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ARBOR VITAE?

by Frederic Seltzer

A discriminating cluster of actuaries distributed throughout the United States and Canada with an outlier from England gathered together from September 2 to September 4 at the University of Michigan, Ann Arbor, for the Eleventh Annual Actuarial Research Conference.

Crowded together in the front rows of an auditorium in the Modern Languages' Building, William A. Ericson, Chairman of the Department of Statistics, welcomed the conferees. John A. Hartigan of Yale University led off with an overview of significant papers in the historical development of clustering. After queuing for coffee and doughnuts, he continued with a fascinating exposition of clustering algorithms finally leading us through the forest of "k means" and "single linkage" to the "minimum spanning tree." Phelm P. Boyle from the University of British Columbia closed the morning by taking us over the "Black-Scholes" of European call options into the absorbing barrier of the Cox Family by applying stochastic processes to financial problems. Our appetites whetted, we proceeded to lunch at the Michigan League.

Aa robustt add hogg talkk byy Robert V. Hogg off thee Universityy off Iowaa onn discriminationn functionss openedd thee afternoonn sessionn andd endedd withh aa revieww off rankk approachess. Bob was followed by William H. Du Mouchel of the University of Michigan. He reported on his findings with a data set supplied by LIMRA using logit regression compared with discriminant analysis and ordinary least squares. Carol C. Shall of Peat, Marwick, Mitchell and Co. closed the session with a practical example of using discriminant

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THE 1976 OASDI TRUSTEES REPORT LOOKS AT THE FUTURE

by E. J. Moorhead

The "1976 Annual Reports of the Board of Trustees of the Federal Old-Age and Survivors Insurance and Disability Insurance Trust Funds, of the Federal Hospital and Insurance Trust Fund, and of the Federal Supplementary Medical Insurance Trust Fund" will be reviewed in the Transactions.

The annual Social Security Trustees Reports — heavily the product of the Office of The Actuary — contains much of interest and value to actuaries who practice outside the realm of social insurance. The OASDI estimates cover an exceptionally long period (75 years) and employ economic and demographic factors that are of significance in non-governmental insurance and pensions. This article is not a review of the 1976 OASDI Report; it is a description with comments of some of these economic and demographic forecasts.

Estimates Of Growth In National Average Wages and In The Consumer Price Index

The following table shows the historical, current, and estimated annual increases in (a) average wages of this country's workers, (b) the Consumer Price Index, and (c) the excess of (a) over (b) which can be considered an approximation to the growth of real wages.

	Percentage Increase Over Preceding Year In —		
	(a) *National Avge. Wage*	(b) *Consumer Price Index*	(c) *"Real" Wage Growth*: (a) − (b)
Avge. 1948-1953	5.5%	2.2%	3.3%
" 1953-1958	3.6	1.5	2.1
" 1958-1963	3.4	1.2	2.2
" 1963-1968	4.9	2.6	2.3
" 1968-1973	5.9	5.0	0.9
Year 1974	6.5	11.0	− 4.5
" 1975 (prelim.)	6.8	9.1	− 2.3
Estimate 1978	8.9 to 9.6	5.5 to 6.5	2.4 to 4.1
" 1981	6.6 to 6.8	4.0 to 5.0	1.6 to 2.8
" 1982 - 2050	5.25 to 6.25	3.0 to 5.0	1.25 to 2.25

The reader will see that real wage growth, as here defined, settled down soon after World War II to a remarkably steady performance of more than 2% a year until it was eroded by the stepped-up pace of inflation that began to afflict us in the middle 1960's. The SSA forecast foresees prompt emergence from the recent spate of negative wage growth but regards a future growth rate below 2% as more likely than a matching of that past performance. The assumptions used for future CPI suggest adherence to the view that we shall not return to the days of an American dollar of stable purchasing power.

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Fertility Rates — Historical, Current, and Assumed

1950	1955	1960	1965		
3.0	3.5	3.6	2.9		
1970	1975*	1977	*Ultimate*		
			Alt. I	2.3	
2.4	1.8	1.75	Alt. II	1.9	
			Alt. III	1.7	

*preliminary figure.

