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# Some Directions for Actuarial Research

by Cecil J. Nesbitt

For many years, and in various capacities, I have had the opportunity to consider and to react to actuarial research. Drawing on this experience, I shall indicate a few of the directions which invite actuarial research in the near future. For this purpose, it is convenient to classify actuarial research under three headings: 1) Experience Studies; 2) Theory; and 3) Practice.

## Experience Studies

These are concerned with the estimation of rates to be used in actuarial financial models. Similar to population studies, but unlike clinical studies, the data are much more numerous and much less controlled. Usually, these rates relate to decrements, but there are also rates of growth.

In life insurance, mortality rates are needed for various categories of insureds. Rates may be in terms of lives, policies (or amounts of insurance), or of annuity incomes. The immediate aim is to determine current rates, but the ultimate objectives may be loaded and projected rates. Lapse rates and rates of disability incidence and termination may be considered. Economic factors, such as rates of investment return and of inflation, are of major importance.

Many of these same rates are studied from a different perspective for actuarial analyses of pensions. Rates of salary growth and of retirement from service are additional elements. Covered lives, either active or retired, are the primary units of observation.

For Social Security and other national purposes, current and projected mortality rates based on population data are the starting point for actuarial projections of benefit outgo and tax income. But many other demographic, economic, and programmatic factors must be studied. For example, the distribution of population by marital status, average real wages, labor force, and covered workers must be considered.

Non-life insurance, with its studies of claim frequency and of claim distributions, may come closer to statistical estimation theory. But, again there are many special features.

Simultaneously, a number of developments are impinging on experience studies. More of the SOA's studies are being compiled through the centralized facilities of the Medical Information Bureau. This opens new opportunities for the submission of seriatim data and for the more flexible data base and analysis methods resulting therefrom. At the same time, electronic transfer of data is being pursued in the various stages of submission, analysis, and publication. These developments bring in new problems of data editing, control, and analysis. There may also be opportunity for separate study of claim frequency and claim amount for individual lives.

One consequence is that a considerable portion of the actuarial education materials relating to the estimation of basic rates may be out of touch with developing methodology. There is a real need for a critical review of 1) the objectives of various experience studies; 2) the nature and dynamic character of the observed data; and 3) the computer-based methodology of data assembly, analysis, and publication. This is hard, applied research for some skilled and experienced actuaries.

An historical 1915-85 Review of Mortality and Morbidity Studies is being evaluated as a possible project to be encouraged. The time span covers two World Wars; the influenza epidemic; the 1929 Financial Crash and subsequent Depression; the growth of group insurance; Social Security and pension funds; the discovery of antibiotics; the development of nuclear weapons and power; the ongoing computer revolution; and entry into the Space Age. It would be a very large panorama to survey. One purpose would be to evaluate the contributions of past experience studies toward furnishing the basic information for insurance operations. Another would be to gain insight into how mortality and morbidity respond to economic and political stresses. A third would be to record progress in study methodology. A fourth would be to record improvement in the survival and health of the insured

population. The Research Policy Committee of the Society of Actuaries thought such a study would be more meaningful if based on population data, but to my mind there is merit in reviewing the methodology and results pertaining to insured lives in past years.

The foregoing reviews are somewhat in line with the report of a recent Task Force on the Expansion of Mortality and Morbidity Studies. The recommendations of the Task Force included:

- Expansion of the Society's volunteer and staff research efforts.
- Increased funding of actuarial research.
- Consideration of university-based actuarial research centers.
- Establishment of a "Surveillance Team" to identify information and data sources of interest to actuaries.
- Conducting symposia on mortality and morbidity and related topics.

One modern-day factor which has not been taken into account in the projections from experience studies is what shall be discussed elsewhere under the topic of nuclear holocaust hazard. Another factor which is of increasing concern is the AIDS epidemic.

## Theory

The new textbook, *Actuarial Mathematics*, integrates individual and collective risk theory into the mathematics of life insurance, life annuities, and pensions. It draws on more than a century of actuarial research, including some recent developments such as variable life insurance and annuities. Also forthcoming is a more extensive treatise on the application of insurance risk theory, tentatively entitled "Insurance Risk Models."

A catalyst for theory research is the Society's Committee on Research on Theory and Applications. This Committee prepares a recommendation for award of the annual Halmstad Prize for a leading actuarial research paper in a publication year. The 1982 and 1983 Halmstad Prizes were

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awarded to an Australian and a Swedish actuary, respectively, for papers on control theory. This appears to be a promising direction for insurance research.

