

2005 ASTIN Colloquium Zurich Switzerland

The 2005 ASTIN Colloquium was held in Zurich, Switzerland. The papers and presentations spanned an impressive selection of topics: corporate strategy, economic modeling, fair valuation and solvency, mortality and pension, premium calculation, portfolio optimization and asset allocation, reinsurance, reserving, risk measures and dependence, solvency, and statistical and numerical methods.

The invited lectures featured well-known actuaries and academics. Actuaries interested in the developments of reserving techniques will be interested in the presentation by Thomas Mack of Munich Re. He provides a quick overview of the chain-ladder and Bornhuetter/Ferguson techniques. He shows that the chain-ladder method has a sound stochastic foundation and one can calculate the prediction error for an entire portfolio. While many actuaries have seen the Bornhuetter/Ferguson method as a manipulated version of chain-ladder, Mack shows how to correctly (and independently of the chain-ladder) estimate the parameters in this model. The final model he mentions is the Munich Chain Ladder. This model is meant to address the observation that the projection of paid triangles will in general not yield the same reserve estimates as the projection of incurred triangles. The Munich Chain Ladder is a combination of the classical chain-ladder method and the Bornhuetter/Ferguson method.

Hans Buehlmann, ETH Zurich, gave a lecture on his view of the three fundamental issues of insurance: the collective, the reserve, and profitability. He emphasized that the mathematical modeling of the collective is crucial to clarify and quantify our intuitive notions about it. Also in reserving actuaries must rethink the actuarial valuation and use sound financial concepts. Finally in considering profitability he stressed that assets and liabilities speak the same language (even though until recently actuaries have not been willing to recognize this). At the end of his presentation he stressed that while these might be the three fundamental issues of insurance; why not make them the “*three fundamental issues for the actuary*”?

Phelim Boyle, University of Waterloo, offered his reflections on incomplete markets, the divergence and convergence between finance and insurance, hedging versus reserving, the analysis and practical management of risks, and some implementation challenges.

Robert F. Engle, New York University, discussed econometric models for downside risk and their financial implications. He mentioned that downside risk can be modeled as a time series process and as consequences downside risk can be predicted and dynamic hedging and dynamic portfolio strategies can be implemented. His analysis shows that multi-period risks may be substantially different from one-period risks. Multi-period risk changes over time can be forecast and big market declines are more likely when volatility is high.

PREMIUM CALCULATION

Three papers were presented under the premium calculation category. Two of them deal with the analysis of bonus-malus systems (that is experience modifications). The paper by Niemiec Malgorzata, “A bonus-malus system as a Markov set-chain,” has some wide-ranging implications. The author takes the standard Markov chain a step further by allowing the transition probabilities to vary within an interval. The paper by Bonsdorf looks at the asymptotic properties of bonus-malus systems where both frequency and severity affect the migration to other classes.

RESERVING

Six papers explored issues in reserving and most of them used a stochastic approach. It is well known that sum of chain ladder projections across multiple triangles is not equal to the chain ladder projection

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of the sum of the triangles. Carsten Proehl and Claus Schmidt (Technische Universitaet Dresden) presented a multivariate chain-ladder method that explores this issue. Under certain assumptions their techniques can be used to analyze portfolios consisting of sub portfolios of risks. Werner Huerlimann, Aon Re and IRMG (Switzerland), revisited the methods of Benktander, Neuhaus, and Mack for credible loss ratio claims reserves. His method closely follows the model of Mack "Credible claim reserves: the Benktander method," ASTIN Bulletin 30(2) but provides two key advantages: the optimal credibility weights can be easily computed and different actuaries would always come up with the same result provided they use the same actuarial premiums.

The paper by Bertrand Verdier (Swiss Re) and Artur Klinger (Alea Europe) "JAB Chain: a model-based calculation of paid and incurred loss development factors" uses information on both paid and incurred triangles to estimate ultimate losses. Their method is similar to the Munich Chain Ladder introduced in 2003. They argue that the incurred process may be informative to the paid losses but the paid losses should not give any further information on the incurred amounts. After all the incurred amounts are supposed to be determined by using all historical payment information. Thus, they separately model the incurred process from the paid process.

