



DISTINGUISHED ACADEMIC ACTUARIES

An Interview With Hans U. Gerber



Hans U. Gerber, ASA, is professor emeritus in the Department of Actuarial Science at the University of Lausanne, Lausanne, Switzerland. He is an honorary member of the Swiss Association of Actuaries. Professor Gerber is the recipient of many prestigious actuarial distinctions, including several *North American Actuarial Journal* Annual Prizes (1995, 1998, 2000), Halmstad Prizes (1994, 1998, 2000) and the International Actuarial Association Centennial Gold Medal for Outstanding Scientific Achievements Within the Actuarial Profession (1995). He has more than 160 research publications and is known as an excellent teacher and academic adviser.

Q: Tell us about your background. How did you enter the actuarial profession?

A: In some countries, tuition is high and students are away from home. As a consequence, university education is expensive, which is a well-known problem for society. However, there is also a positive aspect to it. If the cost is high, the future students spend

time on the questions of what to study, where to enroll and what the job opportunities after graduation will be. In Switzerland, the situation is different, and many future students don't spend enough time on these questions. I was no exception. Because I loved mathematics in high school, I decided to study mathematics at ETH in my hometown Zürich, without having a clear idea of what I was going to do after graduation. After three semesters, I realized that there were essentially only three job opportunities for a mathematician: actuary, high school teacher or computer specialist (new at that time). I decided to become an actuary, presumably with an insurance company. I was privileged to be Hans Bühlmann's PhD student. Subsequently, I was lucky to spend two years in the United States, at the University of Rochester and at the University of Michigan, both times as a visiting assistant professor. At that time, I had absolutely no academic ambitions. After my return to Switzerland, I started my actuarial career with the largest life insurance company in Switzerland. But then something unexpected happened: I was contacted by the University of Michigan, which was looking for an actuarial professor. My wife and I convinced each other that we should go back to the United States. I passed the first four exams of the Society of Actuaries (SOA) while still in Switzerland. In Ann Arbor, I had to take the fifth exam (which covered also risk theory) three times to become an associate of the SOA (ASA).

Academically, I became an actuary when I started using the symbols λ and δ (instead of α and β) for the Poisson parameter and the force of interest.

Q: Who was an influential person in your professional life, and why?

A: Hans Bühlmann, my PhD adviser, for several reasons. He gave me a really good research topic (which was based on an idea of Bruno de Finetti on dividend payment strategies). For my second year in the United States, I could choose among Columbia–Missouri, Michigan and Yale. Hans suggested Michigan because of their actuarial program. I followed Hans's advice; this decision turned out to be crucial for my subsequent career. My first year in the United States was at the University of Rochester. Julian Keilson (one of the founders of the journal *Stochastic Processes and Their Applications*) gave me intensive lessons in English and mathematics, sometimes on Saturday and often with humor. I always remember the limerick (about the man in Aberdeen and convexity ...) he taught me. Was that perhaps the reason why many years later Olivier Deprez wrote his thesis “*On Convex Principles of Premium Calculation*”?

All my coauthors (including my PhD students) played an influential role. Writing the SOA textbook *Actuarial Mathematics* with Newt Bowers, Jim Hickman, Don Jones and Cecil Nesbitt was a unique experience. Pedagogical details were discussed extensively. A reviewer of the book reminded us not to forget the self-studying actuarial student in Boise, Idaho. Cecil Nesbitt always gave me good advice. For example, it never hurts to start the title of a paper with the word *On* (reason: the choice between arrogance and modesty). For many years, I shared an office with Don Jones; we had good discussions, not always about actuarial topics Similar exchanges with Arnold Shapiro at research conferences. I am grateful to David Cummins for his extraordinary help with editing my green paperback (*An Introduction to Mathematical Risk Theory*). In his farewell lecture (December 2019), David Dickson stated that he read Hans' book so many times the book fell apart and he had to put tape on it." My final move to the University of Lausanne was due to the vision of Marc-Henri Amsler. Marc Goovaerts was a great visionary. Together with Etienne de Vylder and Jean Haezendonck, he founded *Insurance: Mathematics and Economics (IME)*, today considered to be the top journal in actuarial science. My most important contribution to the success of *IME* was to recruit Elias Shiu as an editor. My two most successful papers ("[Option Pricing by Esscher Transforms](#)" and "[On the Time Value of Ruin](#)") are joint papers with Elias Shiu, both published in journals of the SOA. Thanks to Hailiang Yang and his colleagues, Hong Kong has become my second home for many years. And I truly enjoyed visiting China. But most important, I would like to mention my late wife, Marlis. Without her, my career would not have been possible.

