ARTICLES, PAPERS AND PUBLICATIONS OF ACTUARIAL INTEREST

JOURNAL OF ROYAL STATISTICAL SOCIETY
Series 'A', **147** (1984)

EL-SAYED NOUR, SUCHINDRAN. C.M. *Multi-state mortality by cause of death: a life table analysis.* The multi-state life table is presented as a discontinuous Markov process with n absorbing and m non-absorbing states such that $n \geqslant 1$ and $m \geqslant 1$. The computational formulae for the various life table functions are given under the Markovian assumption—this assumption permits the construction of life tables from the type of demographic data that are usually available viz. decremental rates. The model is used to describe cause-specific mortality in relation to various factors. The analysis of marital status mortality by cause of death for North Carolina females is given as an illustrative example.

Series 'A', **148** (1985)

Projections of Student Numbers in Higher Education—R.S.S. Working Party Report, introductory papers and general discussion. The Ordinary Meeting of 9 November 1984 had as its subject the Report of the Working Party on Projections of Student Numbers in Higher Education. The Report is published in full followed by revised versions of introductory papers from T. M. F. Smith, W. B. Wakefield, I. Diamond and D. F. Barton. An edited version of the general discussion is also published. All the documents are concerned with the appropriate methodology to be used for such projections and the problems of interpreting the results.

Series 'B', **47** (1985)

SILVERMAN, B.W. *Some aspects of the spline fitting approach to non-parametric regression curve fitting* (with discussion). The paper and discussion provide a thorough investigation of the principles of the method, the relation with moving average and other methods, the automatic choice of the amount of smoothing and the use of residual for diagnostic checking and model adaptation.

LAWRENCE, A.J. & LEWIS, P.A.W. *Modelling and residual analysis of nonlinear autoregressive time series in exponential variables* (with discussion). The paper explores an alternative way of modelling time series to Box-Jenkins' ARIMA models which allows for non-Gaussian marginal distributions, dependence beyond autocorrelations and non-reversibility in the path behaviour. New exponential autoregressive models called NEAR (2) models are put forward. Some advantages are claimed and some difficulties are encountered. The discussion is a reflection of the present state of time series work.

Series 'C', **34** (1985)

LARSON, MARTIN G. & DINSE, GREGG E. *A Mixture Model for the Regression Analysis of Competing Risks Data.* A parametric mixture model provides a regression framework for analysing failure-time data that are subject to censoring and multiple models of failure. An EM alogorithm facilities the maximum likelihood analysis and illuminates the contributions of the censored observations.

MOREAU, T., O'QUIGLEY, J. & MESBAH, M. *A Global Goodness-of-fit Statistic for the Proportional Hazards Model.* A simple alternative to the proportional hazard model is considered, whereby the regression coefficients can vary with time. It leads to a statistic which can be used for checking the assumption of proportional hazards.

CLAYTON, D. & CUSICK, J. *The EM algorithm for Cox's regression model using GLIM.* It is shown how this algorithm allows the Cox model to be fitted using the computer program GLIM.

Book Reviews include:

HOGG, ROBERT V. & KLUGMAN, STUART A. *Loss Distribution.* This book deals with the theory of inference from distributions of size of loss. . . . The authors take the stand that fitted models are more appropriate than empirical distributions. . . . Chapter 2, on models, works its way from simple Binomial to mixtures taking in the Poisson process and including the exponential, Weibull, Gompertz, Makeham, gamma, Pareto, generalized Pareto, Burr, Normal, lognormal, log gamma, *t*, Cauchy and beta distributions. The data used are: (1) loss from hurricane damage (exemplifying ungrouped data, truncated from below; (2) domestic insurance claims (grouped data, mixture models); (3) long-term disability insurance (truncated and shifted data, mixture models); (4) losses from bodily injury in automobile accidents (clustered data, truncated from above) and (5) hospital professional liability losses (bivariate model).

BAILEY, NORMAN T.J. *The role of statistics in controlling and eradicating infectious disease.* This gives historical background to a scientific approach.

GILBERT, E.S. *How much can be learned from populations exposed to risk to low levels of radiation?* Various models such as Cox's model are fitted using long-likelihood methods. The resulting confidence intervals for parameters are rather wide.

DARBY, SARAH C. *Evaluation of radiation risk from epidemiological studies of populations exposed at high doses.* The reasons for basing cancer risk estimates of the effects of low doses of radiation on extrapolations from populations exposed to high doses, rather than directly on studies of the effects of low doses are discussed.

BARRY, S.F. *Estimation of internal exposure to radiation using empirical Bayes.* This paper considers empirical Bayes methods of estimating the decontamination of a group of individuals on the basis of the whole group's measurement.

PEARCE, L.R. *A time correlation between cigarette smoking and lung cancer.* This investigation is based on official or other published statistics relating to the population in general.

Book Review:

NAYLOR, CHRIS. *Build your own expert system.* A generally favourable review includes remarks such as: "There is an excellent discussion of some expert systems currently in use." "The book provides many insights into the psychology of computer usage and I found it's humorous style a welcome contrast to the formality of many textbooks."

