchange Commission exerts control over the stock operations of the company and the issuance of variable annuities and segregated account group annuity contracts. The tax laws administered by the Treasury Department and the Internal Revenue Service clearly affect the life insurance business. The Department of Justice supervises insurance company mergers. In the field of health care the federal government has been very active, for example, in the Medicare and Medicaid programs under the Department of Health, Education, and Welfare.

As a competitor, the federal government is active through the Federal Housing Administration, Veterans Administration, Farmers Home Administration, Federal National Mortgage Association, Small Business Administration, and Federal Land Banks. As social security has grown and as Medicare and Medicaid have been added, life insurance companies have had to reassess their competitive position. In some areas life insurance companies are in partnership with the federal government—Medicare, FEGLI, SEGLI, and Federal Employees Health Benefit Plan.

Johnson expects that the pressure from the federal regulatory bodies will continue, and he looks to the insurance companies to continue to adapt themselves to the emerging regulatory patterns.

*Chapter 17.*—This chapter consists of an article entitled "Pensions Are for People: The 'ERITD' (Earned Retirement Income Tax Deferral) Approach to Federal Regulation of Pensions," by Dr. William C. Greenough, Chairman, Teachers Insurance and Annuity Association and College Retirement Equities Fund. Greenough puts forth a plan for permitting an individual to defer federal taxation on up to perhaps 20 per cent of his earned income, by placing such money in an approved retirement program meeting specified standards of vesting, funding, noncashability, and other characteristics. He believes that this approach would improve pension benefits, mobility of employment, and needed capital formation. He also believes that the increase in personal savings would enhance the tripartite partnership of public pensions, private pensions, and personal savings.

The author cites the similarity of his suggested plan to the plan established by Congress in 1958 for nonprofit organizations and certain governmental units under Section 403(b) of the Internal Revenue Code. An important feature of both plans is the deferral of the federal income tax on an employee, with respect to the employer's and the employee's contributions, to the time when benefits are received as annuities.

Greenough admits, "It is inconceivable that the ERITD suggestion is the answer to all problems. Furthermore, it is not worked out in enough detail to

answer all questions, and some of its aspects unquestionably could be improved on or even perhaps scrapped." He hopes that his presentation will eventually improve the ability of the individual to provide his own pension rights directly related to his earned income.

*Chapter 18.*—In this chapter Kimball discusses state versus federal regulation and presents arguments in favor of a state system, although it is not yet clear what alternatives are presented by those who favor a federal system. He cites as advantages of the state system the following: (1) it is the known and established system; (2) it does not require a total nation-wide commitment by a company; (3) it permits experimentation in selected areas; and (4) it avoids a concentration of power in Washington.

He cites the diversity of rulings made by various offices of the Internal Revenue Service as an argument against the expectation of national uniformity under a federal system.

Likewise, he does not expect that the various departments of the federal government—the SEC, the Department of Justice, the Federal Trade Commission, the HEW, the Internal Revenue Service, and other agencies—will suddenly see eye to eye on every insurance question.

As Kimball sees it, the form of federal regulation could involve one or more of the following patterns: (1) the issuance of national charters to insurance companies, which would then be regulated by the national commissioner, while state companies would be regulated as at present; (2) the subjection of companies which operate strictly or largely within a single state to state regulation and the others to national regulation; (3) certain problems becoming the concern of the national government—mail-order insurance, mergers, antitrust and holding company problems, for example; and (4) the continuance of the present practice of "increasing national intervention on specific matters of national importance without a formal change of regime."

He cannot predict which of these patterns would develop, although he regards pattern 4 as the most likely. He fears that "What you may get may or may not be an improvement on the present system—in my judgment it would be unlikely to be much better and fairly likely to be far worse."

He refers to the possibility of further changes in the state system, which will improve its operation and reduce the pressure for a federal system. Such changes would (1) focus state supervision on important questions and abandon others and (2) relax the scope and degree of the supervision over responsible companies, while maintaining it over new companies and companies whose past actions warrant close supervision.

He cites the recent development of an effective central office for the National Association of Insurance Commissioners as a means for developing further uniformity of state regulation. He minimizes the importance of the absence of adequate regulation in certain states. He ventures to make the following statement:

If a few policyholders should remain in states with inadequate regulation who are hurt because they buy from companies not licensed by a single state with good regula-

tion of its licensees, that is unfortunate, of course, but its dimensions as a weakness in our social organization should be kept in perspective.

Kimball cites the role which academicians have been playing in the dialogue going on between the proponents of the two regulatory systems and urges that the industry enter this dialogue in the interest of "practical reality."

*Part VII: "The Diagnosis and Treatment of Sick Insurers"*

*Chapter 19.*—In this chapter Kimball and Denenberg describe the development of the Wisconsin insurance law as enacted in 1967 for the rehabilitation and liquidation of insurance companies, including the study that preceded its enactment. The authors regard this act as "the only comprehensive systematic legislative treatment of delinquency proceedings in insurance to date."

There are several brief references to the California and New York laws on this subject matter. Reference is also made to the Uniform Insurance Liquidation Act, which is in effect in about twenty-seven states, and to the Wisconsin departures from its provisions, particularly the power to ask for a federal receiver.

Apparently the Wisconsin law does not yet provide for security funds, although the New York code has been guaranteeing losses in the event of the insolvency of life, workmen's compensation, and motor vehicle insurance companies for many years.

*Part VIII: "Overview"*

*Chapter 20.*—This chapter consists of an article entitled "American Insurance Regulation Seen through European Eyes," by Werner Pfennigstorf, University of Hamburg, Germany, Research Associate, University of Michigan. Pfennigstorf views American insurance regulation through European eyes. It would appear that his European remarks are based essentially upon operations in the six countries in the European Common Market.

He comments on the diversity of regulation by the "50 state agencies," with their frequently amended statutes and inadequately staffed offices. He observes that a national approach is generally adopted in each of the six European countries; that they have two separate codes applicable, respectively, to the law of the insurance contract and to the administrative regulation of business operations; that the American statutes operate more on a case-by-case approach, while the European statutes rely more on a systematic unity; that European commissioners are generally appointed for life, while American commissioners serve for limited terms; that less prestige and social status attach to American commissioners; and that their departments frequently complain of insufficient funding in spite of the excess of their income from premium taxes and fees over disbursements.

As to the substance of regulation, the author states that the American statutes are more detailed than the European statutes, which generally refer to rules to be issued by the department under its general powers. He notes that in the

European Economic Community the thinking is to permit companies from member countries to operate within the Community but to be less liberal with companies from other countries, while in the United States foreign and alien companies are treated in about the same manner. He refers to the possibility of retaliation by the states against each other's insurers, a practice which is not followed in the Community. As to rate regulation by the states, Mr. Pfennigstorf notes that the six countries in the Community have left the matter of rate regulation to the jurisdiction of the individual countries. He adds, "Present laws and practices differ more among the European countries than they do among the American states."

He refers to the filing and approval of policy forms, practiced on both sides of the Atlantic, and he wonders how the American departments can adequately review the very many forms that cross their desks.

By way of consolation, the author makes the following statement:

The discovery that the American system of insurance regulation consists of 50 independent jurisdictions would discourage the foreigner from further inquiry were it not for the fact that a small number of states have acquired, over the years, leading positions, and are, in fact, setting the pace and determining the direction for the regulatory policy of most of the other states."

Some readers may question the author's following statements:

1. "In the absence of *Paul v. Virginia*, the United States might have had federal insurance regulation or a mixed system as early as the early 1870's." The SEUA decision has been with us since 1944, and yet state supervision is still with us, in a more fortified form.

2. "It is obvious that the American insurance laws and the state insurance departments do not, in general, recognize the fact that an insurer has been licensed and is being supervised by another state as any greater guaranty of the insurer's financial solidity and lawful management than if it were domiciled and supervised in a far-away foreign country." This reviewer believes that the New York commissioner could justifiably regard an application for admission from a foreign company domiciled in Wisconsin differently from that of an alien company domiciled in South Africa, for example.

