

GENERAL INSURANCE STUDY GROUP - OCTOBER 1988

OVERSEAS DEVELOPMENTS

1. Introduction

The Centre for Insurance and Investment Studies at the City University Business School continues to develop its monitoring of publications related to insurance. Abstracts of appropriate publications are compiled and placed on the Register of Insurance Research (a computer based enquiry system run by the Centre). Over the two years 1987 and 1988 approximately one hundred abstracts of publications related to overseas developments in General Insurance have been put on the Register. These cover a wide range of topics which is reviewed below.

2. General Surveys

Illustrative of the many publications which consider the subject in a descriptive manner are; A Survey on Insurance and Reinsurance Operations in Developing Countries (United Nations); Captives (Portal, CPCU USA) which relates the captive position to the insurance cycle; Japanese Fire Costs (Wilmot, World Fire Statistical Centre); Impact of Savings Type Insurance on Non-life Insurance in Japan (Suzuki and Yamaha, 23rd TICA); The Impact of Rate Regulation in USA (Cummins and Harrington, Geneva Papers 12/42), which adopts a multiple regression approach.

There are several studies published by Swiss Re, which include; World Insurance 1985 and 1986, giving extensive data for numerous countries; Premium Growth and Shifts in Industrial Countries, illustrated by graphs and charts; Insurance Premium Forecasts, which analyses the relationship between premiums and gross domestic products by linear regression; Underwriting the Loss Cycle, which is a survey of loss ratios and underwriting results for a number of countries including Europe, USA and Japan; Development of World Aviation Insurance 1979-86; Insurance Years 1975-86 in seven industrial companies giving overall results; A Comparison of Insurance Markets in Europe and USA.

3. Catastrophe Insurance

The general nature of catastrophe risks is considered in International Natural Catastrophes and Major Losses, 1986 and 1987, which are annual reports indicating the extent of the damage published by the Swiss Re. Other articles of a descriptive nature include Fire Following Earthquakes which

gives a very detailed report, by the All Industry Research Advisory Council of the USA, quantifying monetary losses; and Mitigation of Cyclone Damage, by the Australian Institute of Actuaries.

The subject is dealt with in a more technical fashion in Definition of Catastrophe Losses (Ajne and Wide, ASTIN) which describes a model adopting the Pareto family of curves for possible catastrophe claims (pcc) and uses a Poisson distribution for the numbers of pcc's per line of business; and a Statistical Analysis (Yamada and Shimura, 23rd TICA) which contains stochastical analyses, in particular related to typhoons and a study of application models for reinsurance programming.

4. Financial/Investment

Papers under this heading include; A Financial Theory of the Insurance Firm under Uncertainty and Regulatory Constraints (MacMinn and Witt, Geneva Papers 12/42), in which a financial model of an insurer under uncertainty is developed and used to examine its behaviour under three regulatory constraints with the insurer being subject to two independent sources of risk, the underwriting risk and the return on the investment portfolio; Direct Insurers Capital Investments, a study by Swiss Re analysing insurers investments between 1975 and 1985 for eleven countries; A Financial Model for Pricing Insurance (Urrutia, CPCU USA) which discusses the Arbitrage Pricing Theory as an alternative to the Capital Pricing Model.

A number of papers deal with the alternative balance sheet approach and the emerging cost approach to measuring solvency and capital strength. Important amongst these are Simulation Models and the Management of a Reinsurance Company (Coutts and Devitt, 23rd TICA); and Handling Uncertainty in Examining the Financial Strength of a General Insurance Company (Daykin, 23rd TICA).

Extensive simulation work on cash flow is exemplified in Simulating the Cash Flow of a General Insurer (Hey and Bernstein, 23rd TICA); and identification and consideration of the main differences in the accounting approaches used in different countries is contained in Problems of International Comparability, the emergence of General Insurance surplus under different accounting conventions (Harvey, 23rd TICA). Amongst other papers, General Insurance and Financial Institutions (Kahane, 23rd TICA) concerns itself with funding an optimal strategy for a general insurance portfolio.