Q: What is your personal philosophy with regard to teaching?

A: Blackboard and chalk (sometimes with jokes), with a microphone if necessary. Such a live event ensures authenticity. In Lausanne, I regularly taught a first-year calculus and linear algebra course in an auditorium of some 300 students. When slides are used, it is important to resist the temptation of "cheating" and speeding. Learning by teaching? Yes, sometimes.

Q: To what extent did professional actuarial exams influence your teaching?

A: The teacher and the student have a common goal. Thus, it is easy to motivate the students for the teamwork.

Q: What is your personal philosophy with regard to actuarial research? Was your approach practical, theoretical or a combination of both, and why?

A: Probably a combination. It is all relative. In the words of Arnold Shapiro, "In the business school I'm viewed as a mathematician. In the math department they consider me a poet."



Q: Looking back, would you have welcomed greater input from or communication with the business community to indicate possible areas of research likely to be of particular value or practical interest to them?

A: Switzerland is a small country. So contact with the business community is natural.

Q: Looking forward, do you feel that members of the business community should be given greater opportunities to familiarize themselves with the latest academic research and to benefit from it? If yes, how do you suggest that it be done?

A: Yes. For that purpose, the Swiss Association of Actuaries created its [International Summer School](#) almost 40 years ago. My colleague François Dufresne, ASA, has successfully organized this annual event for the last 16 years.

Q: What would you tell or advise someone considering entering the actuarial profession?

A: Good choice! Mathematical and computer skills are important. But so are soft skills such as communication. Take the exams and good luck!

Q: Thinking back on your career, what are your biggest accomplishments? Any memories or moments that stand out above the rest? Any disappointments?

A: Receiving the Halmstad Prize three times for joint papers with Elias Shiu and obtaining honorary degrees from the Universities of Leuven, Lyon and Waterloo were very special. In 1985, when I met Elias in Winnipeg, I would never have imagined that one day, a function would be named after the two of us. A French wisdom is that *jamais deux sans trois*. Unfortunately, *jamais trois sans quatre* is not always true.

Q: What might someone be surprised to know about you?

A: I am a fan and friend of the circus. ■



THE ART OF ACTUARIAL SCIENCE

The Consulting “Regulatory” Actuary

By Sarah Christiansen

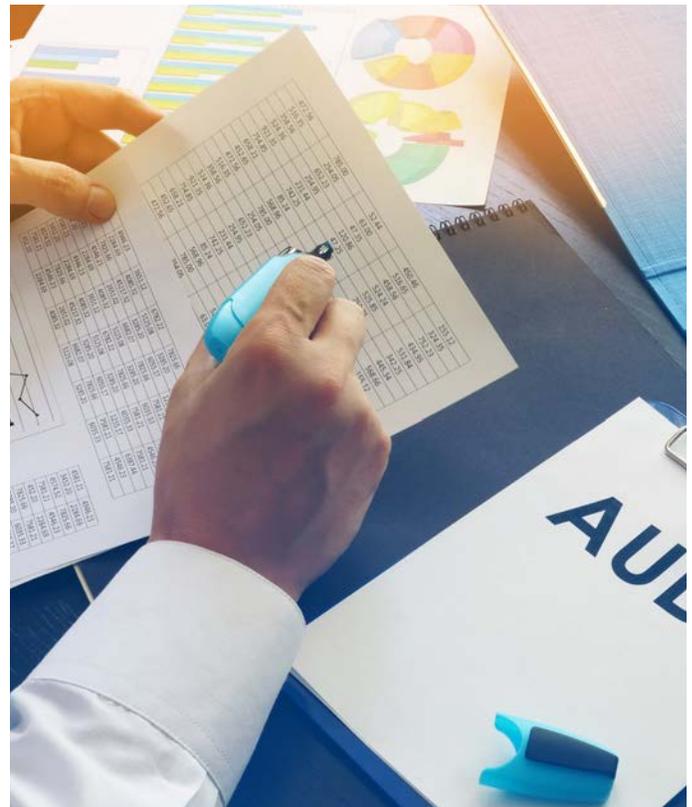
Insurance Strategies Consulting’s exam team includes several independent consultants, of which I am one. The purpose of our team is to work on the risk-focused state audits (exams) of insurance companies. The primary concern of the state insurance departments is protecting the policyholders by making sure that the company is solvent. Reducing the likelihood of accessing the state guarantee fund protects all the companies. If a company becomes insolvent, the policyholders can access their guarantees and, if the company has insufficient funds to meet the guarantees, the other companies domiciled in the state may have to contribute additional funds to ensure the guarantee fund has enough money. Our team motto is “trust but verify.”

