

TRANSACTIONS OF SOCIETY OF ACTUARIES
1973 VOL. 25 PT. 1 NO. 73

BOOK REVIEWS AND NOTICES*

Tanur, Judith M., *et al.* (eds.), *Statistics: A Guide to the Unknown*, pp. xxiii, 430, Holden-Day, Inc., San Francisco, 1972, \$9.95 cloth, \$4.95 paperback.

Part 2 of the Society examinations is an intensive test over the fundamentals of probability and statistics, with little coverage given to statistical methodology and none to applications. Moreover, the only applications of the Part 2 materials to be found in the examination Syllabus are the probability models used in life contingencies and risk theory. The Recommended Course of Readings for the 1973 examinations has "an additional reference, for students who may wish to acquire further insight into the underlying nature of statistics and exposure to statistical applications, . . . *Statistics: A Guide to the Unknown*." Your reviewer heartily recommends it for us all.

In 1969 the Joint Committee of the American Statistical Association and the National Council of Teachers of Mathematics on the Curriculum in Statistics and Probability set out "to prepare a volume describing important applications of statistics and probability in many fields of endeavor. . . . This book [was planned] primarily for readers without special knowledge of statistics, probability, or mathematics. This audience included especially parents of school children, school superintendents, principals, and board members, but also teachers of mathematics and their supervisors, and finally, young people themselves. . . . Several of us . . . found much of the material very useful—even inspirational—to undergraduate and graduate students." So testifies editor Tanur in her preface to the collection of forty-four essays which range in length from 5 to 14 and average 9.34 pages.

There are three tables of contents in the book, each representing a criterion for grouping and ordering the essays. The first, which reflects the actual order, gives the articles by subject matter of application. A census of the essays by this criterion follows:

	No. of Articles
Part One—Man in His Biologic World	10
Part Two—Man in His Political World	7
Part Three—Man in His Social World	20
Part Four—Man in His Physical World	7

* 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*.

The second table of contents classifies the essays by data sources as follows:

	No. of Articles*
Samples	14
Available data	16
Surveys and questionnaires	7
Experiments	9
Quasi-experiments	4

* Four essays are not included in this table and ten are double listed.

The third table of contents, which classifies the essays by statistical tools used, will be the most useful to many readers. The census by this classification is given below.

	No. of Articles
Estimation	10
Hypothesis-testing	10
Bayesian analysis	1
Data analysis	11
Tables	6
Graphs and maps	9
Per cents and rates	15
Standardization and adjustment	7
Time series and index construction	8
Probability	13
Modeling	13
Sampling	13
Randomization	3
Correlation and regression	11
Factor analysis	1
Multidimensional scaling	1
Transformations	1
Discriminant analysis	2
Tests and measurements	1
Forecasting and prediction	8
Decision-making	7

In this table of 151 entries, each essay is listed at least once and one is listed seven times.

In addition to the tables of contents, there is an index, which, among other people and things, lists "Accountancy 201-211, Baseball 244-252, Demography 297-309, 335, Economics 310-320, 321-325, Insurance Compensation 107, Life Tables 43, 299, 405, Linguistics 176-194, Petrography 362-371, Stationary Population 308," but not actuaries or actuarial science! For a book to be read by actuaries, this omission is not harmful. But, in a book to be read by students and adults involved in secondary education, this actuarial reviewer regrets that actuaries were not "asked . . . to stress one or a very few important

problems within their field of application and to explain how statistics and probability help to solve them and why the solutions are useful to the nation, to science or to the people who originally posed the problem [Editor's Preface]."

Two of the forty-eight authors will be speakers at the 1973 Harvard Actuarial Conference on Demographic Projections and Related Actuarial Topics, to be held November 29–December 1. Conrad Taeuber, a retired associate director of the Bureau of the Census, contributed an essay that describes the Current Population Survey, which is the basic source of data for monthly federal statistics such as the "jobless rate." Nathan Keyfitz, Andelot Professor of Demography and Sociology at Harvard University and a joint contributor of papers at recent Society meetings, has been representing Harvard in the planning of the November conference. Keyfitz's essay "How Crowded Will We Become?" illustrates the use of "eigenvalues in population projections"—*but* in terms understandable to the secondary school reader.