"A dynamic claims reserving model," by Christian Roholte Larsen (Larsen & Partners) is based on individual claim development. His model can handle seasonal effects, changes in the mix of business, claim types, and claim sizes. In particular, the model takes into consideration that the development of large claims is often very different from the development of small claims.

REINSURANCE

Actuaries interested in analyzing observed market prices for reinsurance should read the paper "Benchmark rates for excess-of-loss reinsurance programs," by Verlaak, Huerlimann, and Beirlant. They use generalized linear and non-linear modeling techniques to analyze four years of reinsurance data for automobile third party coverage in the Belgian and Swiss markets.

Actuaries working on reinsurance strategy will be interested in "On the optimality of proportional reinsurance," by Lampert and Walhin where they study how four proportional reinsurance covers (quota share, variable quota share, surplus, and surplus with a table of lines) affect the results of the ceding company based on actual claims data. In particular, they show that a surplus treaty with a table of lines is not better than a standard surplus treaty. Also quota share is suboptimal compared to the other three forms.

The underwriting cycle is well known to all actuaries. But so far no one has come up with theory that explains it all. This year Rene Schnieper, "Modelling the underwriting cycle," presented a model to help us understand the cyclical nature of our business. His model is based on the assumption that cyclical results from changes in supply and demand for insurance. Cycles are induced by supply, demand, and external factors. Profits and losses feed back into surplus leading to shifts in supply. Temporary acceleration or deceleration of demand growth leads to fluctuations in the rate of return. And significant changes in the value of assets have a direct impact on the amount of capital available to insurance companies. Moreover, there are complex interactions of the above factors that play crucial roles.

PORTFOLIO OPTIMIZATION AND ASSET ALLOCATION

Donald Mango, then GE Insurance Solutions but now at Guy Carpenter, presented his ideas of insurance capital as a shared asset; that is, insurance contracts have simultaneous rights to access (part

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or all of) the shared asset. He discussed the valuation of parental guarantees, how to determine capital usage cost, and showed how his ideas could be used to price products and evaluate a portfolio mix using economic value added concepts.

Delong's paper investigates the use of stochastic control theory to find the optimal investment strategy for a non-life insurance company. He uses the standard Black-Scholes market setup (n-risky assets and one risk-free asset) but does not consider regulatory restrictions (no constraints on control variables). He concludes that higher initial reserves (via higher premiums) lead to more cautious investment in the future.

CORPORATE STRATEGY

Almost all the papers in this section deal with the problem of finding an optimal dividend strategy. All the papers are very technical and we only provide a very concise overview. The paper "Optimal dividends in the Brownian motion model with credit and debit interest" extends the classical model by crediting the surplus account with interest. The authors concentrate on barrier strategies; that is, dividends are paid only if the surplus amount exceeds the barrier.

Two papers by Lin and Pavlova and Gerber and Shiu investigate dividend strategies for the compound Poisson model. Gerber and Shiu show that the optimal dividend payout is a threshold strategy. Lin and Pavlova derive analytic results for the probability of ruin, time of ruin, and the joint distributions of the surplus immediately before ruin and the deficit at ruin.

The last paper by Gerber, Shiu, and Smith also investigates the compound Poisson model where dividends are paid based on a threshold strategy but with a twist. The classical problem is to find the threshold that maximizes the expected discounted dividend payout without regard to the size of the deficit at time of ruin. Here they find the threshold that maximizes the difference between discounted dividends until ruin and the deficit at ruin.

RISK AND MEASURE DEPENDENCE

Copulas are used in most of papers in this category. In "Dependence matters!" Doreen Strassburger and Dietmar Pfeifer clearly articulate the often abused concept of correlation is not an appropriate dependence measure when risk aggregation or reinsurance of combined risks is considered. They show, via case studies using the concept of copulas, that several uncorrelated risks give rise to a broad range of aggregate sum distributions.

