
Milestone Ideas: Marking Fifty Years

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One-half century is a blink of an age in geology but in the domain of designing and managing financial security systems it is an epoch. As part of the celebration of its Golden Anniversary, the Society of Actuaries presents this monograph of significant papers published by Society of Actuaries-sponsored research publications over the past fifty years.

Many individuals contributed to the selection process; it is self-evident that all the good advice could not be adopted. As the selection process evolved, the concepts of “best” or “most significant” were found difficult to define. A pragmatic compromise was required. That compromise resulted in the selection of seven important papers representing some of the main practice areas for actuaries, with publication dates scattered over the fifty-year period and which clearly influenced actuarial thought and practice. In the process of developing this collection, the team working on the project came to call this the “golden oldies monograph.” The informal title captures the spirit of the project. We hope you share this spirit.

To guide your reading, a few introductory statements will be made about each paper. These statements are probably unnecessary, for each selected paper is well written and self-contained.

1. Jenkins, W. A., and Lew, E. A. 1949. “A New Mortality Basis for Annuities,” *Transactions of the Society of Actuaries* I:369-468.

William M. Rae, in his discussion of this paper, called it a “monumental masterpiece.” Even if Rae was wrong in his evaluation, this paper would deserve consideration for inclusion in a collection of milestones in the history of the Society of Actuaries. It appeared in the first volume of the new publication *Transactions of the Society of Actuaries*, and it was written by authors who were to become presidents of the SOA, Jenkins in 1961-62 and Lew in 1973-74.

Rae was not wrong; the paper was, and after fifty years remains, important. Section V, hardly one-quarter of the way through the paper, contains a description of

the Annuity Table for 1949, which in fact consisted of separate tables for females and males. Most of the remainder of the paper discusses mortality projection. There are elaborate analyses of time trends in insurance and population mortality. Informed opinions about the future path of mortality from actuaries, demographers, and public health specialists are elicited. The cases for generation and year-of-exposure projection methods are presented and analyzed. After fifty years, this paper continues to provide a foundation for those who analyze and project mortality.

Readers who entered actuarial practice after 1970 may be somewhat annoyed by the many pages in the paper, and in the discussions, devoted to the computational task of working with year-of-exposure mortality projection factors. If the annoyance leads to an appreciation of the flexibility permitted in actuarial practice by modern computing, the result will be salutary.

2. Trowbridge, C.L. 1952. “Fundamentals of Pension Funding,” *Transactions of the Society of Actuaries* IV:17-43.

This classic paper appeared in the early years of the rapid growth of the pension movement and has provided a framework for discussing funding methods ever since. Before the publication of this paper, actuarial literature contained many papers on valuing complicated benefits. There had been earlier papers on pension budgeting plans, but none had provided a general model for further developments. In the United States, pension practitioners previously had only the “Bulletin on Section 23(p)” published by the Treasury Department. The bulletin was sketchy and had a narrow focus. The model introduced by Trowbridge has been expanded in many directions in the 47 years since its publication. The stationary population and unit annual benefits assumptions have been modified and some elements of the model have been made stochastic rather than deterministic. Nevertheless, this 1952 paper remains the place to start the study of pension funding methods.

When the paper was written, and during most of his actuarial career, Trowbridge was with the Bankers Life Company, now the Principal Financial Group. He served as President of the Society of Actuaries in 1974-75.

3. Anderson, J.C.H. 1959. "Gross Premium Calculations and Profit Measurement for Nonparticipating Insurance," *Transactions of the Society of Actuaries* XI:357-94.

Students of the history of computing will be able to date this paper by its reference to the IBM 650. But this paper is not about computing, despite the appearance of formulas and tables. In the second paragraph of the paper Anderson states six purposes. It was the second of these purposes that makes this an enduring contribution to actuarial literature: "To suggest criteria for measuring contingency and profit margins and introducing these items into the calculation of premium rates." Forty years after the publication of Anderson's paper, his suggestion that contingency and profit loadings be thought of as rates remains relevant. In addition, these rates should vary with the type of risk assumed and, in the case of profit loadings, should be related to the amount of surplus that must be invested to acquire the stream of profit generated by the insurance business. Today these ideas would be taken as self-evident by pricing actuaries and managers in other industries setting prices. Yet in 1959 they were novel and they constituted a significant contribution to theory of premium determination.