An author's name will attract the reader to other essays. For example, George Gallop explains the failure of the 1936 *Literary Digest* presidential poll (but he is silent on 1948). Egon Pearson (remember Neyman-Pearson?) writes about a multivariate normal distribution used to model antiaircraft fire in World War II. And Frederick Mosteller, who was chairman of the American Statistical Association–National Council of Teachers of Mathematics Joint Committee, is coauthor of two essays. The first, with Lincoln Moses, is an interesting analysis of death rates to determine the safety of an anesthetic. The second, with David Wallace, is a glimpse of their book *Inference and Disputed Authorship: The Federalist* (Cambridge, Mass.: Addison-Wesley, 1964), which is now a classic in Bayesian analysis.

The titles of some essays will catch the professional interest of an actuarial reader. For example, Reid's "Does Inheritance Matter in Disease"? will do so; however, it is really more concerned with the design of experiments using twins than with the results. McCarthy's "The Consumer Price Index" gives a good definition of the CPI.

But titles will not tell the whole story, because this is a collection of problem-oriented applications of statistics. The one unifying theme is the presentation of a problem followed by a scientific (and usually statistical) analysis. The reader will be rewarded when he can see similarities between the described problem and one of his own. For example, Howell's "The Importance of Being Human," which describes how bone fossil is classified as man or ape by discriminant analysis, could have been titled "The Importance of Being Insurable" and described the classification of insurance applicants by discriminant analysis.

There are some recreational readings among the essays. R. G. Miller contributed "The Probability of Rain," which gives the weatherman's secret of divining "10 per cent chance of rain." Incidentally, the methodology uses seven different statistical tools according to the third table of contents. Hooke's "Statistics, Sports and Some Other Things" studies the odds for the sacrifice

bunt, intentional walk, and other baseball tactics. An actuarial reader may find that it is as much fun to be an "armchair statistician" while reading Hooke as it is to be an "armchair field manager" while watching Yogi Berra.

Before summarizing, a reviewer must document his reading by a parade of errors. The reference on page 219, which is incomplete, appeared in the *Journal of the American Statistical Association*, LXI (1966), 658-96. Done.

In summary, this reviewer strongly recommends the book for actuaries as well as for students. In the Foreword, Mosteller reports that one author's "secretary told him, after finishing the typing of a revision, that she enjoyed it enormously. When asked what she especially liked, she said that she had finally found out what the work of the office was all about." With the addition of this book to the Part 2 Course of Reading, perhaps actuarial students will find out what that exam is all about.

DONALD A. JONES

Foster, G. T., et al., *IBNR: The Prize-winning Papers in the Boleslaw Monic Fund Competition Held in 1971*, pp. 132, Netherlands Reinsurance Group, Amsterdam, 1971.

The Netherlands Reinsurance Group sponsored a contest for papers to be submitted on the question of what scientific and quantitative methods can be used for determining the claims incurred but not reported (IBNR), but for reserve and underwriting purposes. The six prize-winning papers are collected in this volume.

The problem of determining the reserve for IBNR claims is a major one for the nonlife actuary, especially in reinsurance but also in direct business. The life insurance actuary meets the problem most severely in the area of health insurance.

The papers included in the volume are as follows:

1. "The Determination of IBNR Reserves and the Effect of IBNR on the Underwriting of Excess of Loss Business," by G. T. Foster.
2. "Liability IBNR Reserves," by T. W. Fowler.
3. "Treatment of Incurred but Not Reported Claims," by V. Harding.
4. "IBNR Methods for the Liability Excess of Loss Reinsurer," by C. K. Khury.
5. "Determining the IBNR," by D. Landin.
6. "On the Calculation of IBNR Reserves," by E. Straub.

Many of the papers are concerned with estimating IBNR reserves under a nonproportional reinsurance treaty. The time-lag feature in such a contract is exacerbated by the steep inflation of recent years. The problem essentially is to estimate the cost of future claims if the claim history is known, and *The ASTIN Bulletin* contains several papers applying risk-theoretic models to solving this question. Once the models are formulated, the problem of estimating the relevant parameters remains. Because normal trends are obscured by ran-

dom fluctuations, a straightforward mathematical approach is not generally feasible, and recourse must be had to sophisticated analytical techniques.

The papers are oriented to casualty problems. Although this reviewer is impressed by the sophistication of the papers and congratulates the contest judges on their choices, he feels that the techniques are less applicable to life insurance problems than to problems in liability insurance and certain catastrophe coverages.

PAUL MARKHAM KAHN

*F. J. McDiarmid, *Investing for a Financial Institution* (2d ed.), pp. 258, Life Office Management Association, New York, N.Y., 1972. \$7.00, \$6.50 for LOMA Member Companies.