#### REVIEWER'S CONCLUDING REMARKS

This book presents a unique combination of material relevant to insurance regulation. It contains twenty-one selections, eight of which are reprints of previous addresses, reports, and papers, while thirteen represent material prepared especially for the book.

The compilation frequently stresses the need for adequate research and discussion to properly prepare the way for legislation. Special attention is called to Kimball's plea in chapter 18 to insurance executives to enter into the dialogue now in progress with respect to the future of insurance regulation. In this dialogue, life insurance actuaries, especially those in top management, may be expected to participate and contribute "actuarial reality" to the "practical reality" and academic thought developed in such dialogue.

The authors have outlined two important basic improvements in state insurance regulation:

a) Place increased reliance on rules to be administered by the department instead of relying on detailed statutory requirements which may have ceased to be applicable under new conditions.

b) Fit the regulatory pattern to the age, strength, and characteristics of the individual company instead of regarding all insurance companies as requiring the same close supervision.

I submit the following suggestions for inclusion in such dialogue:

1. In addition to the present zonal system of examinations of insurance companies, introduce two more zonal uniform requirements in the life insurance field: (a) the filing and approval of policy forms and (b) the development of standards for policy reserves. Hopefully, uniform zonal standards may some day result in uniform national standards.

2. In addition to improving the making of insurance laws, improve the methods for selecting the individuals who administer these laws, to the end that only qualified persons will be appointed, who will then be taught proper techniques of administration by competent teachers.

In several chapters detailed attention is paid to proposed revisions of the Wisconsin code. The authors note that the "Wisconsin idea" of "close cooperation between University and Government" has produced desirable results which can be utilized in other areas also.

The editors state in their Preface that they "do not necessarily espouse the views reflected in these papers, except those they wrote themselves, and they are not free from doubts about the latter." Likewise, it may be expected that a reader's views of the opinions expressed in the selected material will be affected by his particular "apperceptive mass."

The editors hope that other emerging questions can be tackled in due course in the manner used in studying the problems covered in the book. The book's Epilogue, however, gives the following caution:

The neat outlines and satisfying thought patterns of the study will, one can confidently predict, be grossly distorted by the forces of the real world, where the only certainty is uncertainty, and the only reality complex beyond comprehension."

Formidable forces are at work seeking to change state insurance laws, both in the state legislatures and in the halls of Congress. Also, efforts are being made to modernize the techniques of state regulation, including the restructuring of the National Association of Insurance Commissioners. This book presents a comprehensive account of the problems and the proposed solutions. While not all the chapters in this book are of equal interest to life insurance actuaries, I am of the opinion that this book will make a worthwhile addition to insurance libraries.

MORRIS PIKE



*The Mathematical Sciences: A Collection of Essays*, pp. x, 271, edited by the National Research Council's Committee on Support of Research in the Mathematical Sciences, M.I.T. Press, Cambridge, Mass., 1969. \$8.50.

This is the third of three publications prepared by the Committee on Support of Research in the Mathematical Sciences. The first two were *The Mathematical Sciences: A Report* and *The Mathematical Sciences: Undergraduate Education*, Publications 1681 and 1682, respectively, National Academy of Sciences, Washington, 1968. The over-all aims of these earlier reports were to assess the present status and to project the future needs and directions of the mathematical sciences.

To supplement these studies, the twenty-two essays of the third volume give a sampling of lines of mathematical research and an overview of the increasing range of mathematical applications. Ideas are presented and illustrated in non-technical language, and some, if not all, of the essays should be of interest to actuarial readers. Each essay will now be noted briefly with varying emphasis according to its proximity to actuarial mathematics.

In "The Applicability of Mathematics," S. Ulam surveys the development of mathematical ideas and their later often unexpected successful application. This essay serves as an appropriate introduction to the collection.

"Complex Analysis," by Lipman Bers, traces the growth of this subject from the reluctant introduction of imaginary numbers to the unsolved Riemann hypothesis concerning the zeta-function to the modern problems concerning functions of several complex variables. He is the first of two authors who describe  $e$  as the amount obtained by depositing \$1 for one year in an unusual bank providing interest at an annual rate of 100 per cent, compounded continuously. Also, he remarks on the beauty of the relation  $e^{\pi i} = -1$  among the four important numbers  $e$ ,  $\pi$ ,  $i$ , and 1.

In "The Social Sciences Call on Mathematics," John G. Kemeny gives an enthusiastic description of the applicability of mathematics to the social sciences. Included are simplified examples of problem solving by linear programming, graph theory, differential equations, computer simulation, and Markov chains. The differential equations example is due to A. Lotka and concerns the interrelated growth of fox and rabbit populations. The simulation example studied the effect (if any) of the batting order on the production of runs in baseball and turned up the result that luck is a more significant factor than strategy.

Joshua Lederberg in "The Topology of Molecules" discusses the applicability of graph theory to organic chemistry and computer implementation of such application. H. S. M. Coxeter's essay "Non-Euclidean Geometry" outlines the evolution of alternatives to Euclidean geometry—in particular, hyperbolic and elliptic geometry—and suggests their application to space.

"Statistical Inference," by J. Kiefer, provides thought-provoking reading for actuaries. He describes statistical inference as a sort of converse probability

theory; one observes what has happened and then tries to deduce features of the probability mechanism that made it happen. Using a simple coin-tossing experiment, he illustrates what questions may be asked, the cost of being wrong, the selection of admissible statistical procedures, and basic ways of choosing among them. He indicates that there is no simple recipe for choosing a statistical procedure for all possible settings; rather, each problem requires its own precise probabilistic analysis.

"Functional Analysis," by J. T. Schwartz, lucidly illustrates the generalization of a mathematical idea by tracing Pythagoras' theorem from a plane rectangle context to that in function space, the elements of which are functions. The study of such function spaces is the content of functional analysis. "Vector Spaces and Their Applications," by E. J. McShane, is a companion piece for Schwartz's essay. It details the concept of a vector space and describes some applications.

The next two essays are also companion pieces. In "Mathematics in the Physical Sciences," Freeman J. Dyson gives some observations on the interplay between mathematics and physics, then mentions three approaches to the study of elementary particles, namely, field theory, scattering theory based on analytic functions of complex variables, and group theory, with an illustration of the last. A. S. Wightman, in "Analytic Functions and Elementary Particles," expands on the second approach.

A third pair of essays concerns numerical analysis and computers. Philip J. Davis' essay "Numerical Analysis" outlines briefly the history of numerical analysis and computation. Of interest to actuaries is his remark: "In past generations, the difference calculus was of great importance in numerical analysis, both in the theory and in the practice. There has been a marked decrease in the use of differences in favor of the functional values themselves." He thinks, however, that no mathematical method should ever be ruled out of consideration from computing practice. "Solving a Quadratic Equation on a Computer," by George E. Forsythe, presents in detail the pitfalls that may be encountered in this seemingly elementary computation. The computer works in a limited domain of truncated decimal numbers, and errors can arise from rounding or from overflows. Computer algorithms must be devised carefully and skillfully to obviate these errors.

Samuel Eilenberg, in "The Algebraization of Mathematics," contends that almost every mathematical theory has an algebraic part. One illustration he gives of this is the theory of categories and functors, which is a way of expressing certain common features of mathematical structures. He foresees the application of this theory to the theory of automata, computer languages, and abstract linguistics.

