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AUSTRALIAN ACTUARIAL JOURNAL

Volume **10** (4), 2004

BALDWIN, C. *Pre-budget submission to the Commonwealth Government 2005*. 815-842. In this submission, the Institute focuses on the following areas of Government policy and actuarial involvement: intergenerational issues & sustainable futures; retirement incomes policy; financial reporting, and regulatory issues in the financial services sector.

DICKSON, D. C. M. & WONG, K. S. *De Vylder approximations to the moments and distribution of the time to ruin*. 709-726. De Vylder (1978) proposed a method of approximating the probability of ultimate ruin in the classical risk model. In this paper we show that his ideas can be extended to approximate the moments and distribution of the time to ruin.

INSTITUTE OF ACTUARIES OF AUSTRALIA, IAS 39 TASKFORCE. *Submission to International Accounting Standards Board on fair value option under IAS 39 — alternative proposals*. 729-735. This submission was made on 24 December 2004 to the International Accounting Standards Board. It sets out the preliminary views of the IAS 39 Taskforce of the Institute of Actuaries of Australia on the IASB's tentative alternative proposals in relation to the use of the fair value option under IAS 39. Due to the need for quick response it was not possible to put this submission through the necessary process required for formal endorsement by the Institute.

INSTITUTE OF ACTUARIES OF AUSTRALIA, INTERNATIONAL ACCOUNTING STANDARDS COMMITTEE. *Submission to the Subcommittee on Actuarial Standards of the International Actuarial Association Committee of Insurance Accounting, on Exposure drafts of IAA standards of Practice on IFRS Actuarial Practice, measurement and current estimates*. 737-770. In January 2005 the Institute of Actuaries of Australia made a submission to the Subcommittee on Actuarial Standards of the International Actuarial Association Committee of Insurance Accounting, on Exposure drafts of IAA standards of Practice on IFRS Actuarial Practice, measurement and current estimates.

INSTITUTE OF ACTUARIES OF AUSTRALIA, LIFE INSURANCE PRACTICE COMMITTEE, VALUATION STANDARD REVIEW TASKFORCE. *Response to the Life Insurance Actuarial Standards Board on the issues Paper on Adoption of International Financial Reporting Standards — Prudential implications for life insurers and friendly societies*. 771-814. This response to the issues Paper circulated by the LIASB dated 23 November 2004 was prepared by the Valuation Standard Review Taskforce of the Institute's Life Insurance Practice Committee, which comprises representatives of the Institute who specialise in life insurance. The Taskforce is currently developing a number of discussion notes to provide additional guidance to actuaries following the changes to AASB 1038.

TICKLE, L. *Causes of death among Australian insured lives*. 623-707. This study of causes of death among Australian insured lives over the period 1995-1999 is based on data collected by the Institute of Actuaries of Australia as part of its Personal Business Insured Lives Mortality Investigation. A comparison against population experience reveals low insured lives

mortality for external causes of death (motor vehicle accidents, suicide and other external causes), cerebrovascular disease, digestive diseases and AIDS. It is clear from the analysis that both male and female insured cancer mortality relative to the population is substantially heavier in 1995-1999 than it was in 1990-1994, though the actual reason for the change cannot be determined with certainty. There is also the suggestion of a relative worsening in insured male suicide. As expected, there is evidence of selection effects for the non-external causes of death, and of high mortality among policies in the minimum evidence underwriting category. An unexpected finding is that medically underwritten policies experience the same or even slightly heavier mortality than non-medically underwritten policies; however it is possible that these groups have different underlying mortality prior to the underwriting process. Overall female insured mortality is 69% of that for males — identical to the result for 1990-1994 — with relatively light experience for the external causes of death and ischaemic heart disease, and relatively heavy experience for other neoplasms (which includes breast cancer).