The first edition of this book was published in 1961. Over the years, that book as well as the predecessor book *Investments of Life Insurance Companies in the United States and Canada*, which was published in the mid-1950's, played an important part in the education of many actuarial and F.L.M.I. students. Actuaries will recall with gratitude the clarity and the down-to-earth approach which the author brought to his task. In summary, the first edition was a concise and intelligent survey of the investment environment of the times.

In the light of the stature of that first edition, many readers may be disappointed with the second edition. It is to be regretted that a more fundamental recasting of the book could not have been undertaken. The chapter format has not been altered, and, indeed, lengthy sections have received little or no modification. As a consequence, such currently important topics as cash-flow management, real estate investment, and separate account investment management receive little or no attention.

Notwithstanding these deficiencies, the second edition will make an important contribution for anyone trying to acquire a basic understanding of the investment process of a life company. The pros and cons of various classes of investments are discussed, but this is not a "how-to-do-it" handbook. Rather, the concentration is upon the relative risks associated with each form of investment. For that reason, many of the lessons brought out in the book are no less timely and current today than they were in 1961, and the author does bring a valuable perspective to his subject.

DUNCAN R. WINHOLD

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 AND GRADUATION

Donald S. Grubbs, Jr., *Study of the Cost of Mandatory Vesting Provisions Proposed for Private Pension Plans*, pp. 92, prepared for the Senate Subcommittee on Labor, U.S. Government Printing Office, Washington, D.C., February, 1973.

This study was made to determine the range of estimated vesting costs resulting from several proposed minimum vesting standards. Seven pension plan populations were used as models. The measure used to ascertain the relative cost of vesting was the relationship between attained age normal cost for vested benefits and entry age normal cost for retirement benefits. For each of the seven populations the cost estimates were prepared for present employees under plans in which the accrued liability is fully funded or completely unfunded and for new employees.

The vesting cost estimates were derived under four benefit formulas (of the final average salary, career average salary, flat unit benefit updated annually for inflation, and flat unit benefit types). Costs were determined under four schedules of vesting: (1) Graded vesting with 30 per cent vesting after eight years of service and an additional vesting of 10 per cent a year thereafter; service prior to the effective date would be counted in determining eligibility for vesting, but benefits accrued based on such past service would not be vested. (2) A schedule like the first, except that all past-service benefits would also be subject to the vesting requirements. (3) A schedule like the first, except that past-service benefits for employees age 45 or over on the effective date of this vesting schedule would also be subject to the vesting requirements. (4) Fifty per cent of benefit vested when age plus service equals 50, with at least three years of service included in the total and with an additional 10 per cent for each of the following five years. The resulting vesting percentage would not apply to benefits accrued based on past service prior to the effective date. These new vesting schedules were compared with three present levels of vesting assumed to be in effect previously in each plan: none, moderate (after completion of fifteen years' service and at age 45), and liberal (full vesting after ten years of service).

Detailed tables show the following for each group: sex, hiring age, years of service, and salary distributions; original plan costs before modification of vesting; plan cost increases on account of new vesting; revised total plan costs (all as percentages of payroll); and vesting cost ratios (revised total costs divided by original costs). Termination rates for each group and sex are shown by hiring age and service, on a select and ultimate basis.

Howard E. Winklevoss, *Estimates of the Cost of Vesting in Pension Plans*, prepared for House of Representatives, General Subcommittee on Labor, pp. 49, U.S. Government Printing Office, Washington, D.C., February, 1973.

This study extends the author's 1972 analysis of vesting costs resulting from several proposed minimum vesting standards. (See review of *Analysis of Cost of Vesting in Retirement Plans* in *TSA*, XXIV, 501-3.) Six pension plan populations were used in conjunction with a computer simulation model to generate vesting cost estimates over a projection period of fifty years, assuming a population which is growing at a decreasing rate over the projection period. The measure used to ascertain the cost of adopting vesting for these plans was the percentage increase in their yearly contributions according to the entry age normal cost method. For each of the six groups the vesting cost estimates were developed for three assumed initial states of funding of the accrued liability: fully funded, completely unfunded, and

partially funded. The vesting cost estimates were derived under three benefit formulas (of the final average salary, career average salary, and flat unit benefit types) and three schedules of vesting: (1) full vesting in ten years (called F-10); (2) graded vesting with 30 per cent of accrued benefits vested in the eighth year and an additional 10 per cent for each of the following seven years (G-15); and (3) 50 per cent of accrued benefit vested when age plus service equals 50, with at least three years of service included in the total and with an additional 10 per cent for each of the following five years ("rule of 50," or R-50). The cost comparisons reflected the introduction for active employees of a fully retroactive vesting provision in a pension plan with no previous vesting whatsoever.