The states generally audit a company in good standing once every five years. The audits involve either a state insurance department team or a specialized auditing firm that specializes in regulatory audits, under the direction of the examiner-in-charge (EIC), who is an employee of, or reports to, the state insurance department. These teams audit the accounting, investment, claims paying and all other aspects of the insurance company. If they do not have enough actuarial expertise on their staff, they may outsource the actuarial portion of the audit to an actuarial consulting firm. If a company is relatively new or not in good standing, there may be more frequent reviews.

Some of our audits have been multistate audits, and some of the companies have been international companies. The exam teams range from two to six people, depending on the size of the company being audited, and the work is divided by line of business. I usually do annuities and/or health (but not long-term care).

RISK-FOCUSED EXAMINATIONS

Risk-focused examinations involve determining where the larger risks to the company are and focusing the examination



there. In a risk-focused exam, the examination team is included on interviews with the company executives, which include the chief actuary and chief risk officer as well as the CFO and CEO, to gain an understanding of the company culture. The team also reviews the parts of the external auditor’s reports that pertain to reserves, and the team can now rely on their work. A company that has been merged into a larger company, where the original company is in run-off mode, may have a less-intensive audit than a company that is actively selling policies. Various states approach risk-focused examinations differently. Each examination team completes a risk matrix, and the examination focuses on those areas of the matrix where there is high or moderate risk of the financials being misstated. The state where we do most of our work, for example, considers the risk of reserve misstatement as one that would have a moderate to high impact on the company, so we can begin working on our reserve audits earlier in the process. That gives the team time to complete its work without being rushed and to get its report into the state by the time the rest of the exam team completes its work.

AUDIT PROCESS

The team starts by sending out an initial data request, which includes all reports, copies of the annual statements and seriatim policy lists, without personal identifying information, which can be balanced to the reserves. Some reserves, such as incurred but not reported (IBNR) reserves, are calculated in the aggregate, and the team asks for the supporting work papers. Teams request this data in electronic form whenever possible; it is generally provided via a share drive. These reports are always confidential.

The team balances the seriatim listings to the annual statement to make sure that all the reserves are included on the annual statement. With some large international companies, this is much easier said than done, since the statements are on a legal entity basis and some companies organize their liabilities on a line of business basis. The various legal entities may be domiciled in different states, so the law may be different. There are always some small pieces that come in from, say, third-party administrators (TPA) or brokers. If these become material (that is defined by the state insurance department), then the team may have to request that the company get seriatim listings from that TPA. The team also takes the reinsurance reserve credit into consideration and may review the treaties. If the treaties are not reviewed, it is because the examination team is reviewing them or the reinsurance is minimal.

The team reviews the reports, which may mean reading very large reports. Some of the asset adequacy reports run several hundred pages. In addition to the asset adequacy report (VM 30), the team reviews X factor reports, VM-21 (AG 43) reports, AG 38, C3 Phase 1 and C3 Phase 2 reports and PBR (VM-20) reports, as applicable to the company being reviewed.

The team’s report review, which is part of all risk-focused exams, includes checking to make sure that the report contains everything that is required. The team also reviews the assumptions used in the model to make sure that they are reasonable. The asset adequacy report is supposed to contain enough data so that a seasoned actuary can make a judgment based on the report. If the report has enough detail, there may be only five to 10 questions, but if the report is written at the big-picture level only, there can be over 50 questions. A team often asks for the detail output from the actuarial software as an Excel spreadsheet to verify that the model output is consistent with the assumptions mentioned in the report.

Then the team chooses sample policies to review. Often these come from the plan codes with the largest reserves, but the very small reserves and zero-dollar reserves are also looked at to make sure that these are appropriate. Structured settlements and substandard annuities are high on my choice of items to review, because they are subject to AG 9 and because they are individualized policies. A team might also review new blocks that are expected to grow. My preference most of the time is to calculate the reserves independently on a spreadsheet from first

principles. That works well for most of the simple annuities and even the indexed ones, but not for the highly complex variable annuities. The more individualized the reserving process is, as it is with variable annuities and principle-based reserves (PBR), the more time must be spent validating assumptions and methodology as opposed to reviewing individual reserve calculations.