5. Health/Disability

Health Insurance was the principle topic for the Annual Assembly of the Geneva Association in 1987 (Geneva Papers 12/45). 12 papers were presented covering, particularly, developments in the USA and also in France, Germany, the Netherlands, Spain and the UK.

The Central Sickness Rate (Haberman, 23rd TICA) provides a mathematical investigation of the rate and the underlying force of sickness.

Permanent Health Insurance in the UK (Waters, 23rd TICA) outlines the new model and considers parameter estimation, data analysis and graduation.

Amongst other papers, Modelling Disability by Mixed Exponentials (Tuomikoski, 23rd TICA) is concerned with modelling disability pension duration by mixtures of exponential distributions, such that the influence of the background variables is limited to the weights defining the mixture, the expectations of the component distributions being independent of these variables.

6. Liability Insurance

The Geneva Association has promoted research in liability insurance and safety regulations and, recently, in environmental liability problems.

Insurance for Civil Liability for Marine Oil Pollution Damage (Bongaerts and de Bievre, Geneva Papers 12/43) deals with developments of international public regulations and private arrangements concerning the compensation for damages for marine oil pollution. It discusses the political target of offering full compensation and insurance for oil pollution damage and reduction of risk.

Moral Hazard and Safety Regulation (Hansson and Skogh, Geneva Papers 12/43) analyses the conflict between external control and insurance when information is imperfect by means of a statistical model.

Problems and Issues of Environmental Liability Insurance (Kunreuther, Geneva Papers 12/44) discusses the reasons for the market for environmental impairment liability in the USA having dried up, with most insurers not offering coverage and reinsurers withdrawing from the market.

Personal liabilities and Insurance for Corporate Directors and Officers (Copeman, Financial Times) is a report, based on extensive research, which analyses the overall UK provisions of Directors and Officers Liability Insurance for executives of corporations based in the UK and those areas in which UK written cover may sometimes be extended.

7. Motor

A number of papers on motor insurance are on applications of statistical theory and may be listed under this heading or under credibility theory.

In Motor Insurance in the UK (Hey and Hey, Geneva Papers 12/44), two unusual features are postulated and examined, namely the continued existence and operation of no claim discount schemes, and the continuing large differences in ex ante tariffs for ostensibly the same risk.

Two Credibility Regression Approaches for the Classification of Passenger Cars in a Multiplicative Tariff (Sundt, ASTIN 17/1) is a nice blend of theory and practical application. Motor Insurance and Compensation of Motor Accident Victims in Developing Countries (United Nations) is a fairly comprehensive study into the problems of motor insurance in the developing countries.

8. Reinsurance

The papers on reinsurance fall into two groups - those more in the nature of a survey and those that are developing applications of statistical theory.

In the former category are two UNCTAD reports on international reinsurance security and on insurance and reinsurance in developing countries. In the latter category are several papers submitted to the 23rd International Congress of Actuaries under Subject 4, Actuarial Challenges of Reinsurance. However of the 14 papers submitted only three related to general insurance and were in English. Benktander deals with Security Loadings in Excess of Loss producing some useful approximations for the standard deviation of the loss amount. Sato and Ikuma construct a model to measure the effects of inflation, or other environmental changes, by replacing parameters in the model. Yamada and Shimura analyse natural hazard risks and develop a statistical model for determining the net retention, cover limit and net reinsurance premium for excess-of-loss covers.

Another paper of interest is on the determination of a distribution-free retention (Schmitter, Bulletin of the Association of Swiss Actuaries), but this paper is in German.

9. Risk Theory

Several papers directly introduce risk theory. Amongst these are Bounds and Approximations for Some Risk Theoretical Quantities (Kaas, Amsterdam University). This

study considers methods of approximation relevant in mathematical risk theory and a number of paradigms are also considered.

Mathematical Software Tools in Risk Theory (Hurliman, 23rd TICA) discusses how the basic equation of risk theory can be solved using modern mathematical software tools.

