SYNOPSES

THEORY AND PRACTICE OF MULTINATIONAL POOLING

BY RAY WOOTTON, B.A., F.I.A.

(Synopsis of a paper presented to the Society on 4 December 1984)

THIS paper sets out to complement a paper entitled "Multinational Experience Rating", presented to the Faculty of Actuaries Students' Society on 3 December 1979 by G. C. Archibald and J. Wallace, by providing an in-depth analysis of the subject from the viewpoint of a life office actuary. It aims initially at an understanding of the basic concepts, particularly those of expected surplus and both random and *a priori* variation, but after that concentrates on the practical study of the various possible structures for pooling arrangements by the use of a computerized Monte Carlo technique, embodied in a PASCAL program. Results obtained from this program provide a simple way of handling complex losses-carried-forward arrangements as if they were on a yearly full stop loss basis but with a coefficient of variation reduced by the factor $T^{-\varepsilon}$ where

T is the average lifetime of pooling arrangements with the specified structure and

ε is a structure-dependent parameter.

Having prescribed bases for the operation of international pools the paper then goes on to consider the principles of apportionment of the risk and risk charge among the insurers participating in each pool and defines four different frameworks for the interrelation of these insurers.

The paper is organized under the following sequence of chapter headings:
1. Introduction
2. The fundamental experience-rating structure: Full Stop Loss.
3. The concept of expected surplus.
4. Theme and variations—the diversity of structure of Losses-carried-forward arrangements.
5. The interaction of structure and risk charges.
6. The interrelation of network insurers and the apportionment of risk and risk charges.
7. Miscellaneous problems.
8. Technical description of the computer simulation techniques and PASCAL programs used in arriving at the results presented in this paper.
9. Tables for approximate computation of the risk charge based on the POISSON distribution.

DEFINED CONTRIBUTION PENSION SCHEMES IN THE UNITED KINGDOM

BY R. KEY

(Synopsis of a paper presented to the Society on 18 December 1984)

DEFINED contribution or 'money purchase' pension schemes until recently attracted little attention. In particular the devastating effects of inflation in the 1970's might have killed off such schemes. Now, however, with inflation well within single figures, the defined contribution pension scheme is making its comeback.

The paper describes defined contribution schemes in their various basic forms:

(a) Fixed benefit—where contributions would purchase non profit endowment assurances or deferred annuities.
(b) With-profit benefits—similar to the above except that with profit endowment assurances or deferred annuities are purchased.
(c) Unit-linked—where contributions purchase a 'share' of the total fund, normally by the purchase of units in a unitized fund.

These are compared with defined benefit schemes.

The reasons why a defined contribution pension scheme might be established in preference to a defined benefit scheme are discussed by considering the extent to which each type assists the achievement of a selection of corporate objectives which might be set for a pension scheme.

Those discussed are:

(a) To assist with recruitment.
(b) To promote retention of staff.
(c) To provide a benefit to employees retiring after long service with the company which is sufficient to provide a reasonable standard of living.
(d) To concentrate resources on employees who stay with the company until retirement.
(e) To be seen to treat all members equitably.
(f) To operate a scheme which will be easily understood by its members.
(g) To operate a scheme which can be administered simply and at minimum cost.
(h) To concentrate resources on employees who are concerned about their pension provision.
(i) To provide the benefits cost-effectively.
(j) To enable the cost of the scheme to be controlled.

The operation of a scheme in practice is considered, covering some aspects of scheme design, and, in particular, the determination of contribution rates and

benefits payable on withdrawal. The choice of investment media and investment manager is discussed. In both cases areas where actuarial advice may be required are noted.

The benefits which might emerge from final salary and defined contribution schemes are illustrated by comparing results obtained from a 'model scheme'.

Finally the paper analyses some ways in which the simple defined contribution pension scheme can be amended so as to achieve particular objectives which might not, of themselves, suggest the use of such a scheme. Those described are

(a) The use of age-related contributions.
(b) The use of service-related contributions.
(c) 'Matching' the company's contributions to those of the member.
(d) The incorporation of a final salary guarantee.
(e) Making use of a choice of investment funds.
(f) Investing a part of the contributions paid in the shares of the sponsoring company.

ACTUARIAL VALUATION OF PENSION SCHEMES

BY P. WORTHINGTON, F.I.A.

(Synopsis of a paper presented to the Society on 19 March 1985)

THE paper, concentrating on privately invested pension schemes, discusses the various purposes for which an actuarial valuation can be undertaken: consideration of the discontinuance position; provision of an Actuarial Certificate A; the ongoing actuarial valuation and, for the purposes of the pension, aspects of purchases and sales of companies and their subsidiaries.

The author considers that a discontinuance valuation should take into account the benefits to which members would be entitled were they normal withdrawals. The major reason being that the discontinuance certificate would then compare the benefits available to those who left just prior to any notional discontinuance with the ability of the scheme to continue to provide them. The author states that it is of great importance that any certificate given should set out clearly the benefits and assets taken into account in order that any reader should not be misled. The need to compare assets and liabilities as factually as possible means that the actuary will tend towards considering the cost of buying benefits from an insurance company rather than the cost of continuing the scheme on a closed basis. The incidence of expenses into the future would make calculations for a closed scheme difficult to substantiate. Some subjective judgements must be made and the requirement to publish the percentage cover, if less than 100%,

could lead to some pressure for revision from companies where calculations show a percentage cover of less than 100%.