For the complex annuities and for much of the life insurance, audit trails from the actuarial software will be requested to review. It really helps when there is someone in the company who knows the software well, and it is not a “black box.”

BLACK BOX

A black box occurs when no one in the company understands how a software program works. This may be because everyone who knew how the software works has left the company or moved to a different department. It may be because the software is proprietary; for example, most of the software for modeling asset cash flows in various interest rate scenarios is proprietary. Generally, however, the investment department does have someone who has access to a manual and understands the underlying assumptions. If the asset cash flow software is commonly used, and since there are many fewer moving parts than in actuarial software, this is generally acceptable. Audit trails may be many pages long and difficult to follow (that is where having someone in the company who can guide the exam team is crucial), but they do generally alleviate the black box aspect of the various complex actuarial software packages that are often customized for a particular company.

The more complete the initial data is, the fewer questions and follow-up requests that an exam team will have because they will have all the data needed to calculate reserves. However, if all that’s available is a policy number and a reserve amount, that guarantees that the team will have to ask for the necessary data for all policies in the samples.

FINAL REPORT

The team documents its work and produces a final report, which is shared with the company and goes to the EIC and the state insurance department. The final report includes the findings, any adjustments and recommendations for the future. If the total adjustments plus those from the rest of the examination team are over the materiality threshold, the company may be required to restate its financials. This report becomes part of the state insurance department’s files on the company.

The team tries to avoid asking questions during annual statement time and quarterly statement time; however, the best way to avoid questions then is to provide sufficient information when responding to the initial data request to enable the team to sort the policies by plan code and calculate reserves independently.

STATE LAWS

For those of you whose work involves valuation, it would be prudent to pay attention not only to the laws of your state, but

of other states, especially New York. New York has the strictest standards of any state and applies its standards extraterritorially, thereby making all of a company’s business for a company that issues policies in New York, subject to New York law. I came across a situation where the direct writer was a small regional insurer and the reinsurance company was a major reinsurer, licensed nationwide. There was a block of business issued in the late 1990s where New York law was the predecessor of the XXX law for term life insurance reserves, and the state of domicile permitted gross premium reserves. This meant that the reinsurer was holding much larger reserves on that block than the direct insurer was. And when filling out the annual statement, the valuation actuary had just taken the total from the reinsurer’s computer output. That meant that indirectly and unintentionally too much reserve credit was given for reinsurance. The audit stayed open for an additional six months while the administrative system was corrected, and the actuary revised his reserves for that block, lowering the reinsurance credit to the coinsurance percentage of the direct reserve and using X factors in later blocks (where he had used 1 to be conservative). Fortunately, his conservatism in the other blocks meant that the company did not have to restate its financials for the year of the audit. Valuation actuaries need to carefully review and understand information received from reinsurers or other sources.

ARTIFICIAL INTELLIGENCE (AI)

As a regulator, I abhor those black boxes that do not permit access to their assumptions—and for that reason, I do not think artificial intelligence is appropriate for reserving purposes. For one thing, when a team requests that audit trail, it is as of the end of the year being examined. Right now, exam teams are doing 2018 audits—and will be doing them until all the companies that have to be examined in 2018 are completed. The state law/National Association of Insurance Commissioners (NAIC) requires that all 2018 audits be completed by June 30, 2020. As soon as these are finished, teams will start on 2019 audits—and these can’t be started until the 2019 annual statements are filed, including the required reports, which generally means the end of March 2020 at the earliest. But AI keeps on learning, so how does one get a Dec. 31, 2018, reserve audit trail from a model sometime in March 2020? Beyond the reproducibility question, which might be solvable, there is the question of what happens if the underlying assumptions are changed or scenarios need to be run on the model? In my opinion, AI does not have a good explanation of why it did what it did.

ACADEMIA’S POSSIBLE ROLE

Academic actuaries can help exam teams in two ways, one involving the education role and the other a research role. Relative to the research role, whether we like it or not, AI is probably part of the future. A good study determining (for reserving but also pricing purposes) whether there is reproducibility of results and how to do this would be very important. If 1,000 policies are run on an AI model in the original order, and then from the same starting point run in reverse order—are the results the same on a policy-by-policy basis? What about if after the first run (again starting from the same place), a subset of 10 or 100 policies are run (not consecutive policies)—are the results the same? What do we need to do with the model so that results are reproducible? Also, how do we explain what the model does well enough to take responsibility that the results are correct? Does this get into the areas such as are covered by ASOP 38, using models that are outside of one’s expertise? This particular ASOP is for property casualty actuaries. It was developed for actuaries who use meteorological models for catastrophe modeling; however, that does not preclude a similar ASOP for life, health and/or pension areas.