Comprehensive sets of tables summarize for each group its attained age/service and hiring age distributions and its termination rates. Other tables show the disability rates and salary scales assumed in the projections. Estimates for each group, benefit formula, and vesting provision display percentage increases in costs on account of vesting, both on an entry age basis and on the basis of total population. The population-based estimates are extended over fifty years of simulation and include costs for each initial funding state. Statistics on the population characteristics with respect to vesting are shown separately for all active, vested active, vested terminated, and retired employees. The report also analyzes briefly the relative costs of vesting under some other vesting provisions, providing full vesting at various durations of service, at various ages, according to a rule of 20 up to a rule of 80, or according to alternate combinations of age and service.

HEALTH INSURANCE

The National Center for Health Statistics publishes "Vital and Health Statistics," which consists of several series of reports, some of the more recently published of which may be of interest to actuaries. Several are digested below. To be placed on the mailing list for all items in the series, write to:

National Center for Health Statistics
U.S. Public Health Service
HEW Building South
Washington, D.C. 20025

U.S. National Center for Health Statistics, *Approximate Tests of Independence in Contingency Tables from Complex Stratified Cluster Samples*, pp. 14, Data Evaluation and Methods Research, Series 2, No. 53, Rockville, Md., March, 1973.

Several approximate tests based on half-sample estimates are proposed for testing hypotheses in contingency tables from complex stratified cluster samples. Monte Carlo methods are used to evaluate the power and expected significance level of each of these tests.

U.S. National Center for Health Statistics, *Quality Control and Measurement of Nonsampling Error in the Health Interview Survey*, pp. 53, Data Evaluation and Methods Research, Series 2, No. 54, Rockville, Md., March, 1973.

A report describing the selection and training of interviewers, an interviewer observation program, a reinterview program, measures of interviewer performance, the editing and coding of questionnaires, a response error study, and an interviewer variability study. The report is based on the Bureau of the Census experience with the Health Interview Survey.

U.S. National Center for Health Statistics, *Current Estimates from the Health Interview Survey, United States—1971*, pp. 69, Data from the National Health Survey, Series 10, No. 79, Rockville, Md., February, 1973.

Provisional estimates of incidence of acute conditions, number of persons reporting limitation of activity, number of persons injured, hospital discharges, persons with hospital episodes, disability days, and frequency of dental and physician visits. Based on data collected in the Health Interview Survey during 1971.

U.S. National Center for Health Statistics, *Prenatal-Postnatal Health Needs and Medical Care of Children, United States*, pp. 43, Data from the National Health Survey, Series 11, No. 125, Rockville, Md., April, 1973.

Extent and timing of prenatal medical care, condition at birth, health in infancy, extent of breast feeding, and health status at the time of the survey for children 6–11 years of age. Differentials are shown by family income, education of parent, race, and by region and rural areas.

U.S. National Center for Health Statistics, *Nursing Homes: Their Admission Policies, Admissions, and Discharges: United States April–September, 1968*, pp. 63, Data from the National Health Survey, Series 12, No. 16, Rockville, Md., December, 1972.

Statistics on number and types of nursing and related care homes according to admission policies, total admissions, admissions according to the former place of residence, total discharges, discharges alive and discharges due to death, rate of patient turnover, and length of patient stay. Based on data collected during the period of April–September, 1968.

U.S. National Center for Health Statistics, *Characteristics of Residents in Nursing and Personal Care Homes, United States June–August, 1969*, pp. 41, Data from the National Health Survey, Series 12, No. 19, Rockville, Md., February 1973.

Statistics on residents in nursing and personal care homes during June–August, 1969, by age, color, sex, and marital status. Based on data collected in a national survey of institutional establishments such as nursing homes, homes for the aged, and similar facilities.

U.S. National Center for Health Statistics, *Surgical Operations in Short-Stay Hospitals, United States—1968*, pp. 33, Data from the National Health Survey, Series 13, No. 11, Rockville, Md., January, 1973.

Statistics are presented on the volume and classes of surgical operations and procedures performed in short-stay hospitals, based on data abstracted from a national sample of records of inpatients discharged in 1968. Estimates of discharges with surgery and all-listed operations classified by surgical specialty and body site are distributed by size and regional location of the hospital and by age and sex of discharged patient.

U.S. National Center for Health Statistics, *Inpatient Utilization of Short-Stay Hospitals by Diagnosis, United States—1968*, pp. 76, Data from the National Health Survey, Series 13, No. 12, Rockville, Md., March, 1973.