FOX, A.J., GOLDBLATT, P.O. & JONES, D.R. *Social class mortality differentials: artefact, selection or life circumstances?* Data from ten years follow-up mortality in the O.P.C.S. Longitudinal Study are used to relate deaths of men in 1976–81 to their social class as recorded by the 1971 Census. Explanations of social class mortality differentials are critically reviewed in the light of these data. The class differentials observed for men aged 15–64 in this study are similar to those

reported in the 1970–72 Occupational Mortality Decennial Supplement. This indicates that the published social class gradients were not grossly distorted by numerator-exposed to risk biases. Distortions to gradients seen in the early years of the Longitudinal Study and ascribed to selective health-related mobility out of work from the main social classes to the permanently sick had largely worn off after five years' follow-up. Sharp gradients at ages over 75 suggest that, for men aged over 50; selective health-related mobility between social classes does *not* contribute to mortality differentials.

JACKSON, P.M. *Economics of an ageing population.* Throughout this century, as in many other western countries, the proportion of the British population in the older age groups has increased. The effect this has on the economy is discussed. Topics covered include the determinants of the economic status of old people; the reasons for the choice of retirement ages; the burden of the aged on younger generations: the costs of State pensions; the disincentive effects of pensions on savings, and poverty in old age.

BIOMETRIKA, **72** (1985)

REID, N. & CREPEAU, H. *Influence functions for proportional hazards regression.* It is suggested that empirical influence functions, computed for each observation and each covariate, can be useful in an informal way to identify influential observations.

MODERN LAW REVIEW, **49** 2 (March 1986)

PAGE, ALAN C. *Self-regulation:*[1] *The Constitutional Dimension.* This paper is about accountability in the Financial Sector and the role of self-regulatory authorities (SROs). It draws on history from the granting of the Royal Charter to the Bank of England in 1694 to the rescue of the Johnson Matthey Bank and refers frequently to both Professor Gower's Discussion Document and his Report.[2] Largely written before the Financial Services Bill[3] was published the issues and concerns discussed are unlikely to lie dormant after the 'big bang'.

Three authorities are discussed in detail:

The Stock Exchange (S.E.)

The Council for the Securities Industry (C.S.I) together with the Panel on Takeovers and Mergers (C.S.I. function now merged with the Securities and Investments Board—S.I.B.).

The Insurance Brokers Registration Council (I.R.B.C.)

SROs either have intrinsic authority (e.g. S.E.) or act by common consent (e.g. C.S.I.) and may be established by law (e.g. I.B.R.C. under the Insurance Brokers (Registration) Act 1977). They are distinguished from associations formed to avoid regulation or to regulate outsiders only. The ability, motivation and circumstances under which SROs may operate effectively are set out. Government, with an eye on cost, is encouraging SROs with more persistence than in 1938 when regulation of the unit trust movement passed to the then Board of Trade.

The author notes that the striking feature of Self Regulation over the last 15 years is the extent to which it has been redefined to encompass public interest, the interest of users as well as practitioners, of non-members as well as members. Control of SROs through their rule making, disciplinary and other powers are discussed and the roles of the Secretary of State, the Governor of the Bank of England and the Director-General of Fair Trading are also considered.

Whether the structures to cope with accountability arising from the intermingling of private institutions with public purposes are such that the government is able to exercise power without responsibility or they are so weak that they can be dismissed as of little significance is a question to which our attention will be turned in the coming months.

[1] Review of Investor Protection: A discussion document (1982).
[2] Review of Investor Protection. Cmnd 9125 (1984).
[3] Bill 51 of 1986.

FINANCIAL TIMES (25 February 1986)

DAVIES, RACHEL. *F.T. Commercial Law Report.*

'IN RE IMPERIAL FOODS PENSION SCHEME
Chancery Division: Mr Justice Walton: 7 February 1986'

The duly appointed actuary of the Imperial Foods Pension Scheme without attempting to be exhaustive said there were six methods which might be considered for calculating the portion of the fund to be transferred to a new or existing scheme on the sale of a subsidiary company in respect of their employee members. They are:

(1) number of members;
(2) cash accumulations;
(3) value of accrued rights calculated by reference to current salaries;
(4) past service reserve with allowance for future salary and pension increases;
(5) total past and future service methods;
(6) share of the fund.

Within each method was a whole range of assumptions which very materially affected the result. He chose method (4) when he certified the amount to be transferred and was challenged on the basis that method (6) was more appropriate, producing greater equality between continuing and transferred members.

This challenge was rejected at two levels:

It highlighted a division of opinion among actuaries and opinion was no ground to upset the certificate—proof of 'mistake' was needed.
If the court were to have been able to adjudicate on the question of opinion only it would have still upheld the certificate as method (6) failed to recognize the role of the employer which is of crucial importance since 'surplus' in this case represents temporary surplus funding by the employing company.

In this particular case the new fund was not ready until some months after the sale of the subsidiaries and so lost the benefit of some surplus from those potential members of the new scheme who left before it was ready.