Another paper using copulas to measure the dependence between risks is by David Cadoux and Jean-Marc Loizeau. They investigate the capital adequacy of a French non-life insurer using Monte Carlo simulations. Their underlying model is based on copulas, which they fit to actual data and select based on a chi-squared goodness of fit criterion.

Castella Herve and Chiolero Alain also use copulas in their study of a reinsurance portfolio exposed to natural catastrophe risk. They consider analytic and empirical copulas along with another technique called event-induced dependencies (used in CAT models). Their data show that the fitted Gaussian copula gives loss distributions that are very similar to the ones obtained from the empirical copula or the event-induced dependencies technique. Moreover, they do not see any evidence of tail dependence.

SOLVENCY

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In “Measuring Loss Reserve Uncertainty,” William H. Panning (Willis Re) proposed a simple parametric method for measuring the loss reserve uncertainty; namely, the coefficient of variation of estimated future loss payments. He argues that the coefficient of variation (CV) offers a simple and robust method with the following important properties: (1) one can compare the CV across different lines of business, (2) the CV can be compared across different firms for the same line of business, and (3) his method can be applied to reserves that have been estimated by methods different than the one he recommends. The paper is very well organized and the author provides clear explanation on how to implement his formulas in Excel.

Thomas Luder, Swiss Federal Office of Private Insurance, in his paper “Swiss Solvency Test in non-life Insurance” shows one of the tools that the Swiss regulator uses to identify the risks that an insurance company is exposed. Their approach is based on a standard stochastic model together with a set of scenarios. Various components of their model are described in detail: target capital, risk bearing capital, market risks, insurance risks, and the use of scenarios.

The paper “Legal Valuation Portfolio in Non-Life Insurance” by Buchwalder, Buehlmann, Merz, and Wuerthrich advocates the construction of a portfolio of assets as the most important step in assessing the liabilities of a risk carrier. The authors provide a clear presentation on how to calculate the errors of prediction based on the classical chain ladder model. Not only do they provide prediction errors for single accident years but more importantly also for accounting years. The authors also note that their method is similar to the one proposed by Mack in “Distribution-free calculation of the standard error of Chain Ladder reserve estimates,” ASTIN Bulletin 23 (2), 1993. In fact, Mack’s assumptions are generalizations of those presented in this paper. The assumptions in this paper are the same as those in Murphy’s weighted average development (WAD) methods presented in “Unbiased Loss Development Factors,” CAS Proceedings Volume LXXXI, 1994. In the example they worked out have been found to give the same result numerically as in Murphy’s paper.

STATISTICAL AND NUMERICAL METHODS

In “Multivariate Excess Distributions,” Balkema (University of Amsterdam) and Embrechts (ETH Zurich) investigate the limiting behavior of a vector of losses conditional on those losses being in a remote half space; that is, simultaneous (to some degree) large losses in each component. The paper is very technical but it builds on the one-dimensional theory of extreme values where the limiting distribution of exceedances is a generalized Pareto distribution.

In the past many papers have dealt with the estimation of liabilities based on a single triangle of data. But there are a lot of situations where actuaries need to estimate the run-off of correlated loss triangles. For example, consider paid versus incurred loss development, different lines of liability business, or triangles arising from excess of loss coverage with several layers. Erhard Kremer, University of Hamburg, tackles this problem in the paper “The correlated chain-ladder method for reserving in case of multiple excess layers.” He shows how to use linear regression to estimate the loss development factors for all triangles simultaneously. By looking at the correlation, we are bringing in additional related information and could improve the estimates.

Other papers presented in the Colloquium are also worthwhile reading. All papers can be downloaded from ASTIN Colloquium website at <http://www.actuaries.org/ASTIN/Colloquia/Zurich/papers.cfm> The next ASTIN Colloquium will be very special because ASTIN will be celebrating its 50th anniversary. The colloquium will be held on June 20-23, 2007 in Orlando, Florida. Hope to see you there.