(1951) and in Brussels (1960). The applications can be divided into three groups:

(a) Samples drawn from existing finite populations. Methods of estimating premium reserves by means of samples, methods of sampling inspection and quality control in relation to administrative work are discussed.
(b) Random samples drawn from theoretical populations. This means statistical inference by means of e.g. significance tests and interval estimation.
(c) Monte Carlo and similar techniques based on simulation.

Enige aspecten met betrekking tot het solvabiliteitsvraagstuk in het schadeverzekeringsbedrijf, by C. CAMPAGNE, *Het Verzekerings-Archief.* January 1959. 's Gravenhage.

Considerations derived from collective risk theory may be used to derive a minimum solvency standard to be maintained by the insured; this minimal standard depends on the form of the risk distribution. Two probability schemes, namely the Poisson and the Beta distribution are introduced and compared. It is proved that the Beta distribution is a somewhat safer approach to adopt. Furthermore, the author argues that the insurer is practically safe as regards the danger of insolvency when the extra reserves amount to 25 % of the total annual premiums.

Winstgevendheid en Winsthansen bij Valuta-arbitrage, by C. VAN DE PANNE and A. STRANDERS. *Statistica Neerlandica,* 1960, p. 187-204, 's Gravenhage.

By systematic analysis of the matrices of buying and selling prices the authors are able to construct the chains of transactions which yield the highest profit. The method is applied to the figures of five countries at three different points of time.

The probability that there is a profit and its mathematical expectation may be calculated as soon as certain suppositions are made about the distribution of the changes of buying and selling prices. These quantities have been computed for two points of time on the assumption that the logarithms of these changes are distributed normally with mean zero and known constant variance.

The authors justify the probabilistic approach by stressing the "decision" character of the problem for which not all relevant factors are known.

Finally the simple model of normally distributed price changes with no time lagged correlations is criticised as being rather unrealistic but nevertheless of some use as it gives indications of those chains which are probably profitable.

J. van K.

The safety loading of reinsurance premiums by Karl Borch, Bergen, *Skandinavisk Aktuarietidskrift* 1960

In a previous paper the author has studied the case of two insurance companies negotiating with the purpose of concluding a reciprocal reinsurance treaty. These results are generalized in the first part of the present paper to an arbitrary number of companies.

By denoting the risk distribution by $F_i(x_i)$ and the available fund by S_i,

the *risk situation* of company i is clearly defined. Hence it follows that the utility $U_i\ (S_i, F_i\ (x_i)\ )$ attached to this risk situation is obtained as

$$U_i\ (S_i, F_i\ (x)\ ) \quad = \quad \int_0^\infty u_i\ (S - x_i)\ dF_i(x_i),$$

where $u_i(x)$ is the "utility of money" to company i.

In the reinsurance market the companies can conclude treaties which may be defined by a set of functions represented by a vector y in the n - dimensional x - space. If there exists no vector $\bar{y}$ such that

$$U_i(y) \quad = \quad U_i(\bar{y}) \text{ for all } i,$$

the set of treaties represented by y will be referred to as *Pareto optimal.*

The author shows that the only Pareto optimal arrangement is that the companies should cede their entire portfolio into a pool and then decide on how to divide the claims among the companies. This leads to the finding of a solution to a n-person game.

The principles of an equilibrium price in a market are set forth and these principles are applied by assuming the utility of money to be represented by second degree polynomials. To obtain Pareto optimailty the only solution is that all reinsurance is made on a net premium basis. The result derived is thus in a sense completely negative, indicating that no market price exists which will lead to a Pareto optimal arrangement. However, the author states that it is possible to construct a model of a reinsurance market in which unrestricted competition will lead to an equilibrium which is Pareto optimal if the sacrosanct principle of equivalence is sacrificed.

Some Applications of Collective Risk Theory to Reinsurance and Group Experience Rating, by PAUL MARKHAM KAHN, University of Michigan, 1961.

This dissertation is divided into four parts. Part I gives an introduction to the theory of risk, part II deals with stop-loss reinsurance, part III contains an extension of a theorem of Borch, while part IV is concerned with certain problems of group experience rating.

In his introduction the author reveals that the collective risk theory, a branch of the theory of random processes, remains largely unknown in the United States. It is therefore the major purpose of this thesis to examine the feasibility of applying the collective risk theory to practical problems in the field of reinsurance and experience rating.

Part I gives a brief outline of the main properties of individual and collective risk theory. Assuming a simple Poisson model, the distribution function and the ruin probability function are discussed.

In part II the results of examples from life insurance and those produced by the collective risk theory, particularly by Esscher's method, in the field of stop-loss reinsurance are compared by following closely the formulae developed by Ammeter. Stop-loss premiums are calculated under four different assumptions. The first method was suggested by Feay in which the normal distribution is used as an approximation to the distribution of claims. The second method is an application of individual risk theory. The third uses tables of the incomplete Gamma function and the fourth applies Esscher approximations. The stop-loss premiums calculated under these assumptions