Lawrence R. Klein's essay, "The Role of Mathematics in Economics," should be of special interest to actuaries since it outlines the problems of mathematical modeling and of measurement of the economic system. Insurance is a subsystem of the economic system and reacts to developments in that system,

so that understanding of the whole system can serve to guide the subsystem. The author, who is in charge of one of the most comprehensive models of the United States economy, outlines various mathematical approaches to economic problems and summarizes in the following statement:

A careful mathematical formulation of economic relationships and their implications, together with mathematical theories of statistical inference, has finally paid off in producing models of economic life that have genuine applicability to important social matters. Mathematics has not been able to do this alone, but mathematics in the service of applied economics with the help of elaborate data collection, computerization, and advances in general economic thinking appears to be the appropriate combination.

"The Evolution of Differential Topology," by Andrew M. Gleason, and "Point-Set Topology," by W. H. Bing, give exciting glimpses of the lively field of topology, the study of how space is organized.

Zellig Harris, in "Mathematical Linguistics," suggests how this new science attempts to analyze basic structural properties common to all languages. Another new field of application of mathematics is described by Hirsh Cohen in "Mathematics and the Biomedical Sciences."

"Combinatorial Analysis," by Gian-Carlo Rota, should be fun reading for actuaries. He notes a few of the many problems that are being actively worked upon and tests the reader with the proof of a little-known theorem, namely: Given a sequence of  $(n^2 + 1)$  distinct integers, it is possible to find a subsequence of  $(n + 1)$  consecutive entries which is either increasing or decreasing. In the concluding section, he predicts that "the next few years will probably witness an explosion of combinatorial activity, and the mathematics of the discrete will come to occupy a position at least equal to that of the applied mathematics of continua."

Mark Kac's essay on "Probability" could well be a suggested reading for actuarial students. He sketches the history of the subject, gives simple illustrations of the ground rules, and discusses the resolution of some of the classical paradoxes. Other examples include the Ehrenfest model, which throws light on a question in thermodynamics theory, and a final example that indicates the relation of the normal curve to the distribution of prime divisors, a concept of number theory.

In "The Continuum Hypothesis," Raymond M. Smullyan outlines man's understanding of infinity and the great unsolved problem which obstructs his grasp. The final essay, "Prospects of Computer Science," is a second contribution by J. T. Schwartz. Something of its spirit is indicated by the following quotation from its summary:

For all its complexity, the electronic computer is an instrument for simplifying problems that overwhelm the intellect. In this respect, it has the same broad goal as traditional mathematics, but the approach is diametrically different. While the mathematician searches for a gem of clarity amid a welter of information, a computer attacks problems like a bulldozer.

This is a well-written set of essays covering a wide range of mathematical theory and applications. An actuary who has lively mathematical curiosity and interest will find much to delight him in this volume.

CECIL J. NESBITT

\* R. E. Beard, T. Pentikäinen, and E. Pesonen, *Risk Theory*, pp. xiv, 191, Methuen & Co., London, 1969.

\* Hilary L. Seal, *Stochastic Theory of a Risk Business*, pp. xiii, 210, John Wiley & Sons, Inc., New York, 1969.

Carl Philipson, "A Review of the Collective Theory of Risk." Reprinted from *Skandinavisk Aktuarietidskrift*, 1968. Distributed as Supplement to the *As-tin Bulletin*, V, 41.

\* Karl H. Borch, *The Economics of Uncertainty*, pp. vii, 227, Princeton University Press, Princeton, N.J., 1968.

For several years the interest of North American actuaries in risk theory has been growing, but they have felt the lack of an easily accessible, comprehensive textbook on the subject. They no longer should feel this need, for we now have two general textbooks on the subject and an extensive, annotated bibliography.

In 1955, Dr. Teivo Pentikäinen, currently Director-General of the Ilmairinen Insurance Company in Helsinki, published in Finland an elementary textbook on risk theory. This has now been rewritten and translated by Dr. Pentikäinen and Dr. Erkki Pesonen, Head of the Insurance Department in the Finnish Ministry of Social Affairs, and has been prepared for English-speaking audiences by Mr. Robert Beard, O.B.E. The result is an excellent introduction to risk theory at a level demanding relatively little mathematics beyond that contained in the Society's *Syllabus*. The student is carefully led, both by the text itself and by several useful exercises, through the development of the distribution branch of risk theory and is introduced to several applications and briefly to the ruin theory branch of collective risk theory. It should be noted that, although the book is entitled *Risk Theory*, it deals exclusively with the collective theory of risk and ignores the earlier, individual theory. The distinctions between the two have grown dim with the passing years, but still a discussion of the classical theory would have provided useful insights and connections with simple probabilistic techniques. This, however, is not a serious flaw.

Chapter 1 discusses the purpose of risk theory in a general way and leads to development in chapter 2 of the claim process which assumes that each claim has constant size. Chapter 3, "Generalized Poisson Distribution," derives the basic distribution function of risk theory and provides several examples of approximating the distribution function of the total claim amount on a portfolio of policies in a given time interval. One of these, the use of shadow claims, I found particularly helpful in a recent reinsurance study. Chapter 4 gives two basic approximations to the distribution function of total claim amount—the Normal and the Edgeworth, and, in particular, the authors suggest the Normal Power

Expansion as a simple alternative to the more complicated Esscher method, which is explained in chapter 7. Chapter 5 contains a discussion of the practical applications of the Normal approximation to such problems as determining retention limits and experience rating. The Normal approach is useful in gaining insight into practical problems, but often it really is not good enough to provide definitive answers, even under the assumptions of risk theory.

Chapter 7 furnishes a discussion of the currently popular Monte Carlo Method and touches as well on the accuracy of such a procedure. Chapter 8 is a mildly esoteric digression into other methods of calculating the generalized Poisson distribution function. Chapter 9 explores the use of the variance of the total claim amount as a measure of stability and considers the optimum type of reinsurance using this criterion. Chapter 10 develops the extension of the basic Poisson model to the case of varying basic probabilities, which is designed to tackle problems where there may be changes in the parameters of the risk process with time.

The ruin branch of collective risk theory is described in chapters 11 (for a finite time period) and 12 (for an infinite time period). Many sensible observations are given. Chapter 13, "The Application of Risk Theory to Business Planning," attempts to put risk theory into the more general framework of business decisions and describes various goals of an insurance company.

A great help to the student is the notes on solutions to the exercises and a good bibliography. The style is lucid, and there are frequent references to applications. This is a fine introductory text.

*Stochastic Theory of a Risk Business*, Dr. Hilary Seal's book, is a mine for the connoisseur. It is a mathematically sophisticated exposition of risk theory seen as a branch of the theory of random processes. In it the author surveys most of the risk-theoretic literature of this century and cites over two hundred and fifty articles and books on the subject. He has brought together here a systematic discussion of the hundred-odd threads which scholars have been working on since Filip Lundberg proposed the collective risk-theoretic model in 1903.

A risk business has three essential properties: a risk reserve, an income from premiums and possibly also from interest on the risk reserve, and an outgo of claim payments. Within this framework, described in chapter 1, Dr. Seal develops the general theory of a risk enterprise.

Chapter 2, "The Distribution of Aggregate Claims," describes the derivation of the distribution function of the amount of total claims by considering the distribution of claim ratios, by using the distribution of within-portfolio classifications, and by using the individual claim amounts, the last method leading to the basic collective risk-theoretic models.

Chapter 3 provides methods for calculating the "fair" net premiums, both directly and through experience and sequential rating.

The heart of the book is Chapter 4. Starting with a consideration of the probability of the eventual ruin of a risk business, all of whose policies have the same sum-at-risk, the author proceeds to the more general case of ruin before a given time, which he solves directly by using Laplace transforms. This model is

developed not only for a life insurance business but also for companies writing only annuity contracts. Seal then analyzes the case in which the interval is increased indefinitely and explores it within the general framework of renewal theory. The book is replete with historical asides, and of particular interest is his reference in this chapter to the connection between certain ruin equations and modern queueing theory. The choice of the term "ruin" has discouraged many actuaries, who shy from considering so cataclysmic an event. The frequently suggested alternative, "the exhaustion of a risk reserve," would probably appeal more to the semantically nervous.