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#### GENEVA RISK AND INSURANCE REVIEW

Volume 30 (2), 2005

BERNARD, C., LE COURTOIS, O. & QUITTARD-PINON, F. *A study of mutual insurance for bank deposits*. 129-146. This article displays a study on the mutual insurance of bank deposits. A system where deposits are first insured by a consortium then by the Government is envisaged. We wish to compute the fair premia due to both the consortium and the Government. Various types of covenants aiming at making banks reduce their risks are detailed. These provisions can be, as is the case in Chapter 11, of a Parisian type. This means that surveillance is based on the path followed by the assets or the leverage. We compare these various types of covenants and conclude on the proposal for new regulatory provisions.

IMMORDINO, G. *Uncertainty and the cost of reversal*. 119-128. For standard irreversibility theory the prospect of acquiring better information in the future should induce more flexible decisions: the 'irreversibility effect'. This result relies on the definition of an irreversible position as one that would be technically or economically impossible to reverse. In practice, many positions can be reversed at an affordable cost. In this case an increase in informativeness alone is not enough to bias decisions in favour of more flexibility. We look for restrictions on decision sets, information structures and preferences that make possible to study the effect of information on flexibility.

LEE, K. *Wealth effects on self-insurance and self-protection against monetary and nonmonetary losses*. 147-159. This paper considers the wealth effects on self-insurance and self-protection activities against possible losses of monetary wealth such as properties and nonmonetary wealth such as health. Increased initial income or monetary wealth decreases the demand for self-insurance against monetary wealth loss under the decreasing absolute risk aversion assumption, and has an ambiguous effect on self-protection. However, increased initial monetary wealth increases both self-insurance and self-protection against health loss, explaining empirical trends, if wealth and health are complements. When multiple self-insurance activities against both types of losses are considered, the effect of an increase in initial monetary wealth on self-insurance against health loss remains the same, but the effect on self-insurance against wealth loss depends on the preferences.

WANG, C.-P., SHYU, D. & HUANG, H.-H. *Optimal insurance design under a value-at-risk framework*. 161-179. This study designs an optimal insurance policy form endogenously, assuming the objective of the insured is to maximize expected final wealth under the Value-at-Risk (VaR) constraint. The optimal insurance policy can be replicated using three options, including a long call option with a small strike price, a short call option with a large strike price, and a short cash-or-nothing call option. Additionally, this study also calculates the optimal insurance levels for these models when we restrict the indemnity to be one of three common forms: a deductible policy, an upper-limit policy, or a policy with proportional coinsurance.

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## INSURANCE: MATHEMATICS &amp; ECONOMICS

Volume 37 (2), 2005

ALBRECHER, H., CLARAMUNT, M. M. & MÁRMOL, M. *On the distribution of dividend payments in a Sparre Andersen model with generalized Erlang( $n$ ) interclaim times*. 324-334. In this paper, we present some results on the distribution of dividend payments until ruin under a Sparre Andersen risk model with generalized Erlang( $n$ )-distributed inter-claim times and a constant dividend barrier. An integro-differential equation for the moment-generating function of the sum of the discounted dividend payments until ruin is derived. Moreover, explicit solutions for arbitrary moments of the present value of dividend payments are obtained, when the individual claim amounts have a distribution with rational Laplace transform. Numerical illustrations of the results are given for an Erlang(2) risk model and Erlang(2)-distributed claim amounts.

BACINELLO, A. R. *Endogenous model of surrender conditions in equity-linked life insurance*. 270-296. We propose a model for pricing a unit-linked life insurance policy embedding a surrender option. We consider both single and annual premium contracts. First we analyse a quite general contract, for which we obtain a backward recursive valuation formula based on the Cox et al. [J. Finan. Econ. 7] binomial model. Then we concentrate upon a particular case, that is the famous model with exogenous minimum guarantees. In this case we extend our previous analysis in order to take into account the possibility that the guarantees at death or maturity and the surrender values are endogenously determined, and provide necessary and sufficient conditions for the premiums to be well defined.