The SSA forecasters believe that the recent abrupt decline in fertility is soon to be succeeded by either a levelling off or a modest rise, but that a return to the fertility level of even 1970 is not to be counted upon. They seem to be giving odds of two-to-one that the fertility rate will stay below the 2.1 level that defines an eventual stable population.

What Are Forecasts Worth?

In view of the imponderables and the demonstrated fallibility of human predictions even when made by actuaries, are these figures worth the paper they are printed on? This observer's answer is "Yes," *provided* it is stressed that their point is in showing relationships rather than absolute values, also to test the reasonableness of benefit formulas in social insurance (or in private pensions). Actuaries and other readers should perhaps challenge the wisdom of assertions in the Report such as on p. 43 that the figures express "the general range in which the cost estimates might reasonably be expected to fall." Wording such as the following, on the same page, saying that "it is *not unlikely* (emphasis added) that actual experience will depart significantly from any particular path which may be postulated" seems too strong and unharmonious with warnings given elsewhere in the same Report.

Whether or not such carping about wordings is justified, this reader contends that Mr. A. Haeworth Robertson (whose first Reports these are since he became Chief Actuary of SSA) and his admirable colleagues in the Office of The Actuary have done themselves proud in these Reports. Actuaries should not overlook the informal but valuable Commentary that Mr. Robertson issued with the Reports.

The implications of the trends examined in the forecasts upon the social, economic and political future of this country are broad. The Commentary wisely utters the following sentiment on this point:

> ". . . in some cases the assumptions produce results so different from the current situation that attention should be directed toward (their) overall implications. . . . For example, . . . if the population composition should change in accordance with these assumptions, it is likely to result in substantial changes in many of the nation's social and economic arrangements." □

ARCH

Issue 1976.1

Moments for a Modified Makeham's Law of Mortality, R. Clifton Bailey

An APL Algorithm for the Incomplete Gamma Function, Frank D. Cavallito

Approximate Solution of an Actuarial Equation in Its Steady State, David Dorigo

On the Foundations of Moving-Weighted Average Graduation Methods, Rolando Sobalvarro

Blood Type and Mortality Rates, C. David Williams, IV
Charles D. Williams, III, F.S.A.

The issue also includes the *Letters to the Editor, Problems and Solutions* and a bibliography of recent articles and publications.

Subscriptions may still be sent to David G. Halmstad, P. O. Box 124, Ridgefield, Conn. 06877. □

Death

W. Warren Yeager

Arbor Vitae?

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analysis to minimize costs in the underwriting of individual disability income insurance.

The next morning John A. Hartigan rescued us from "minimum spanning trees" where he had left us earlier by leading us out of the forest through a maze of special clustering techniques by reducing the data in our path with graphical techniques. Richard Ziock of the University of Iowa tried to predict who among a large insurance company's policyholders would convert their individual term policies or purchase new life or health policies. The morning session closed with an application of economic modelling to a workman's compensation problem presented by Jan A. Lommelle of Aetna Life and Casualty.

After lunch our dessert was a canonical correlation applied to Buyer Study data by Robert Miller, formerly of LIMRA. He was followed by Joseph Brzezinski of LIMRA who introduced us to "Pedoe" expense analysis using stepwise regression with ridge factor adjustments to construct a formula to predict intercompany expenses based upon annual statement values. The afternoon continued with Robert F. Ling of Clemson University who introduced us to an array of graphic aids in cluster analysis. The survivors of the session were then treated to a bonus when Stefan Peters of the Massachusetts Division of Insurance described a system used to classify driver risks in Massachusetts.

A glorious Saturday dawned at Ann Arbor but deep in the recesses of the University of Michigan the actuaries, loyal to their tasks, carried on. Frank M. Andrews of the Institute for Social Research showed us how to analyze data using AID and MCA and Charles Hachemeister, overcoming a bad cold, told us something about "The Stanford Research Institute Study on Insurance Rating." The meeting was closed with the discriminating insight of James C. Hickman who succinctly clustered the thoughts of all our speakers in a graphic algorithm we all could understand. □