The Committee also organizes the annual Actuarial Research Conferences. An objective of the 1986 Conference (which will be reported in *ARCH*) was to enlist academic actuaries for the development of sound, theoretical foundations for the findings of the Committee on Valuation and Related Matters. It was indicated that academic members might be helpful in reviewing statistical work, in applying collective risk theory and, in general, consolidating and clarifying key concepts. Related to this are three monographs on theory of finance developments for actuarial audiences. Other actuaries, through papers and texts, are contributing to the mathematical theory of investment.

Other signs of increased research in actuarial theory are the varied proposals received for the AERF Annual Grants Competition and the substantial distribution of research working papers, particularly by members from the University of Waterloo. This, wittingly or not, realizes a suggestion made by Professor Jan Hoem at the 1976 International Congress of Actuaries in Switzerland to air ideas by such means.

**Practice**

Properly, there should be no hard and fast line between theory and practice, and some of the preceding section has touched on practice. Here also, the line will not be drawn sharply.

Various forces have led to the concepts of the valuation actuary and of standards of practice. To provide some framework for the latter, the Society now has an exposure draft of valuation principles. A more detailed structure has been suggested by James C. Hickman in a memorandum discussing the need for a monograph on the foundations of actuarial science. It is his thought that, if standards of actuarial practice are to be consistent, they must have a coherent, intellectual foundation. The preparation for and writing of such a monograph would be a major undertaking for some individual(s). The scope of the monograph, taken from a tentative outline, includes: economics of risk; time value of money; random variables; individual insurance models; collective vs. individual balance; and classification.

Anyone interested in further details about this proposed monograph might get in touch with James Hickman or myself.

Actuarial theory and practice for U.S. Social Security (which comprises such a significant national program of income and medical benefits) challenges the interest of a number of actuaries. This area has been reviewed for the Old-Age, Survivors and Disability Insurance Program in the recently published monograph by Professors George Andrews and John Beekman. An addendum indicates topics for further study. Two areas stand out as needing research, namely, Short-Range Projections and Medicare Programs. These require demographic, economic, and medical research insights as well as actuarial research skills. There is opportunity here for research of great import for the well-being of the people of the United States.

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### **Nonroutine Actions of the Board of Governors, October 17-18, 1987 Montreal, Quebec, Canada**

1. On October 17, the Board discussed a draft report of the Standards Organizing Committee and approved its recommendations. The report suggests that an Actuarial Standards Board be set up during 1988 as a section of the American Academy of Actuaries in a manner that would leave it independent with respect to setting standards. It would be supported by separate dues from Academy members. The members of the Actuarial Standards Board would be nine in number and would be appointed to three-year terms by a selection committee consisting of the presidents and presidents-elect of the Conference of Actuaries in Public Practice, the Casualty Actuarial Society, the Society of Actuaries and the American Academy of Actuaries. The implementation of the proposal will require action by the Academy.
2. On October 17, the Board accepted the recommendations in the 1987 Report of the Joint Committee on the Role of the Valuation Actuary in the United States. In doing so, it authorized the Joint Committee to

assist other groups that are dealing with various aspects of the development of the role of the valuation actuary.

3. The Task Force on Mutual Life Insurance Company Conversion sent out its report for comments in May 1987. The Executive Committee resolved at its meeting on September 10 to recommend that the Board authorize the Task Force to issue the report as an expression of opinion of the Task Force and to distribute that report to all interested parties. The Board did so on October 17.

4. The survey on Future Education Methods (FEM) proposals had produced returns from 2,300 people from a universe of about 16,000. The responses were reviewed carefully by the members of the Board of Governors, who wish to express their gratitude to those members who responded. The Board took the following actions at its meeting on October 17:

- (a) Reaffirmed that the first priority of the E & E Committee should be to complete the implementation of FES for the November 1988 exams;

- (b) Instructed the E & E Committee to proceed to implement the FEM proposals other than college credit and to conduct a limited experiment to determine the value of the college credit proposal. In this experiment, credit would be allowed for college courses dealing with applied statistics, numerical methods and operations research, provided college and course had been approved — that is, "level 2" college credit in the terms of the White Paper on FEM that had been distributed earlier this year.

5. At its October 18 meeting, the Board approved a proposed budget for the Society of Actuaries for the fiscal year 1987-88.

6. On October 18, the Board approved a proposal to assist in establishing an actuarial science program at Nankai University, in the People's Republic of China in 1988. The assistance would consist of providing seven instructors to teach fundamental actuarial principles for a series of courses that would run about three weeks. The Board also approved reimbursing Dr. Kailin Tuan, a professor at Temple University, for expenses he would incur in helping make the needed arrangements with the Chinese government.  
Richard V. Minck  
Secretary