BALLOTTA, L. *A Lévy process-based framework for the fair valuation of participating life insurance contracts*. 173-196. In this communication, we develop suitable valuation techniques for a with-profit/unitized with profit life insurance policy providing interest rate guarantees, when a jump-diffusion process for the evolution of the underlying reference portfolio is used. Particular attention is given to the mispricing generated by the misspecification of a jump-diffusion process for the underlying asset as a pure diffusion process, and to which extent this mispricing affects the profitability and the solvency of the life insurance company issuing these contracts.

BARBARIN, J. & DEVOLDER, P. *Risk measure and fair valuation of an investment guarantee in life insurance*. 297-323. Investment guarantees are amongst the most important topics in the pricing and management of life insurance. Traditionally, two ways of analyzing the risk are possible: on the one hand, the financial approach based on risk-neutral measure and leading to option pricing and continuous hedging strategy and on the other hand, a more actuarial

approach based on ruin probability and distribution of surplus. The purpose of this paper is to try to integrate these two approaches in the management of life insurance contracts with profits. First, we analyze in terms of value at risk and conditional value at risk the effect of putting an investment guarantee. This will be done in an ALM framework, based on different investment strategies of the insurer in terms of risk and matching between assets and liabilities. The liability side will be represented by a guaranteed technical rate; the asset side will be a mix of stocks, cash and bonds in a Gaussian environment with different matching strategies. Consequences of an investment choice in terms of ruin probability and level of solvency will be illustrated. In a second step, fair valuation principles are used in order to compute the market value of the contract and fix the participation rate of the contract.

CARDOSO, R. M. R. & WATERS, H. R. *Calculation of finite time ruin probabilities for some risk models*. 197-215. In this paper we discuss the numerical calculation of finite time ruin probabilities for two particular insurance risk models. The first model allows for the investment at a fixed rate of interest of the surplus whenever this is above a given level. This is related to a model studied by Embrechts and Schmidli [Adv. Appl. Probability 26] and by Schmidli [Schweizerische Vereinigung der Versicherungsmathematiker. Mitteilungen 1994 (1); Commun. Stat. Stochastic Models 10 (1994)]. Our second model is the classical risk model but with the insurer's premium rate depending on the level of the surplus. In our final section, we discuss the extension of these models to allow for the parameters to change over time in a deterministic way. Our methodology for calculating finite time ruin probabilities is to bound the surplus process by discrete-time Markov chains; the average of the bounds gives an approximation to the ruin probability. This approach was used by the authors in a previous paper, Cardoso and Waters [IME 33 (2003)], which considered a risk process with interest earned on the surplus.

CENTENO, M. L. *Dependent risks and excess of loss reinsurance*. 229-238. In this paper we study, from the insurance point of view, the optimal excess of loss retention limits for two dependent risks. We consider two optimization criteria, which are quite connected. The expected utility of wealth with respect to the exponential utility function and the adjustment coefficient of the retained aggregate claims amount. We consider that the number of claims is generated by a bivariate Poisson distribution. The premium calculation principle used for the excess of loss treaties is the expected value principle. Although the systems of equations, that give the optimal solution for both problems, look quite similar, we will see that the optimal solution is heavily dependent on the criterion chosen.

COLOMBO, L. & HABERMAN, S. *Optimal contributions in a defined benefit pension scheme with stochastic new entrants*. 335-354. This paper focuses on the impact of the stochastic evolution of the active membership population on the mismatch between assets and liabilities of a defined benefit pension scheme. Classical results in the actuarial literature on pension plan population theory have been extended to the stochastic case. The paper formulates the trade-off between risk and cost of contribution strategies. Then, using a constrained nonlinear programming approach, optimal contributions strategies have been derived and the trade-off solved by means of identifying an efficient frontier. Finally, a numerical application has been carried out, showing the inefficiency of certain classical normal cost methods.

