



SOCIETY OF ACTUARIES

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## DECISIONS UNDER UNCERTAINTY

by E. A. Lew

The fourth actuarial research conference, centering on the "Analysis of Decisions Under Uncertainty," was held in Boston Nov. 20-22, under the sponsorship of the Society's Committee on Research and the corresponding group in the Casualty Actuarial Society.

The field of inquiry for the conference combined a number of related topics such as decision theory, utility theory, subjective probabilities, and Bayesian inference, leading to a formal approach for making business decisions. There is little doubt in the minds of those who took part that this type of approach can be highly serviceable in tackling a variety of problems in life and casualty insurance.

The 92 persons who attended were fortunate to have the key notions in the "Analysis of Decisions Under Uncertainty" expounded by Professors Howard Raiffa and Robert Schlaifer of the Graduate School of Public Administration at Harvard. These two distinguished scholars have collaborated for a number of years to establish rigorous foundations for an analytical procedure to produce decisions consistent with a businessman's basic judgments and preferences. Professor Raiffa's book *Decision Analysis: Introductory Lectures on Choices Under Uncertainty*, published by Addison Wesley in 1968, was the sole prescribed reading for the conference.

During the first two sessions, Professors Raiffa and Schlaifer reviewed the subject in broad terms; their incisive comment on the construction of decision trees, assessment of preferences and probabilities, and evaluation of different strategies provided valuable insights for

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## TWENTY YEARS AFTER

*Editor's Note: At the Boston meeting (November 1969) the first 20 years of the Society's history were recognized by a dinner honoring the Past Presidents. E. J. Moorhead, now the President, to the delight of the audience if not to the discomfiture of the guests, briefly delineated the history of each President. E. M. McConney, who was the first President of the Society (and whose two Presidential addresses are well worth reading), replied on behalf of the guests. We are privileged and delighted to print his reply.*

by E. M. McConney

On behalf of the Past Presidents I thank you for your generous and witty remarks about us. It brought to mind the little girl who was strolling with her father through a cemetery and as she read the epitaphs said: "Daddy where are the bad ones?"

On an anniversary one is supposed to look backwards and then forward at the risk of a crick in the neck. I will be brief but not quite as brief as the Chinese poet who, on awakening, wrote an ode to his mistress in two words:

Dawn  
Gone.

Almost 50 years ago I attended my first meeting of the old Actuarial Society at the Astor in New York. It would now seem very strange if we could show it on film. There was an "establishment," of course—Hunter, Henderson, Hutcheson, both Craigs, Rhodes—and they always sat in the front row—rather frightening for the speaker. Some things have not changed—the students complained that the examiners were groovy on graduation and the examiners complained that

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## THE GRADUATE

by Julie C. Stenlund\*

Guest speaker at the December, 1969, meeting of the Actuaries Club of Des Moines was James J. Chastain, Alumni Professor of Insurance, Drake University College of Business Administration. His address was titled "On the Care and Feeding of the College Graduate."

Professor Chastain began by proposing that college recruiting for the insurance as well as for other industries is a game people play, a collegiate "Let's Make a Deal." In meeting today's graduates, the college recruiter must present his case with particular emphasis on those aspects of the business world of primary concern to the graduate. He must anticipate the graduate's demands and be prepared to meet them.

When the recruiter has been successful in selling his "product," and his company has the new graduate firmly in tow, the second stage of the game begins. Now, the employer must chart a course for the graduate that will be simultaneously stimulating, interesting, and challenging, or run the risk of losing him to another employer promising all this and more.

Professor Chastain immediately involved his listeners by some "audience participation." He distributed copies of two lists of phrases entitled: "The College Graduate:" "How to Turn Him On" and "How to Turn Him off." These phrases had been prepared by a researcher and college professor closely connected with the phenomena of college recruiting, and they reflect the views of recruiters from many industries as well as those of present students and recent graduates.

\*Miss Stenlund is a Student of the Society.

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## Decisions Under Uncertainty

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those who had read the Raiffa book carefully. The following half-day, they covered a few more complex issues, fielded a variety of questions, and received a resounding acclamation before being set free for a late lunch.

The rest of the conference was devoted to four actuarial papers presenting applications of the Raiffa-Schlaifer approach to decision making in life and casualty insurance.

Professor Donald Jones of the University of Michigan opened this part of the proceedings with a paper on "An Analysis of the Use of Inspection Reports." He followed closely the methodology of the basic problem in Raiffa's textbook, and showed how it could be used to fix on the inspection reports to be ordered under different circumstances. In the opinion of Messrs. Lew and Shellard, who discussed the Jones paper, the rationale outlined by Jones constitutes a worthwhile refinement of the procedures currently used.