In chapter 5 we find a discussion of the loading of premiums and of reinsurance, the literature of which is well surveyed.

Seal breaks with the risk-theoretic model, at least as identified with the Swedish school, in chapter 6, where he gives an introduction to an insurance model from the standpoint of utility theory and then applies it to such problems as reinsurance.

This is a most elegant and scholarly treatise, but the mathematical background required for a real appreciation of many parts of the book may well discourage many actuarial readers. Much of the book, on the other hand, has appeal to a wider audience, but other sections of it presuppose some familiarity with such topics as Laplace transforms, Bessel functions, and complex integration. The serious student of risk theory will find it an indispensable gem.

Dr. Carl Philipson of Sweden has prepared a survey article on risk theory in two parts. Part I gives a brief and mathematically sophisticated overview of the collective theory of risk which was originally presented at the Risk Theory Symposium held in honor of Filip Lundberg in Stockholm in 1968. Part II furnishes an extensive bibliography of 365 items, only twenty-six of which do not relate directly to risk theory.

In this survey, Philipson quotes the inaugural lecture of Professor Hans Bühlmann upon joining the faculty of the Federal Institute of Technology in Zurich, in which he argues for considering risk theories instead of one risk theory. He would list three risk theories. The first is the collective risk theory of the Swedish school, tracing its origin to the work of Filip Lundberg and depending to a large extent on various ruin probabilities. The second theory adds to the study of ruin some consideration of the maximization of future gains and is exemplified by the work of Bruno de Finetti. The third risk theory would be that based on the ideas of utility theory as expounded in the works of Dr. Borch.

It is this third "theory," in the words of Bühlmann, that forms the subject of *The Economics of Uncertainty*, by Dr. Karl Borch, Professor at the Norwegian School of Economics and Business Administration. It is a general introduction to utility theory and its application to decision making under uncertainty and has, therefore, an audience wider than the actuarial community. Since 1960 Borch has written several papers on this topic, and this text represents a compendium of topics that he has touched on elsewhere.

The development of this topic derives from the work of von Neumann and

Morgenstern in their now classic treatise *The Theory of Games and Economic Behavior*. Borch starts with certain basic assumptions about preference ordering represented by a utility function and with the Bernoulli principle (expected utility hypothesis), and then later he proceeds to develop, on a general mathematical level, many aspects of utility theory and its applications. In chapter 4 he applies the Bernoulli principle to several simple problems, with a view to sharpening the reader's insight into rational decision making. In chapter 5 he applies it to portfolio selection and briefly touches upon the Markowitz investment model. He considers whether the basic axioms are realistic and develops further ideas on the shape of the utility function in chapter 6. A brief introduction to decision making with unknown probabilities is furnished in chapter 7. Then in chapter 8, in a general economic setting, he investigates market equilibrium under uncertainty.

The next three chapters are an introduction to game theory and include two-person zero-sum games, the general two-person game, and the general  $n$ -person game. Some of the material discussed earlier is applied in chapters 12 and 13 to the general objectives of a firm and its survival. He describes a dynamic-programming model to the dividend-setting policy of an insurance company in terms of its basic objectives. Here, frankly, his discussion is exploratory.

He goes on to touch lightly several useful topics, such as credibility theory and Bayesian or subjective probability, in chapter 15, and in chapter 16 he discusses the making of group decisions in game-theoretic terms. Here the mathematical content rises in sophistication above the general level assumed in the book.

The basic ideas in this book can provide useful ways of looking at the decision-making process of business in general and in insurance companies in particular, but simple, definitive answers should not be expected, at least not with the current state of the art. The actuary can find here a veritable smorgasbord of topics, clearly discussed and simply illustrated. The style and mathematical content are such as to assure a wide appeal.

PAUL MARKHAM KAHN

\* *Federal Estate and Gift Taxes Explained*, Commerce Clearing House, 1969. \$5.00.

The 1969 edition of *Federal Estate and Gift Taxes Explained* is a handbook for practitioners in the field of estate and gift taxes, including estate planners. The book is comprised of three distinct sections: "Estate Tax," "Gift Tax," and "Estate Planning." The first two sections are liberally footnoted with references to applicable sections of the Federal Tax Regulations, Revenue Rulings, and court cases. Also included are numerous references to paragraphs of the *CCH Federal Estate and Gift Tax Reporter*. A separate index is provided for each of the two sections.

In the "Estate Tax" section the reader is led through the sixteen schedules incorporated in the forty pages of which the Federal Estate Tax Return, Form

706, is comprised. Explanations are generally clear and in detail. A numerical illustration of each schedule is furnished. The schedules of direct interest to actuaries are those provided for reporting life insurance and annuities. Under specified circumstances, insurance and annuity interests may be reportable in other schedules. Also actuarial determination may be required in connection with certain transfers made in the lifetime of the decedent, with certain powers of appointment, and with the marital deduction.

Actuarial values are required in connection with life interests, remainders, and remainder interests. If such an interest is payable under a contract of an insurance company or other company regularly engaged in selling such contracts, the price of a comparable contract on the valuation date is the value for estate tax purposes. Otherwise, the actuarial determinations required are based on Table 38 of *United States Life Tables and Actuarial Tables, 1939-1941*, by Dr. Thomas N. E. Greville, a member of the Society, and interest at  $3\frac{1}{2}$  per cent. This basis is prescribed by the Estate Tax Regulations and Gift Tax Regulations for deaths or gifts occurring after December 31, 1951.

The statement found on page 201, that the deduction from the value of a gift given in trust subject to a contingent reversion to the donor is determined by the Actuaries or Combined Experience Table of Mortality, appears to be in error, since section 25.2512-4(e) of the Federal Gift Tax Regulations requires the use of Table 38.

Table 38 is the Makehamized table based on the total white population of the United States included in the 1940 Census and deaths in the period 1939-41. The regulations do not contemplate any recognition of differences between male and female mortality. The annuity values furnished are those of immediate life annuities and of immediate annuities certain, both payable annually. Adjustment factors are provided for annuities payable more frequently. These factors are precisely correct only for annuities certain.

Life insurance on the decedent is reported in Schedule D of Form 706. Insurance purchased by a decedent on the life of another person is included in the estate at its cost of replacement but not under the insurance provisions of the estate tax law. Death benefits payable other than under a life insurance contract generally do not qualify as insurance.

Insurance on the life of the decedent purchased by him is included in the gross estate if he retained incidents of ownership of the policy. Benefits paid from a qualified pension or profit-sharing plan however are excluded from an employee's estate to the extent provided by employer contributions.

A life-time assignment of all an employee's incidents of ownership in a group term policy paid for by the employer may remove the proceeds from the employee's taxable estate if the policy includes, pursuant to state law, the right of conversion to individual coverage upon termination of employment, such right is included in the assignment, and state law does not prohibit assignment of the conversion privilege.

Life insurance payable to the estate or to an executor for the benefit of the



estate is includible in the estate even though it would otherwise be excludible.

Schedule I of Form 706 is provided for reporting the value in the gross estate of a decedent of any annuity or other payment or portion thereof (other than as exempted by the provisions of section 2039(c) of the Internal Revenue Code pertaining to qualified employees' benefit plans) passing to a beneficiary by reason of his survival of the decedent. Items reported in Schedule I must be payable under a contract or agreement, other than a life insurance policy on the decedent, which gave the decedent the right to receive an annuity, including a joint annuity, for a period dependent upon his death, or a period which did not end before his death. Deferred compensation agreements which provide for payment after the death of an employee of an annuity or other payments to a designated beneficiary are cited as types of contracts for payments of annuities for purposes of inclusion in Schedule I. Other examples include the post mortem payments under cash, and installment refund, annuities, annuities payable for a period certain, or annuities providing for the payment of a fixed lump sum, without regard to the amount paid the primary annuitant prior to his death.