A Lower Bound for Probability of Ruin (Michel, Bulletin of Association of Swiss Actuaries). Under the assumption that the mean of the claim size distribution exists, a lower bound for the probability of ruin is derived.

10. Statistical Theory

Only one paper makes direct reference to utility theory namely, Evaluating Irreplaceable Losses (Fenn, Geneva Papers 12/43) in which an explanation based on conventional expected utility theory is offered for some of the more unexpected results.

Two papers make a direct reference to a Bayesian approach. The first is Markovian Forecast Processes (Krzysztofowicz, Journal of the American Statistical Association), whose objective is to investigate Markov models of the sequential forecast process; the author considers a Bayesian decision maker who wishes to make the best use of forecasts. The second is Some Experiments with Run-offs (Benjamin, 23rd TICA). Amongst the conclusions drawn by the author is, that treating the claim payments as a modelling process allows different engineering techniques of feedback using the error between actual payments forecast on the model; and that if we allow the underwriter to input his "feel" into the elimination process then a Bayesian approach seems to be the most hopeful for a disciplined actuarial methodology.

Numerous other papers involve mathematical statistics, illustrative of which are:

Time Series Analysis (Holden, Journal of the American Statistical Association) in which the author develops a stochastic model to describe the rates of aircraft hijacking attempts in the USA; Frequency Response Functions (Rantala, 23rd TICA) which indicates the possibilities of the use of frequency response functions in evaluating the variation ranges of certain central indicators in an insurance business.

Hey and Bernstein in their paper to the 23rd ICA describe some of the extensive work they have carried out in Simulating the Cash Flow of a General Insurer.

11. Credibility Theory

Credibility Theory forms the basis of a number of papers. Important amongst these are:

Hierarchical Credibility Revisited (Buhlmann and Jewell, Bulletin of Association of Swiss Actuaries). The paper unites the different working techniques and the main result is the recursive procedure for evaluating hierarchical credibility.

Credibility Theory (Goovaerts and Hoogstad, Surveys of Actuarial Studies) - models considered include the Buhlmann, Buhlmann-Strauss, Hachemeister regression, De Vylder non-linear and semi-linear, and Jewell's hierarchical. Applications to loss reserving and large claims are discussed.

A Credibility Model (Hesselager and Witting, ASTIN 18), in which the authors consider a general credibility model for the prediction of IBNR claims, with allowance for random fluctuations in the underlying delay distribution.

12. Miscellaneous

These papers cover such topics as, Comparisons of International General Insurance Underwriting Results and their Volatility (Ross and Pountain, 23rd TICA), An Economic Perspective for Controlling Fluctuations in Insurers' Business Results (McGuinness, 23rd TICA), Ratemaking of Natural Risks in Agriculture (Kahane, 23rd TICA).

13. Print-outs of Abstracts

A list of the papers reviewed is appended to this report. Members of the Institute may obtain print-outs of the full abstracts either from the Institute Library or from the Centre for Insurance and Investment Studies by quoting the relevant document numbers.

GENERAL SURVEYS

- No: 950 A Comparison of Insurance Markets in Europe and USA. - 1987
- No: 959 World Insurance 1985 - 1987
- No: 1019 Premium Growth and Structural Shifts in the Leading Industrial Countries 1965-85. - 1987
- No: 1059 Insurance Premium Forecast up to 1992. - 1987
- No: 1226 Underwriting Loss Cycle in Non-life Insurance in 1981-5. - 1987
- No: 1227 The Development of World Aviation and Aviation Insurance 1973-86. - 1987
- No: 1267 The Impact of Rate Regulation in U.S.A. Property-Liability Insurance Markets: A Cross-Sectional Analysis of Individual Firm Loss Ratios. - 1987
- No: 1281 Captives: Insurance Industry Cycles and the Future. - 1987
- No: 1389 Impact of the Rapid Growth of Savings-Type Insurance upon the Japanese Non-Life Insurance Business. - 1988
- No: 1424 Japanese Fire Costs. - 1988
- No: 1454 Insurance Years 1975-86 in Seven Industrial Countries. - 1988
- No: 1455 World Insurance 1986: Unusual Growth in the Insurance Industry. - 1988