Statistics are presented on the utilization of short-stay nonfederal hospitals, based on data abstracted by the Hospital Discharge Survey from a national sample of

hospital records of discharged inpatients. The number of discharges, discharge rates, and average length of stay are shown for categories of first-listed diagnoses, by demographic characteristics of inpatients and geographic region of hospitals. The number and per cent distribution of all-listed diagnoses are presented by age and sex. Some comparisons of the 1968 data with the 1965 data are made, to identify changes which have occurred in patterns of hospitalization under Medicare.

U.S. National Center for Health Statistics, *Average Length of Stay in Short-Stay Hospitals: Demographic Factors, United States—1968*, pp. 41, Data from the National Health Survey, Series 13, No. 13, Rockville, Md., April, 1973.

Statistics are presented on the utilization of short-stay hospitals, based on data collected in the Hospital Discharge Survey from a national sample of hospital records of discharged patients. Average length of stay is presented by patient characteristics of age, sex, marital status, and color and for patients with deliveries in conjunction with hospital characteristics of size, ownership or control, and geographic region in which located.

U.S. National Center for Health Statistics, *Infant Mortality Rates: Relationships with Mother's Reproductive History, United States*, pp. 56, Data from the National Vital Statistics System, Series 22, No. 15, Rockville, Md., April, 1973.

Statistics on infant mortality rates according to mother's previous reproductive experience, particularly whether she had had a previous child die in infancy or a fetal death and according to selected socioeconomic factors. Based on data collected by a questionnaire mailed to mothers of infants who had died. Samples selected from records of births and infant deaths in 1964, 1965, and 1966 which were transmitted to the National Center for Health Statistics.

U.S. National Center for Health Statistics, *Catalogue of Publications of the National Center for Health Statistics, 1972 Supplement*, pp. 33, Rockville, Md., May, 1973.

U.S. National Center for Health Statistics, *Current Listing and Topical Index to the Vital and Health Statistics Series, 1962-1972*, pp. 19, Rockville, Md., May, 1973.

SOCIAL SECURITY

Robert J. Myers, *Summary of the Provisions of the Old-Age Survivors and Disability Insurance System, the Hospital Insurance System and the Supplementary Medical Insurance System*, pp. 23, Mimeograph, July, 1973; free copies available from Mr. Myers at 9610 Wire Avenue, Silver Spring, Md. 20901. Noted in the *Actuary*, September, 1973.

Abraham Niessen, *New Actuarial Valuation of the Railroad Retirement System*, pp. 6, Actuarial Note No. 7-73, September, 1973, U.S. Railroad Retirement Board, Chicago, Ill.

This actuarial note summarizes the actuarial balances presented in the Twelfth Valuation of the Assets and Liabilities of the Railroad Retirement System. The valuation results are based on the 1972 social security and railroad retirement amendments, with estimates of the experience under the 1973 amendments to both

programs. All temporary benefit increases are assumed to be permanent. The actuarial deficit of the railroad retirement system is more than 6 per cent of payroll, with the deficit increasing to more than 8 per cent of payroll if the 1973 amendments are included.

OTHER TOPICS

Charles H. Cissley and Jean Barnes, *EDP Systems and Applications in Life Insurance*, pp. 143, Life Office Management Association, New York, N.Y. 1972, \$9.00, \$8.00 for LOMA Member Companies. Reviewed in the *Actuary*, September, 1973.

REVIEWS FROM "THE JOURNAL OF THE INSTITUTE OF ACTUARIES"

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G. Clayton, *British Insurance*, pp. 381, Elek Books, London, 1971, £6.50.

Report of the Tribunal Appointed to Inquire into Certain Issues in Relation to the Circumstances Leading up to the Cessation of Trading by the Vehicle and General Insurance Company Limited, pp. vii, 187, H.M. Stationery Office, London, 1972, £1.20.

Eric Chalmers, *International Interest Rate War*, pp. 260, Macmillan & Co., London, 1972, £4.95.

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James C. van Horne, *Function and Analysis of Capital Market Rates*, pp. x, 180, Prentice-Hall, Inc., Englewood Cliffs, N.J., 1970, £4.00.

E. L. Farness, *An Introduction to Financial Economics*, pp. xi, 275, Heinemann, London, 1972, £2.00.

J. E. Wadsworth (ed.), *The Banks and the Monetary System in the U.K., 1959-1971*, pp. x, 427, Methuen & Co., London, 1973, £5.90.

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