Annuities are includible in the gross estate at the commuted value at the decedent's death of the payments receivable by the survivor. If, however, it is known at the valuation date that the survivor has an incurable and fatal disease in an advanced stage, the value of such interest may be determined by expert medical testimony. If the annuity is provided by an insurance company contract, its value in the estate is the cost at the decedent's death of a similar annuity for the survivor.

The requirement of inclusion of an annuity in an estate depends upon whether the decedent was the purchaser and upon his rights thereunder. If the decedent was the primary annuitant and was the purchaser or had the right to designate the person to receive after him, or if the annuity was purchased by an employer under a nonqualified employee benefit plan, payments due after death are taxable in the estate whether they represent payments to a named beneficiary or the estate. If, however, the decedent were a participant as a common law employee under a noncontributory plan or trust, qualified under the Internal Revenue Code, the value of the annuity receivable by any beneficiary other than the decedent's executor would be excludible from the decedent's gross estate; but, if such qualified plan were contributory, no exclusion would be allowed for that part of the value of such amounts payable to the beneficiary in the proportion that the total payments or contributions made by the decedent bears to the total payments or contributions made.

Similar treatment is accorded employees of educational, charitable, and religious institutions or the public schools for whom so-called tax-sheltered annuities are purchased. Such treatment, however, is not applicable to self-employed individuals.

Annuities provided by a decedent solely for the benefit of other persons are taxable if provided by will, in contemplation of death, or if decedent retained such rights as the right to change the beneficiary or to surrender or revoke the annuity.

Also of interest to actuaries is the qualification for a marital deduction of proceeds of life insurance and endowment or annuity contracts payable in installments or under an agreement to pay interest. Qualification requires that the surviving spouse have the right to receive all the payments to be made in her lifetime and exclusive power to appoint the recipient of any remainder interest at her death. The installments of interest payments must be payable at least annually and commence not later than thirteen months after the death of the decedent.

The "Gift Tax" section is also well documented. Major topics covered are the nature of a taxable gift; gift-splitting between husband and wife; the annual exclusion, deductions, exemptions; and the effect of various types of transfers and powers of appointment. Gift property is generally valued on the same basis as a valuation for estate tax purposes.

The most common deductions are charitable gifts, the marital deduction, and the specific exemption. In addition to the annual exclusion of \$3,000 available to a donor for gifts of present interests made to each donee, there is a specific lifetime exemption of \$30,000 as to each donor.

The annual exclusion is not allowable for gifts of future interests whether vested or contingent:

Denial of the exclusion results from difficulty in determining the number of eventual donees and the values of their respective shares. This difficulty is especially significant where contingent remainders are involved. Rather than attempt to set up many fine-line distinctions, Congress chose to deny the exclusion with respect to all gifts of future interests in property.

The tax is computed by adding the taxable gifts for the current year to total taxable gifts for all prior years, determining the tax which would be imposed if the sum were taxable at current rates, and then deducting the tax at current rates on the total taxable gifts for all prior years. The tax rates are 75 per cent of the federal estate tax rates.

The "Estate Planning" section is a 55-page treatment of the objectives of estate planning and the devices used in accomplishing the objectives. Included in the purposes are the conservation of wealth both by minimizing taxes and expenses of the estate concerned and, at the death of the beneficiaries, by avoidance of forced sale of business interest. The devices discussed are lifetime gifts, life insurance, trusts, the marital deduction, powers of appointment, and the purchase of certain United States Treasury bonds.

Life insurance is recommended as one of the best means of increasing an estate and of reducing administrative expenses after death. While includible in the taxable estate if the decedent retained incidents of ownership, insurance proceeds payable to named beneficiaries are free of costs of administration. Insurance provides liquidity which may eliminate a loss from forced liquidation of business interests to satisfy tax claims or other claims or enable the family to retain ownership of the decedent's business. Insurance is favorably treated under state death tax laws. Most states levy no taxes on insurance proceeds payable

to named beneficiaries, and others grant specific exemptions not available to other property. Annuities provided from insurance are certain to be paid regularly and on time.

Life insurance trusts are discussed as a means of avoiding tax upon the death of the insured and upon a subsequent transfer of the trust property.

The 1969 edition of *Federal Estate and Gift Taxes Explained* is a convenient reference both for the explanations found in the book and for the references to the pertinent regulations and rulings.

SAMUEL ROSENBLUM

\* *The History of Individual Annuity Contracts*, prepared by a Historic Records Working Party of the Insurance Institute of London (England), pp. 34, 1969.

This is the twelfth report of the Historic Records Committee of the Insurance Institute of London. The Council of the Institute at its meeting in December, 1958, formed this Committee, and Working Parties under its guidance, to investigate the history of specific classes of insurance business. The aims and objectives of the Committee are to record information about and to preserve documents of historic interest in insurance, to record the circumstances attending the introduction of new classes of insurance and later major changes in practice, and to record any other matters relating to insurance likely to be of historic interest.

The titles of the previous eleven reports follow:

1. History of Family Income Policies
2. Development of Mercantile Fire Insurance in the City of London
3. Institute Time Clauses—Hulls
4. The History of Children's Deferred Assurances
5. Institute Cargo Clauses
6. The History of Weather Insurance
7. The History of Fidelity Guarantee
8. The Work of the Insurance Companies in Combating and Preventing Fire
9. The History of Underwriting in Life Assurance
10. A Short History of Aviation Insurance in the United Kingdom
11. Shipping and Insurance Sketches, 1867

Except for the third report (*Institute Time Clauses—Hulls*), individual copies of the reports are available from the Insurance Institute of London, 20 Aldermanbury, London, E.C. 2, United Kingdom, at prices ranging from 5 to 14 shillings per report (depending on which report is ordered).

This report deals in some detail with the development of annuities and similar contractual arrangements entered into in England from time to time over the centuries, starting with accounts of "corrodies" sold during the fourteenth century. Heads of religious houses, wanting to raise funds, sometimes sold "corrodies," whereby a layman could obtain for himself and his family the right to board and lodging in a monastery in his old age. Several interesting examples of this form of transaction are described.

Early laws forbidding the charging of interest on money lent, and later enactments limiting rates of interest, are described, together with the interaction of these laws with the sale of life annuities. As long ago as 1500, systems of granting loans repayable by life annuities were devised with a view to evasion of the laws against usury; this practice continued to 1854, when the usury laws were abolished.

During the seventeenth century, governments and private companies having need of money sold life annuities, and many early schemes are described in which the theory of life contingencies was first employed, sometimes effectively, sometimes with disastrous results as the annuitants outlived the assumed expectations of life. Early tables of annuity purchase rates are listed, some based on the first life table—that of Edmund Halley, the Second Astronomer Royal.

Modern history of annuities really began with the founding of the Equitable Life Assurance Society in 1762. Powers to issue annuities were granted to it and to other early insurance societies; these powers are described in some detail, together with contribution rates for early pension schemes. More government plans for raising money through the sale of annuities are described, including the great English Tontine of 1789.

During the early part of the nineteenth century, many English life companies were formed; the conditions and premium rates for their annuity contracts are outlined along with some colorful comments on their successes and failures. Names like Globe Insurance Company, the Pelican Office, the Provident Life Office, the Norwich Union Office, the Philanthropic Annuity Institution, and others are given with descriptions of their early trials and tribulations in the business of granting annuities.

The year 1836 saw the formation of the Independent West Middlesex Company, which set out to defraud the public; this story, with its trail of misery and unhappiness, is outlined together with the resultant government investigation and legislative enactments. The report gives interesting accounts of more legal developments, later court cases concerning failing companies, and more government control measures as the fortunes of the annuity business rose and fell during the 1800's and the number of life companies grew.