CATASTROPHE

- No: 947 International Natural Catastrophes and Major Losses 1986. - 1987
- No: 1148 Fire Following Earthquake - Estimates of the Conflagration Risk to Insured Property in Greater Los Angeles and San Francisco. - 1987
- No: 1218 Mitigation of Cyclone Damage Risk to Housing. - 1987
- No: 1362 On the Definition of Catastrophe Claims and the Calculation of Their Expected Cost for the Purpose of Long Range Planning and Profit Centre Control. - 1987
- No: 1456 Natural Catastrophes and Major Losses in 1987. - 1988

FINANCIAL

- No: 1217 Discounting of Outstanding Claims in the U.S. - 1987
- No: 1233 Financial Liberalisation and the Non-life Insurance Industry. - 1987
- No: 1287 A Financial Theory of the Insurance Firm Under Uncertainty and Regulatory Constraints. - 1987
- No: 1302 A Financial Model for Pricing Insurance. - 1987
- No: 1373 General Insurance and Financial Instruments. - 1988
- No: 1378 Can an Unsegmented Insurance Fund Do Without Modern Investment Techniques? - 1988
- No: 1390 Simulation Models and the Management of a Reinsurance Company. - 1988
- No: 1391 Handling Uncertainty in Examining the Financial Strength of a General Insurance Company. - 1988
- No: 1397 Problems of International Comparability - The Emergence of General Insurance Surplus Under Different Accounting Conventions. - 1988
- No: 1400 Simulating the Cash Flow of a General Insurer. - 1988
- No: 1452 Direct Insurers' Capital Investments. - 1987

HEALTH

- No: 1250 Changing Health Care in the United States. - 1987
No: 1252 Future Perspectives of Health Insurance. - 1987
No: 1253 The Evolution of Health Care Delivery in American Industry. - 1987
No: 1254 HMO's and Some European Alternatives. - 1987
No: 1255 Recent Developments of Health Insurance in West Germany. - 1987
No: 1256 Discussion about Health Insurance in Holland. - 1987
No: 1257 Private Health Insurance in Britain and the National Health Service. - 1987
No: 1258 Social Security and Private Sickness Insurance in Spain. - 1987
No: 1344 The Central Sickness Rate: A Mathematical Investigation. - 1988
No: 1352 Permanent Health Insurance in the UK: The Mathematical Model and the Statistical Analysis of the Data. - 1988
No: 1357 On Modelling Disability by Mixed Exponentials. - 1988
No: 1406 Die Abhangigkeit der Schadenbelastung von der Versicherungsdauer im der Krankenversicherung. - 1988
No: 1418 Der Einfluss der Zufalls bei der Machkalkulation in der Privaten Krankenversicherung. - 1988

LIABILITY

- No: 1145 Personal Liabilities and Insurance for Corporate Directors and Officers 1987-8. - 1987
No: 1246 Study on the Rise in Liability Premiums. - 1988
No: 1259 Problems and Issues of Environmental Liability Insurance. - 1987
No: 1260 Crime and Insurance. - 1987
No: 1262 Negligence, Strict Liability and Regulation of Safety under Belgium Law. - 1987
No: 1263 Accidents, Taxes, Liability, Rules and Insurance. - 1987
No: 1264 Insurance for Civil Liability for Marine Oil Pollution Damages. - 1987
No: 1288 Moral Hazard and Safety Regulation. - 1987

MOTOR

- No: 936 Accident Risk on the Roads of Industrial Countries. - 1987
No: 1149 Motor Insurance and Compensation of Motor Accident Victims in Developing Countries. - 1987
No: 1216 Car Theft in New South Wales. - 1987
No: 1251 Motor Insurance in the United Kingdom: A Description and an Appraisal. - 1987
No: 1361 Two Creditibility Regression Approaches for the Classification of Passenger Cars in a Multiplicative Tariff. - 1987
No: 1364 Distributions Stationnaires d'un Systeme Bonus-malus et Probabilite de Ruine. - 1988
No: 1367 Construction of the New Belgian Motor Third Party Tariff Structure. - 1988
No: 1404 Ratemaking and Reserving Under Decelerating Inflation: The Case of Automobile Insurance in Israel. - 1988