FROSTIG, E. *The expected time to ruin in a risk process with constant barrier via martingales*. 216-228. Two risk models with a constant dividend barrier are considered. In the two models claims arrive according to a Poisson process. In the first model the claim size has a phase type distribution. In the second model the claim size is exponentially distributed, but the arrival rate, the mean claim size, and the premium rate are governed by a random environment, which changes according to a Markov process. Kella and Whitt [J. Appl. Probability 29 (1992)] martingale is applied in the first model. Asmussen and Kella [Adv.

Appl. Probability 32 (2000)] multi-dimensional martingale is applied in the second model. The expected time to ruin and the amount of dividends paid until ruin occurs are obtained for both models.

HOEDEMAKERS, T., DARKIEWICZ, G. & GOOVAERTS, M. J. *Approximations for life annuity contracts in a stochastic financial environment*. 239-269. In the traditional approach to life contingencies only decrements are assumed to be stochastic. In this contribution we consider the distribution of a life annuity (and a portfolio of life annuities) when also the stochastic nature of interest rates is taken into account. Although the literature concerning this topic is already quite rich, the authors usually restrict themselves to the computation of the first two or three moments. However, if one wants to determine, e.g. capital requirements using more sophisticated risk measures like Value-at-Risk or Tail Value-at-Risk, more detailed knowledge about underlying distributions is required. For this purpose, we propose to use the theory of comonotonic risks developed in Dhaene et al. [IME 31(1), 3-33; IME 31(2), 133-161], which has to be slightly adjusted to the case of scalar products. This methodology allows to obtain reliable approximations of the underlying distribution functions, in particular very accurate estimates of upper quantiles and stop-loss premiums. Several numerical illustrations confirm the very high accuracy of the methodology.

LAIVEN, R. J. A., GOOVAERTS, M. J. & HOEDEMAKERS, T. *Some asymptotic results for sums of dependent random variables, with actuarial applications*. 154-172. This paper establishes some asymptotic results for sums of dependent random variables, in the presence of heavy-tailedness conditions. We demonstrate how the derived results can be used to approximate functionals of sums of dependent random variables for which the analytic expression is too cumbersome to work with and which are of major importance in actuarial applications. Numerical illustrations are provided to assess the quality of the asymptotic approximations.

VERRALL, R. J. & ENGLAND, P. D. *Incorporating expert opinion into a stochastic model for the chain-ladder technique*. 355-370. To date, much effort has been directed towards the development of stochastic models that are analogous to traditional deterministic methods. In practice, however, the traditional models are often altered to incorporate expert opinion. This paper considers the use of Bayesian models to allow practitioners to apply their judgement to the development factors in the chain-ladder technique. The implementation uses MCMC methods within winBUGS. In this way, it is possible to use stochastic models to obtain predictive distributions of reserves in a much wider range of situations.

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#### SOUTH AFRICAN ACTUARIAL JOURNAL

Volume 4, 2004

ANDREW, J. P. *The conversion of members' rights in South African retirement funds from defined benefits to defined contributions and the statutory apportionment of the resulting actuarial surplus*. 1-62. This paper reviews and discusses the history of the conversion of members' rights in South African retirement funds from defined benefits to defined contributions. It explains the development of the law in this regard, including legislation governing the apportionment of surplus on conversion. It draws lessons from the process and discusses its ongoing effects.

LOWTHER, M. W. *Exercising actuarial discretion in the pricing of transfer values.* 63-96. This paper considers professional aspects of how actuaries should determine retirement-fund transfer values subsequent to the introduction of statutory minimum benefits in South Africa. It reviews past practices and in particular the exercise of actuarial discretion. It concludes that, in the future, there will still be scope for actuarial discretion when transfer values are determined. In exercising this discretion, actuaries must take decisions that are justifiable in terms of the reasons given, report adequately on such decisions and the impact thereof, and clearly indicate that the information should be distributed to all the parties concerned.

THOMSON, ROB. *Is actuarial science really a science?: Editorial.* 97-103.

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