Modern developments since 1900 are sketched briefly, with emphasis on the increasingly scientific approach used in the sale of annuities; wide use was made in the early 1900's of the O(am) and O(af) tables—based on experience of annuitants during the years 1863–93.

The report comments briefly on some interesting combination sales—annuity plus life plan—developed during the 1930's as well as on the beginnings of annuity taxation problems.

Over all, the report gives a very interesting and thought-provoking review of the early endeavors at the creation of viable risk-sharing schemes. While it is disjointed in some places, and leaves some blank spots in the development story, the report obviously reflects a painstaking and thorough investigation.

ROBERT C. DOWSETT

Metzger, Bert L. *Investment Practices, Performance and Management of Profit Sharing Trust Funds*, pp. 620, Profit Sharing Research Foundation, Evanston, Ill., 1969. \$16.00.

This book sets forth the results of a series of surveys conducted over a six-year period, 1962-68, by the Profit Sharing Research Foundation. The opening chapters merely provide background information on the rates of growth of non-insured and insured pension funds, institutional holdings and transactions in common stocks, receipts and disbursements by type, and other material previously made available by the SEC, Treasury Department, Social Security Administration, Institute of Life Insurance, and various published texts. The surveys themselves covered more than 1,300 profit-sharing programs, and the text presents statistics on such items as the per cent covered, types of plans, rate of growth in covered employees and assets, restrictions on investments found in the trust agreements, the party responsible for the selection of investments, and so forth. One chapter covers the investment performance of the funds and another the relationship of that performance to the particular fund holdings, investment objectives, and trust restrictions. The text also includes comments from the individual trust administrators regarding such investment objectives and results. Separate data are presented for Canadian profit-sharing trusts.

Perhaps the most interesting material is that outlining the recent changes in investment policy for particular funds and breaking them down into the changes made during the 1959-61 period, changes made in anticipation of the 1962 stock market slump, changes caused by that slump, and changes during the 1962-64 and 1964-66 periods. The individual comments are broken down between large, medium-sized, and small profit-sharing trusts, type of investments, and investment management. Examples are also presented of employee announcement material used by some half a dozen or so profit-sharing funds. The last 100 pages consist of sixteen chapters written by outside professionals independent of the Profit Sharing Research Foundation itself, including Raymond L. Crapo, F.S.A., who discusses the use of variable annuities.

This rather impressive compendium of facts and figures ranges in quality from the rather trivial and biased treatment accorded the differing objectives of pension and profit-sharing funds to the publication for the first time of extensive facts and figures regarding profit-sharing plans and their financial operations. The text contains hundreds of quotations, including rather extensive quotations from the works of Preston Bassett, F.S.A., Sam Houston Huffman, A.S.A., William W. Fellers, F.S.A., and others. And there are literally hundreds of tables presenting the financial information and investment results.

Although much of the general material is available elsewhere, the specific results achieved by individual funds are most interesting, and the book should serve as a valuable reference work for those interested in or responsible for the investment of retirement funds.

PAUL H. JACKSON

\* William C. Greenough and Francis P. King, *Benefit Plans in American Colleges*, pp. 481, Columbia University Press, New York and London, 1969.

This analysis of employee benefit plans covering college employees brings up to date the previous studies published in 1940, 1948, and 1959. The authors are well-qualified, being, respectively, the chairman and research officer of TIAA-CREF, and having coauthored the 1959 study. The book is based largely on a questionnaire completed in early 1968 by American universities and colleges regarding their own benefit plans. In addition, the authors have included much background material on the philosophy and design of employee benefit plans, the special needs of college personnel, the benefits provided under social security, and the role of TIAA-CREF.

The authors' formidable nineteen-page questionnaire was completed by 1,232 of the 1,530 colleges surveyed. The resulting tables, much more detailed than those in the previous edition, thanks to computers, occupy half the book. The principal tables contain:

1. A listing of the responding colleges, showing for each college the categories of benefit plans (pensions, life insurance, basic medical, major medical, short-term disability and long-term disability) covering their faculty, administrative, and clerical-service personnel.
2. The frequency with which particular benefit provisions appeared in the plans surveyed.
3. A brief description of each institution's pension plan, including the name of any insurance company serving as funding agency. The following table is a summary of pension funding agencies:

FUNDING AGENCY	FACULTY PERSONNEL		ADMINISTRATIVE PERSONNEL		CLERICAL-SERVICE PERSONNEL	
	No. Plans	No. Employees	No. Plans	No. Employees	No. Plans	No. Employees
State pension plans . . . . .	386	169,663	415	54,751	370	223,396
TIAA-CREF . . . . .	746	151,349	700	63,614	361	102,379
Self-admin./trusteed . . . . .	85	25,051	93	22,479	122	115,099
Church pension plans . . . . .	162	10,364	140	3,266	75	6,491
Insurance company . . . . .	112	14,314	116	5,410	94	29,807
Other . . . . .	28	9,875	26	4,275	23	12,484
Totals* . . . . .	1,170	283,936	1,141	107,705	921	420,974

\* Figures add to more than totals shown because some groups were covered by more than one plan.

The authors can take justifiable pride in TIAA-CREF's success in meeting the needs of the college market, especially through its pioneering efforts with variable annuities. Although the authors for the most part let the facts speak for themselves, the book is not likely to hinder the success of TIAA-CREF.

The authors' treatment of pension-plan financing is brief, steering clear of such technical concepts as normal cost and actuarial liabilities. They do, however, urge proper funding of pension plans, especially under state retirement systems.

A well-organized reference work, the book is aimed primarily at college trustees, administrators, and faculty personnel who wish to appraise the adequacy of a particular plan by current standards. It would, however, also be useful to employee benefit consultants and insurance company executives interested in learning more about the college market.

RICHARD G. SCHREITMUELLER

\* Committee on Employee Benefits, *Retirement Income in the United States: A Case for the Composite System*, pp. 47, Financial Executives Institute, New York, 1969.

#### BACKGROUND

This short paperback was prepared by a project group of the Committee on Employee Benefits of the Financial Executives Institute. The Project Group contained twenty-eight business executives, including three advisers—Roger F. Murray, Thomas H. Paine, and David H. Roenisch, F.S.A. This study extends an earlier study by the Committee, *Private Pension Plans and the Public Interest*, and broadens the view of that study to cover the three major sources of retirement income in the United States—individual savings, group retirement plans, and social security.

#### SUMMARY

The study discusses the needs for, sources of, and adequacy level of total retirement income. It then covers current issues relating to benefits, investment, effect on the economy, and political action. The section entitled "Political Issues" is twice as long as any of the others, perhaps indicating the concern of free enterprisers in this area. The study concludes that the three sources of retirement income are necessary and complementary, but all, particularly social security, must know their stations. Social security should provide the floor of protection and be financed by payroll taxes without using general tax revenues. Social security should also remain work-related and not replace welfare programs.

Group plans should complement social security by providing the variation in plans and financing consistent with the variations in resources and needs of different employers and their employees. Above all:

Legislation covering vesting, portability, funding, and reinsurance appears unnecessary and would be detrimental to the operation and growth of private plans.

Individual savings programs are the frosting on this layer cake:

We feel that income tax provisions should be modified to encourage the building of private retirement funds out of productive earnings.

## REVIEWER'S COMMENTS

This study reminded me of a political speech—it stirs the American heart, and then the next day you can't remember what was said. Although admittedly much detail must be left out of a document of this size, the "case" is weakened by excessive generality. For instance, the investment issues section produced this gem: "Substantial assets have been accumulated in group pension funds in recent years and these accumulations are expected to continue to rise in the future." Again, the section on the level of retirement income contained no examples of possible mixes or tables of current mixes of income from the three sources.

A whole section should have been devoted to the subject of inflation. A short mention is made of this "most urgent problem" in the benefit section, but much is left unsaid. It is hard to tell where the subject is dropped. Perhaps it is at the point where, after two short paragraphs, the authors continue with this sage observation: "Individual savings programs have been made more secure and effective by Federal guarantees of savings accounts."