This paper won the Triennial Prize for 1959-61. At the time the paper was written, Anderson was with the actuarial consulting firm of Bowles, Andrews and Towne. He went on to a distinguished career in actuarial consulting and insurance management.

4. Fraser, J.C., Miller W.N., and Sternhell, C.M. 1969. "Analysis of Basic Actuarial Theory for Fixed Premium Variable Benefit Life Insurance," *Transactions of the Society of Actuaries* XXI:343-78.

This paper was associated with a flood of papers and discussions on variable benefit life insurance and variable annuities. In the 1969 volume of the *Transactions*, pages 343 through 562 are devoted to papers and discussions of these topics. Clearly, in 1969 the time had come for an in-depth discussion of life insurance with benefits related to the performance of a supporting investment fund. Usually the fund would be largely invested in equities. Although the paper by Fraser, Miller, and Sternhell was not the first on the topic, it

clearly established the framework for subsequent developments of variable products. The 79 pages of discussion that the paper elicited clearly indicate that several other actuaries had thought deeply about the design issues inherent in variable benefit life insurance.

At the time the paper was presented the authors were with the New York Life Insurance Company. Indeed, the design they presented in the paper became known as the New York Life design.

5. Bluhm, W.F. 1982. "Cumulative Antiselection Theory," *Transactions of the Society of Actuaries* XXXIV:215-31.

The analysis of the financial experience of mature blocks of individual health insurance policies often reveals a steady and seemingly irreversible increase in loss ratios as time advances. This phenomenon can be explained by durational antiselection—that is, the increased propensity of healthy lives to lapse. This observation has been made by many, but Bluhm constructs a model of this antiselection activity that he then uses to explain the deterioration of loss ratios over time and to quantify the cumulative effect of antiselection.

The paper was awarded the 1980-82 Triennial Prize. At the time the paper was written Bluhm was with the New York State Insurance Department. He has continued his research into antiselection in health insurance.

6. Stiefel, J.D. 1984. "The Guaranteed Investment Contract (GIC)," *Transactions of the Society of Actuaries* XXXVI:527-63.

This paper is somewhat different from the others in this monograph. Its objective is education rather than research. The reader will be rewarded with a plethora of information about GICs, the problems they pose for the companies that issue them, and the tools available to manage these problems. The value of the paper is enhanced by Sections III and IV, where the history of the evolution of group pension products from 1959 to 1984 is traced. This business history in and of itself justifies including this paper as a milestone.

The paper received considerable recognition, including the 1984-85 Annual Prize, and the L. Ronald Hill Memorial Prize in 1985. At the time this paper was written, Stiefel was with Aetna Life and Casualty.

7. Tilley, J.A. 1992. "An Actuarial Layman's Guide to Building Stochastic Interest Rate Generators," *Transactions of the Society of Actuaries* XLIV:563-92.

It is now a cliché to say that financial economics has undergone an intellectual revolution since about 1950 and that this revolution has had a profound impact on

actuarial practice. But the cliché is true, and that fact compels a response in the basic and continuing actuarial education systems. Although many actuaries will not be required to master the theory of pricing exotic financial options, future interest rates enter almost all actuarial models. Therefore, the construction of stochastic interest rate generators as a component of a comprehensive stochastic actuarial model of a financial security system has become an assignment for actuaries in most fields of practice. The descriptive title of this paper has assured it a wide readership. Section 2 provides an introduction to the economics and nomenclature of the yield curve and term structure of interest rates. Section 4 covers three

very important, but difficult, concepts: riskless arbitrage, complete markets, and the risk-neutral world. These sections are important to actuarial readers even if they do not continue on to Section 5, on constructing an interest rate generator, where the ideas all come together to accomplish the goal stated in the title.

This paper won the Annual Prize for 1992-93 and the Halmstad Prize for 1992. The author was with Morgan Stanley at the time this paper was written.

We wish happy birthday to the Society of Actuaries, and to each reader a pleasant journey along the path of fifty years of actuarial ideas marked by the milestones in this monograph.