Professor Karl Borch of the Norwegian School of Economics and Business Administration at Bergen read a paper on the "Dynamic Aspects of Decisions Under Uncertainty." Professor Borch has given a great deal of thought to the applications of decision theory in the insurance business, beginning with relatively simple situations where the mortality or casualty risk was the dominant element and proceeding to the complexities of the life insurance business today. In his conference paper, he again forcefully raised the crucial issue of defining insurance company objectives more explicitly, so that important decisions in the business might be made with all of the objectives clearly in mind. Paul Kahn, Professor Cecil Nesbitt, and John Woody discussed Professor Borch's paper.

Charles Hewitt, Jr., reported on applications of decision theory in the underwriting of fire insurance risks. His paper, "Pro-rata Acceptance of Large Property Lines," offered several convincing illustrations of how the logical apparatus of utility theory and decision analysis can be used to determine the proportion of a large risk which is optimal for retention by a casualty company. He went on to describe a time-sharing computer system which his company is

developing to automate certain kinds of underwriting decisions, based on the kind of reasoning structured by Raiffa and Schlaifer. Important sidelights on this exciting development were discussed by Jeffrey Lange, James McGinnitie, and Dale Nelson.

The conference was brought to a close with a major contribution by Professors James Hickman and Robert Miller (of the University of Wisconsin) entitled, "Insurance Premiums and Decision Analysis." Although opinions have been voiced to the effect that there is little practical need for bringing decision theory into premium calculations, the authors of this stimulating paper try to show that decision theory can be included with some advantage in the determination of life insurance premiums not only to reflect the influence of factors such as competition, demand, and customer preference, but also in situations where policyholders exercise choices with respect to dividends, nonforfeiture values, and settlement options.

Professor John Beekman of Ball State University observed in discussing this paper that it was an enormous undertaking to advocate a new approach to the determination of life insurance premiums after some 200 years of established practice.

It is planned to have copies of the proceedings of the conference available in June. Those desiring such copies should write to D. G. Halmstad, Secretary of the Committee on Research, 1 Madison Avenue, New York, N. Y. 10010. □

## SOCIAL SECURITY NOTES

Robert J. Myers, *Hospital Utilization and Average Daily Hospital Costs for Persons Aged 65 and Over as Indicated by Data Under the Hospital Insurance Program and From the American Hospital Association*, Actuarial Note No. 61, pp. 4, Social Security Administration, Washington, September 1969.

This note compares certain experience data for HI with those obtained from AHA records. Utilization rates (hospital days per person per year) were somewhat higher for HI but average daily costs were lower. For calendar year 1968, the HI utilization rate was 4.03 versus 3.88 for AHA, but the HI average daily cost was \$48.60 versus \$65.30 for AHA. The note also comments on the comparability of the two sets of data.

Copies may be obtained gratis from Robert J. Myers, Chief Actuary, Social Security Administration, Washington, D.C. 20201.

## PLAYING THE MARKET

Richard A. Brealey, *An Introduction to Risk and Return from Common Stocks*, pp. 150, MIT Press, Cambridge, Mass., (1969), \$5.95.

by C. L. Trowbridge

This small volume is a description of the stock market, as seen through the eyes of the statistician. Its author is a former M.I.T. faculty member now connected with the Keystone family of mutual funds. The actuary whose interest in stock market performance has been whetted by equity product development will enjoy Mr. Brealey's documentation of certain hypotheses which seem to fly in the face of the conventional wisdom.

The first hypothesis is that stock price changes over time behave very much like a random variable. This implies that the market change in any time period is essentially independent of stock price history, and that the patterns chartists see in price level graphs are optical illusions. This randomness of price level changes is not claimed by the author to be his own discovery. Actuaries will recognize that it is the assumption behind the recent *TSA* papers of DiPaolo and Turner, and is discussed by Paul Jackson in a book review in *TSA XXI*.

A second hypothesis is that changes in per share earnings over time also behave like a random variable. If true, the past record of earnings growth in itself tells little about the future. Fundamental analysis will perhaps identify companies with good earnings growth potential, but Mr. Brealey leads us to believe that an extrapolation of past earnings growth is meaningless.

This book provides considerable documentation for other concepts as well. Risk (as measured by the variability of price change) has its reward. Volatility or stability characteristics of particular stocks persist over time. The performance of some stocks is highly correlated with the averages, but others are almost independent thereof. The number of stocks needed to get good diversification is not much more than 20. The proportion of price-earnings-ratio differences that can be accounted for by differences in forecast rates of earnings growth is in the neighborhood of one-half.

For an evening of not-too-difficult reading, yet with challenge to both the statistician and the professional investor, this book is recommended. □