In spite of the above deficiencies, the study is a desirable addition to the literature on employee benefits for several reasons:

1. While not unbiased, it does provide an overview of the interrelations of the three sources of retirement income, something which most proponents of one particular system rarely do.
2. It adds one voice from the businessman to the din produced by the academicians and the politicians on the subject of federal regulation. This is particularly timely now that various legislative proposals are being considered. Although the businessman has a reasonable point of view, legislators often respond to noise before reason.
3. It gives a fair return to the reader for the hour or so of reading required.
4. It provides a good mailing piece from the businessman to his legislators.

CHARLES A. PEIRCE

Truth in Lending: Regulation Z; Supplement I; Annual Percentage Rate Tables.

Volumes I and II, prepared by Board of Governors of the Federal Reserve System, Washington, D.C., 1969.

In 1968 Congress enacted a Consumer Credit Protection Act of which Title I is widely known as the Truth-in-Lending Act. The main purpose of the Act was to assure a meaningful disclosure of credit terms so that the uninformed use of credit might be avoided. The Board of Governors of the Federal Reserve System was authorized and required to prescribe regulations to carry out the purposes of the Act. Regulation Z, Supplement I, and Volumes I and II of the Annual Percentage Rate Tables were issued by the Board in 1969. The last two items acknowledge the valuable assistance of Cedric W. Kroll, Government Actuary, United States Treasury Department.

Regulation Z is contained in a pamphlet for which the full title is "What You Ought to Know about Federal Reserve Regulation Z, Truth in Lending, Consumer Credit Cost Disclosure." The pamphlet also contains the law, question-



and-answer sections, and model disclosure forms. The Regulation requires the disclosure of the *finance charge* and the *annual percentage rate* so that a credit customer may tell at a glance how much he is paying for his credit and its relative cost in percentage terms.

Supplement I (12 pages) gives the general rule and equations for determining the annual percentage rate for credit other than open-end accounts, such as charge accounts. Paragraph (a) states the general rule as follows:

The annual percentage rate shall be that nominal annual percentage rate determined by multiplying the unit-period rate by the number of unit-periods in a year and shall be computed so that it may be disclosed with an accuracy at least equal to the nearest quarter of 1 per cent. The unit-period rate shall be determined as that percentage rate which will yield a sum equal to the amount of the finance charge when it is applied in accordance with the *actuarial method* under which payments made on a debt are allocated between the amount of the finance charge and the amount financed, so that each payment is applied first to the accumulated finance charge and any remainder is subtracted from, or any deficiency is added to, the unpaid balance of the amount financed. [Italics added.]

In effect, the "unit-period rate" can be determined by setting up an equation of value between the advance(s) made by the creditor and the repayments by the borrower and solving for the rate of interest. Supplement I gives and illustrates some of the mathematical background, while Volumes I and II of the Annual Percentage Rate Tables give values whereby for almost all regular or irregular transactions the rate of interest or the finance charge can be determined by inspection or by simplified computations. These materials provide what might be called "financial engineering" for the disclosure process.

The "unit-period" is defined, in general, as the common period, not to exceed one year, which occurs most frequently in the transaction. The unit-period rate is the effective rate per unit-period, and the annual percentage rate is the corresponding nominal annual rate. There are mathematical advantages in dealing with the effective rate per unit-period rather than with the effective annual rate. Also, the effective rate per unit-period (as well as the corresponding nominal annual rate) is probably more easily understood by the public than the effective annual rate.

The finance charge, no matter how arrived at originally, is, in the mathematical model for determining the annual percentage rate, the sum of repayments by the borrower less the sum of advance(s) to him. In other words, the finance charge is considered as the total interest paid by the borrower on the unpaid balances at the effective rate per unit-period.

As has been pointed out in recent issues of *The Actuary*, there may be more than one real solution to the equation of value set up to determine the interest rate. This problem is referred to on page 10 of Supplement I but is not resolved completely. If the unpaid balances are never negative, that is, the lender does not at some stage become the borrower, the problem is avoided.

Annual Percentage Rate Tables, Volume I, are based on the standard amount

financed of \$100, to be repaid by  $n$ -level payments  $100/a_{\overline{n}|i}$  at the ends of the  $n$  unit-periods following consummation of the loan. The finance charge per \$100 is then

$$100 \left( \frac{n}{a_{\overline{n}|i}} - 1 \right).$$

The main tables give the values of the finance charge for a wide range of values of  $n$  and  $12i$  or  $52i$ . The scope of the tables is indicated in Table 1.

For a regular transaction, involving a single advance and equal payments at the ends of  $n$  unit-periods following the date of the advance, the finance charge is computed as the sum of the payments less the single advance and is converted into a finance charge per \$100 of advance (amount financed). If the unit-period is a month, the annual percentage rate can be found to the nearest  $\frac{1}{4}$  per cent by inspection in the -M tables. If the unit-period is  $m$  months, ( $m \leq 12$ ), the annual percentage rate is  $1/m$  times the rate found in the -M tables. If the unit

TABLE 1  
FINANCE CHARGE PER \$100 OF AMOUNT FINANCED

Table Codes	No. Unit-Periods per Year $w$	Range for No. Payments $n$ (Interval 1)	Range for Annual Percentage Rate $wi$ (Interval $\frac{1}{4}\%$ )
FRB-101-M to FRB-115-M.....	12	1-60	2-61 $\frac{3}{4}\%$
FRB-201-M to FRB-210-M.....	12	61-120	2-41 $\frac{3}{4}\%$
FRB-301-M to FRB-330-M.....	12	121-480	2-21 $\frac{3}{4}\%$
FRB-101-W to FRB-130-W.....	52	1-104	2-61 $\frac{3}{4}\%$

period is a week, or a multiple thereof, a similar procedure is used with the -W tables.

In Appendix A, there are given adjustments to be used for finding the rate in certain single advance transactions with an odd first period, odd first payment and/or odd final payment. These adjustments have a Procrustean flavor. The given transaction does not fit the tables; therefore, we stretch out and level the payments so that the revised transaction does fit a table. There are several steps, but one proceeds so that finance charge per \$100 remains unchanged and also a first-order estimate of the interest rate is not altered. If the only irregularity is that the set of  $n$  payments is deferred  $h$  periods, the revised set of payments extends for  $n + 2h$  periods and has the same sum and the same approximate equated time as the original set.

Appendix B shows how to find the finance charge for regular transactions by direct use of the -M or -W tables. Appendix C discusses some special transactions and, in particular, how to determine the unearned finance charge after a transaction has been in progress for some time. Appendix D gives some notes on accuracy. In using the tables for transactions with payments which are uniform in period and amount, one can generally read the rate to the nearest  $\frac{1}{4}$  per cent

directly and determine it to a greater precision by interpolation, if desired. For rates determined after adjustment for certain irregularities by the methods of Appendix A, there may be an error of  $\frac{1}{4}$  per cent or more. Error illustrations are presented.

The last section of Appendix C in Volume I states, somewhat optimistically:

The rates for irregular transactions of all types can be found by using the factor tables contained in Volume II in conjunction with the rate tables in this volume. By use of these two volumes all combinations of highly irregular advances and payments (within the range of the tables) can be solved with reasonable accuracy by the actuarial method, and the results so obtained shall be considered to comply with the requirements of Regulation Z.

If one has computer facilities available, he could for any transaction start with an appropriate equation of value and employ some solution algorithm to

TABLE 2  
FACTOR TABLES FOR IRREGULAR TRANSACTIONS

Table Codes	No. Unit- Periods per Year	Range for No. Payments	Range for Annual Percentage Rate (Interval 5%)
FRB-101-MF to FRB-146-MF.....	12	0-480	5-20%
FRB-147-MF to FRB-158-MF.....	12	0-120	25-40
FRB-159-MF to FRB-166-MF.....	12	0-60	45-60
FRB-101-WF to FRB-112-WF.....	52	0-104	5-60

obtain the rate of interest. Volume II seeks to obviate this process by setting up procedures for finding the percentage rate by use of the factor tables in Volume II and the tables of Volume I.