An actuarial valuation for the purpose of providing an Actuarial Certificate A produces few additional problems to the discontinuance position other than that of considering, within the statement, the next 5 year period. This is normally achieved by comparing the funding rate being paid with the minimum required to support Guaranteed Minimum Pensions.

The purpose of the on-going actuarial valuation is to recommend a single funding rate; most clients prefer a single rate combined with a willingness to discuss rather than a range of alternatives which should be adopted for the scheme. The author recognizes that valuations are based on assumptions as to future experience and therefore that a range of different assumptions could be made. He argues that no one basis is correct and that it is perfectly proper for an actuary advising a number of clients to adopt different bases for different clients. What is important is that the actuary draws to his client's attention the effect that deviations in experience from his assumptions will have and the subjective likelihood of those deviations occurring. Actuaries are being asked more frequently than previously to provide some form of certificate concerning the adequacy of the funding of the pension scheme. The statements made are often woolly and, the greater the scrutiny to which they are subjected, the less they appear to say. The author questions whether or not it is appropriate to make such statements.

An on-going valuation of a pension scheme requires a valuation to be placed on the invested fund. The paper discusses the advantages and disadvantages of one particular method, that of assuming a notional portfolio where the fixed interest content exactly matches the fixed money liabilities of the scheme, and the remainder of the assets are assumed to be invested in U.K. equities. Portfolios hold an increasing proportion of property and overseas stocks and it is difficult to argue that it is correct to place a different value on these holdings, relative to their market value, than on a similar holding in U.K. equities. A lower value would imply that the actuary should speak out against them and, therefore, an assumption that they are U.K. equities is a conservative approach.

RIDER BENEFITS AND OPTIONS ON LIFE ASSURANCE CONTRACTS

By M. R. T. North, F.I.A. and P. J. Savill, F.I.A.

(Synopsis of a paper presented to the Society on 2 April 1985)

THE addition of extra benefits and options to a basic life assurance contract has been a traditional feature of products in the U.K. market. However, the main

emphasis of the industry has been on the savings aspect of life assurance, particularly in the unit linked sector.

Within the last decade, the unit linked companies have increasingly introduced protection elements into their product design, and following the removal of Life Assurance Premium Relief on 13 March 1984 the authors believe that the whole industry will need to pay much more attention to its unique feature—the offering of life assurance protection.

The paper examines the two broad categories of additions to a basic contract—additional benefits (or rider benefits) and options.

The most significant additional benefits are waiver of premium and the various forms of disability benefit. Also included are comments on accidental death benefit; unemployment waiver; medical expenses and hospitalization benefit. The paper considers aspects of pricing but concentrates on design of benefits as well as underwriting and claims control. These matters are more complex and difficult than in the area of ordinary life assurance risks.

On options, the paper considers the traditional conversion and renewal options available with term assurances, but goes into more detail on the newer type of guaranteed insurability options linked to the Retail Prices Index. Here, the design of the operation of the options is stressed as a means of controlling the claims costs.

The paper concludes by pointing out that care is needed in the construction of additional benefits and that it will be necessary to pay more attention to risk selection if a move towards protection develops. This is a reversal of earlier trends where the role of the underwriter has tended to diminish. It is stressed that any office introducing benefits or option arrangements of the type described must have clearly thought out underwriting and claims procedures before product launch.

SUMMARIES OF RESEARCH DISCUSSION PAPERS

(Copies of these papers may be borrowed from the Institute Library)

STEPS TOWARDS A COMPREHENSIVE STOCHASTIC INVESTMENT MODEL

BY A. D. WILKIE, M.A., F.F.A., F.I.A.

(Paper No. 36 deposited in the library in December 1984)

THIS note is an Appendix to the paper "A Stochastic Investment Model for Actuarial Use" by the same author, which was submitted to the Faculty on 19 November 1984.

Part I of the note describes the statistical investigations that led to the development of the stochastic investment model described in the Faculty paper. This is based on a study of the Retail Prices Index, and its predecessors, over the period from 1661 to 1982; indices of share dividends and share yields from 1919 to 1982; and the yields on Consols from 1756 to 1982. The resulting model takes as input four independent 'white noise' series, and transforms them into suitably correlated series that adequately describe the movements of these investment variables, so that the resulting model can be used for simulations of 'possible futures'.

Part II of the note gives details of the results from the model with various parameters and various starting values, to show the sensitivity of the results to changes in these parameters.

Finally a table showing a particular simulation is given, along with graphs of it and of other simulations.

ON A CLASS OF RESTRICTED PERMUTATIONS

BY DR JACQUES DUTKA, PH.D.

(Paper No. 37 deposited in the Library in April 1985)

THE paper treats the problem of "Circular Sealing Arrangements" (see D. S. Jones and P. G. Moore, *J.I.A.*, **108,** 405) as a particular case of a diverse family of problems of the same genesis. An explicit solution of the general problem is developed, and an historical sketch is provided of several related problems including the 'Genoese lottery', 'Tait's knot problem', the 'problème des ménages' and other variations.