REINSURANCE

- No: 946 A Long-term Comparison of Direct Insurance and Reinsurance. - 1987
- No: 1229 Reinsurance Security. - 1987
- No: 1230 Statistical Survey on Insurance and Reinsurance Operations in Developing Countries. - 1987
- No: 1293 Security Loadings in Excess of Loss. - 1988
- No: 1298 Effects of Inflation and Other Environmental Factors on Reinsurance. - 1988
- No: 1301 Statistical Analysis for Natural Disaster Reinsurance Programme. - 1988
- No: 1434 Eine verteilungsunabhängige Selbstbehaltsbestimmung. (The determination of a distribution-free retention.) - 1987

RISK THEORY

- No: 1349 Further Results on the Probability of Ruin with an Absorbing Upper Barrier. - 1988
- No: 1383 Limsup-Theorems and Their Applications to Risk Theory. - 1988
- No: 1402 Mathematical Software Tools in Risk Theory. - 1988
- No: 1432 Bounds and Approximations for some Risk Theoretical Quantities. - 1987
- No: 1433 A lower bound for the probability of ruin, given a compound Poisson process. - 1987
- No: 1437 A general model in risk theory. An application of modern martingale theory. Part two: applications. - 1988

STATISTICAL THEORY

- No: 1265 Evaluating Irreplaceable Loss: Some Implications for Insurance and Liability. - 1987
- No: 1286 The Pricing of Non-independent Risks Under Constant Absolute Risk Aversion. - 1987
- No: 1297 The Claims Occurrence Process and the IBNR Problem. - 1988
- No: 1310 Time Series Analysis of a Contagious Process. - 1987
- No: 1312 Markovian Forecast Processes. - 1987
- No: 1350 Motivating Claim Frequency Models. - 1988
- No: 1384 Some Experiments with Run-Offs. - 1988
- No: 1395 The Severity of Ruin in Case of Completely Monotone Claim Distributions. - 1988
- No: 1413 Frequency Response Functions - a Technique to Evaluate the Variation Range in Certain Insurance Indicators. - 1988
- No: 1415 Changes in the Probability of Insolvency - Results from a General Insurance Simulation Model. - 1988
- No: 1438 Estimating the tail index of the claim size distribution. - 1988
- No: 1440 Some approximation of ultimate ruin probability for finite initial surplus. - 1988

CREDIBILITY THEORY

- No: 1336 Credibility Theory. - 1987
No: 1365 On a Model for the Claim Number Process. - 1988
No: 1366 A Credibility Model with Random Fluctuations in Delay Probabilities for the Prediction of IBNR Claims. - 1988
No: 1405 Credibility Premium - The New Premiums System for Motor Vehicle Insurance in the "Dunav" Insurance Community. - 1988
No: 1435 Hierarchical Credibility Revisited. - 1987
No: 1439 Kreditabilitatsschätzungen für die Anzahl IBNR-Schaden. (Credibility estimators for the number of IBNR-claims.) - 1988

MISCELLANEOUS

- No: 1295 Ratemaking of Natural Risks in Agriculture. - 1988
No: 1316 Cash Flow Alternatives to Workers' Compensation Insurance. - 1985
No: 1363 Panjer vs. Kornya vs. De Pril: a Comparison from a Practical Point of View. - 1987
No: 1396 An Economic Perspective for Controlling Fluctuations in Insurers' Business Results. - 1988
No: 1401 Reservierung und Abwicklungsergebnis in der Kraftfahrt-Haftpflichtversicherung. - 1988
No: 1416 A Fluctuation Reserve System in Non-Life Insurance. - 1988
No: 1417 Comparisons of International General Insurance Underwriting Results and their Volatility. - 1988
No: 1441 Eine Bemerkung zur Exposure Tarifierung. (Some remarks on exposure rating.) - 1988