In the education role, academic actuaries can help us by encouraging their students to understand the models and the principles on which they are based. Encourage them to ask a lot of questions and to document their work.

In conclusion, this is a challenging and interesting career path for experienced actuaries. Because an exam team usually does several examinations a year, they have a new learning curve for each one. Even if they worked on the same company five years ago, since they have examined other companies in the meantime, the team is no longer as familiar with that company as they were when they completed the last examination. The company may also have had some systems changes or upgrades and even the contacts may well be different. The appointed actuary may be different, and the report may be organized very differently than it was five years earlier. All of these hurdles mean consulting regulatory actuaries must keep their skills sharp to ensure their work is at its best. ■



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ACTUARIAL RESEARCH CONFERENCE

University of Nebraska– Lincoln Invites You to ARC 2020

By Sue Vagts, Colin Ramsay and Shengchao Zhuang

Editor's note: At the time of this publication, all dates related to the ARC were scheduled. It is possible they may be rescheduled or canceled due to COVID-19.

The University of Nebraska–Lincoln (UNL) is proud to host the 55th Actuarial Research Conference (ARC). The conference will take place from Sunday, Aug. 9, through Wednesday, Aug. 12, 2020. Most activities will take place at the College of Business' Howard Hawks Hall on the UNL city campus in downtown Lincoln.

REGISTRATION FOR ARC 2020

Registration for the conference is now open. Attendees can register and find more information about accommodations and transportation on the official [ARC website](#). The abstract submission deadline for presenters is May 31, and the early registration deadline for the conference is June 30.

TRAVEL TO ARC 2020

Air travel to Lincoln, Nebraska, is convenient. The campus is only a 10-minute drive from the Lincoln Airport (LNK), from which you may take hotel shuttles, rideshare services, taxis or rental cars to your hotel. Additionally, Lincoln is a one-hour drive from Omaha, Nebraska's airport (OMA; also known as Eppley Airfield). There are many daily flights to and from most major U.S. cities and these airports.

Attendees may choose to stay on campus in suite-style housing or off campus in downtown hotels, which are within walking distance of the campus.

Lincoln is a medium-size city with many theaters, museums, parks and sports facilities, as well as a variety of excellent restaurants and bars. Notable museums include the International Quilt Museum, Sheldon Art Gallery, Morrill Hall and the Children's Museum—all of them on or very near campus. Off campus, the Lincoln Children's Zoo and Sunken Gardens are just a short drive away.



PLANNED ACTIVITIES FOR ARC 2020

The conference will kick off with an evening reception on Aug. 9 in the atrium of the College of Business. This will be followed by three days of engaging and informative sessions, including a poster session by graduate and undergraduate students. For conference attendees, we have planned a visit to the Omaha Henry Doorly Zoo and Aquarium, which is consistently ranked as one of the world's best zoos. The zoo offers a variety of travel-worthy experiences, including wandering through the world's largest indoor desert, the largest indoor rainforest in North America, the Scott Aquarium, the Kingdoms of the Night exhibit and many more adventures. Our half day at the zoo will be followed by a banquet dinner next to the manta rays inside the Scott Aquarium.

ABOUT THE UNL ACTUARIAL SCIENCE PROGRAM

The University of Nebraska–Lincoln boasts a strong history in actuarial science, beginning in the 1920s when math professor Floyd Harper taught actuarial mathematics. The program formalized in 1957 when industry leaders of the Nebraska Actuaries Club hired a director and provided external funding and oversight. Today, our students can major in actuarial science through either the College of Business or the College of Arts and Sciences, even though we are physically and administratively housed in the College of Business. In 2017, the College of Business formally moved into its new 240,000-square-foot Howard L. Hawks Hall, which will be the venue for the conference. Within the College of Business, we are a part of the Department of Finance and currently have seven full-time faculty members in actuarial science, with one in risk

management and insurance. Of these eight faculty members, six are active in research and two are professors of practice with industry experience. We offer both undergraduate and graduate programs in actuarial science. Our 400 students come from 23 states and 14 countries.

The Nebraska faculty, staff, students and members of the Nebraska Actuaries Club all look forward to welcoming you to ARC 2020. We hope you have a great conference and a fantastic visit to Lincoln! ■



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