The main tables in Volume II are indicated in Table 2.

Each of these tables gives values for three factors,  $A$ ,  $B$ , and  $C$ , for computing the theoretical finance charges in various subsequences of payments in a transaction.

The  $A$ -factor simply represents the number of regular (monthly or weekly) payments.

The  $B$ -factor represents the equated time for  $A$  regular payment of 1; thus

$$Av^B = a_{\overline{A}|i}$$

For these payments, the finance charge at interest rate  $i$  is expressed as

$$A - Av^B = A - a_{\overline{A}|i}$$

The  $C$ -factor represents the finance charge per \$1,000 of payment at the equated time  $B$ , or per \$1,000 of total payments made in  $A$  regular installments. Thus

$$C = 1,000(1 - v^B) = 1,000(1 - a_{\overline{A}|i}/A)$$

If the set of installments is deferred  $h$  periods, the  $B$ -factor is replaced by  $B + h$ .

By means of factors  $A$ ,  $B$ , and  $C$  the finance charge at a trial rate of interest may be calculated by breaking the transaction into subsequences of level payments, computing the finance charge for each subsequence, and adding to get the finance charge for the whole transaction. If there are any advances from the lender to the borrower after the initial date, there will be an offsetting finance charge for these. One compares the finance charge at the trial rate with the actual finance charge, recalculates at an appropriate second trial rate, and interpolates for the percentage rate of the transaction.

The inverse problem (given the annual percentage rate), the advances, and the arrangements for the payments to determine the finance charge can also be handled by means of the tables of factors in Volume II. Some notes on accuracy are included. The so-called double-run method indicated above appears to give rates well within the  $\frac{1}{4}$  per cent tolerance, except for very short transactions for which more direct methods may be available.

In case of unusual sequences, such as uniformly increasing or decreasing payments, it is suggested in Volume II that auxiliary tables be developed for specific situations to convert such sequences to their single-payment equivalents.

The two volumes of tables represent a well-executed effort to make it feasible and practical for creditors to provide the disclosures required by the Truth-in-Lending Act.

CECIL J. NESBITT

### SELECT CURRENT BIBLIOGRAPHY

In compiling this list, the Committee on Review has digested only those papers which appear to be of direct interest to members of the Society of Actuaries; in doing so, the Committee offers no opinion on the views which the various articles express. The digested articles will be listed under the following subject-matter classifications: 1—"Actuarial and Other Mathematics, Statistics, Graduation"; 2—"Life Insurance and Annuities"; 3—"Health Insurance"; 4—"Social Security"; 5—"Other Topics."

#### ACTUARIAL AND OTHER MATHEMATICS, STATISTICS, GRADUATION

Committee on Research, *Selected Bibliographies* (available on request from the Office of the Society of Actuaries or from the Secretary of the Committee on Research, Mr. D. G. Halmstad).

These bibliographies are prepared by the Committee on Research in furtherance of the responsibility for maintaining links with current thinking on the theory of risk, applications of various operations research techniques, new methods of statistical analysis, and such other disciplines as may lead to new and better methods of performing the work of the actuary. Revised in 1969, the bibliographies list books and articles selected by the Committee from the numerous references now available. The lists include references to the general theory with comments as to the degree of mathematical

background assumed by the author as well as references of particular interest to actuaries. Separate lists are available for the following ten topics:

Bayesian Statistics	Operations Research
Decision Theory	Risk Theory
Game Theory and Gaming	Simulation
Multivariate Analysis and the General Linear Model	Systems Analysis
Numerical Analysis	Theories of Mortality

Eduardo E. Arriaga, *New Life Tables for Latin American Populations in the Nineteenth and Twentieth Centuries*, Population Monograph Series, No. 3, University of California.

Life tables for almost all Latin American countries are presented here, not only for the most recent censuses but also for various censuses in the past. The stated purpose of the book is to provide solid data for studies of the rapid decrease in Latin American mortality rates in recent decades, a phenomenon which, together with fertility rates that are still relatively high, has produced a high rate of population growth.

An item of actuarial interest is the method used by the author to derive life tables from census data when no vital statistics are available, by drawing his conclusions from the age-distribution shown in the censuses. The method involves choosing the table from among the United Nations Model Life Tables that is most consistent with the age distribution and with the author's estimate of the "intrinsic growth rate" of the population and using this as a basis for smoothing the data. The applicability of the method to Latin American populations, and the use of "quasi-stable" assumptions (implying fertility rates that do not change rapidly and negligible net immigration), are discussed more fully, pro and con, in the July, 1969, issue of the *Milbank Memorial Fund Quarterly*.

#### SOCIAL SECURITY

R. J. Myers and F. Bayo, *Disability Incidence Rates under OASDI System for Disability Onsets Occurring in 1956-64*, Actuarial Note No. 58, pp. 7, Social Security Administration, Washington, August, 1969.

This note briefly analyzes the incidence experience for disabilities with onset in the period 1956-64. The data are based on actual awards made before 1967 and on projections of awards after 1966. Values of the number of disability awards and of the incidence rates are presented by sex and by five-year age groups for each calendar year in the period. According to the analysis, the incidence rates increased until 1961 but remained relatively level thereafter. It is estimated that, due partly to the 1965 Amendments, the incidence rates after 1964 will be about 5-6 per cent higher. Preliminary data for 1967 and 1968 seem to indicate that, disregarding the effect of the 1965 Amendments, the incidence rates have increased lately.

F. Bayo, *Termination Experience of Disabled Worker Benefits under OASDI, 1957-1963*, Actuarial Study No. 65, pp. 27, Social Security Administration, Washington, March, 1969.

This study presents the first analysis of the disabled worker benefit termination experience that has been observed under the Old-Age, Survivors, and Disability Insurance program. An analysis is made in broad form (all ages and sexes combined) of the death and recovery experience by calendar years for 1958-67. The gross death rates

have been decreasing slowly, while the gross recovery rates have been increasing slowly. The gross total termination rates (deaths and recoveries combined) have remained relatively stable in the last seven years.

A detailed analysis is presented by sex, age, and duration of disability based on the combined experience for cases that started during the period 1957-63. The termination rates are compared to those obtained in the Railroad Retirement System and are about 5-10 per cent higher. Annuity values based on these rates are presented for various ages at onset of disability, at several interest rates.

Robert J. Myers and Marice C. Hart, *Analysis of Experience under Hospital Insurance Program*, Actuarial Study No. 68, pp. 36, Social Security Administration, Washington, September, 1969.

This study presents data tabulated for all bills received by the Social Security Administration covering hospital and related benefits furnished under the Hospital Insurance program from July, 1966, through December, 1968. The data are derived from bills submitted by providers of service and processed by July 11, 1969, and are virtually complete for 1966-67 and substantially so for 1968.

Data are shown separately for insured beneficiaries and noninsured persons, as well as total beneficiaries, by type of benefit (inpatient hospital, extended care facility, home health services, and outpatient hospital diagnostic services) and by month in which the service was furnished. Utilization rates, average costs, average payments, and the effect of cost-sharing are shown. In this 100 per cent tabulation, detailed breakdowns by age and sex are not obtained (although such data are obtained through sample studies, published elsewhere).

Although the data are not complete and contain some deficiencies which cannot yet be precisely measured, they are now made available for public use and will be published at intervals in the future, with refinements and more extensive analysis as further data become available.

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NOTE.—The *Journal*, in addition to actuarial papers and discussion, contains digests of articles, papers, and publications of actuarial interest and "Notes on Other Actuarial Journals."