

## EDITORIAL NOTE

The 2004 ASTIN Colloquium was held in Bergen, Norway. Amongst many excellent invited talks and contributed papers (see the full report later in this volume) one of the highlights was the keynote closing address given by the Vice-Chairman of ASTIN, Jean Lemaire. The Editors thought that Jean's address was sufficiently original and thought provoking to merit wider exposure as an 'extended editorial' to all of the members of ASTIN and AFIR. We are very grateful to Jean for taking the time to provide us with a full text version of this address.

## CHALLENGES TO ACTUARIAL SCIENCE IN THE 21<sup>ST</sup> CENTURY

BY

JEAN LEMAIRE

"Prediction is very difficult, especially if it's about the future"  
Niels Bohr (1885-1962)

It was a difficult decision to accept the challenge of the Organizing Committee of the Bergen ASTIN Colloquium to share my ideas about the development of actuarial science over the next one hundred years. What could I possibly say that the brightest minds in our field, the Presidents of our national actuarial associations, have not discussed in successive annual addresses? Then I realized that, as actuaries, we are all making a living making predictions, and we know that our success rate is far below 100%. I also realized that, if most of my predictions turn out to be dead wrong, I would be in excellent company. Very distinguished scientists and industrialists have made predictions that turned out to be ... not exactly true.

"640K should be enough for anyone" (Bill Gates, 1984)

"I think there is a world market for maybe five computers" (Thomas Watson, Chairman of IBM, 1943)

"There is no reason anyone in the right state of mind will want a computer in their home" (Ken Olson, President of Digital Equipment Corp, 1977)

"Television? A great invention, but no commercial future (Consultant's memo, 1934)

“Who the hell wants to hear movie actors talk?” (H. Warner, Warner Brothers, 1927)

“We don’t like their sound, and guitar music is on the way out” (Decca Recording Co, rejecting the Beatles, 1962)

“Heavier-than-air flying machines are impossible” (Lord Kelvin, President, Royal Society, 1895)

“Drill for oil? You mean drill into the ground to try to find oil? You’re crazy.” (Edwin Drake associates, 1859)

“Stocks have reached what looks like a permanently high plateau” (Irving Fisher, Professor of Economics, Yale University, 1929)

Given these monumental prediction failures, I decided to accept the challenge of our Norwegian friends, and tackled the problem as an actuary: try to forecast the future by looking into the past first. An insurance company has been compared to a car driven by the company’s CEO, with the Vice-President for sales pushing the accelerator, both following advice from the actuary who is looking at the road behind the car. So let’s start by looking at the road behind the car, if only to describe to the young actuaries in the audience how far along we have come in the last 30+ years.

My road began many years ago, when I graduated from the Free University of Brussels as an actuary, after having learned the mathematics of compound interest and the calculation of insurance premiums and reserves using a mortality table, one course in accounting, one course in economics. My actuarial thesis included a simulation, which I achieved by typing about 600 punch cards, bringing them every evening to the computer center of the university, only to learn the next morning that there was a semi-column instead of a period on card 63 that prevented the computer from looking at the next 500+ cards. After two months my program was ready, and I booked the University main frame computer – all of it – for a Sunday night, between 10 pm and 4 am, to run my program, for the one and only possible time. At 2 am, the printer ran out of paper, and I had to wake up the IBM representative for Belgium to ask him how to change the paper. I then had to type my thesis on a manual typewriter, pushing as hard as I could on every single keystroke in order for all six required carbon copies of the thesis to be readable. Typing mistakes were nightmares, as they had to be scraped off every single copy using a shaving blade. Yes, times have changed.

While I am a little jealous of the fact that all of you can now obtain the same results in the comfort of your home in about half an hour, these were exciting times to be an actuary. With my fantastic knowledge of mortality tables and compound interest, I could be on top of everything that got published in actuarial science. I got so excited at the stochastic models published in a new journal called the ASTIN Bulletin. I knew everything about actuarial science, this was wonderful.

Today, when I open the very same ASTIN Bulletin, I realize that I don’t know everything about actuarial science any more. Part of this is because I graduated

during the Punch-Card Era, but most of it is due to the extraordinary development of our profession.

While I am overjoyed at this vigorous expansion of our field, due to the remarkable work of so many colleagues, some aspects of this growth worry me. According to the Education Guidelines and Syllabus approved by the IAA Council, to be implemented by all full members of the IAA from 2005 onwards, if I want to become an actuary today, I still need to know compound interest and mortality tables, but in addition, I need to learn the different asset types and securities markets, the term structure of interest rates, the taxation and valuation of investments, principles of portfolio selection and management, as well as practice standards and my code of conduct. I need to be an expert in capital management, option pricing, asset-liability management, the shape of demand curves, oligopolistic competition, the fiscal and monetary policy of the central bank, the CAPM model, ... what next? Oh yes, copulas!

I certainly do not question the use of copulas or the CAPM model, these topics are wonderful tools for actuaries, I am just worried about the evolution of our curriculum. In the constant search of an adequate balance between depth and breadth in our education, I fear that the pendulum is swinging in the direction of breadth. I fear that the actuary of the 21<sup>st</sup> century will be required to know so many fields that he will be the expert of none. He, or, more and more so, she, and, more and more so, Asian rather than white. I was astounded to read in the IAA's Education Guidelines "Actuarial Mathematics would be expected to have more than a one-tenth involvement in the [education] process." One-tenth! I thought actuaries were – by definition – the unique experts in actuarial mathematics, and now national associations need to be reminded to spend at least 10% of the time educating students on the very topic that creates our value. This is like asking future brain surgeons to devote at least 10% of their training time to the study of medicine!

I believe that it is time to re-focus actuarial training towards our own discipline, what makes us unique and different from other quantitatively-oriented financial analysts. With more and more actuaries working in non-traditional areas, a trend that will continue, it will not be possible any more to fill our brains with all of these special models that we may or may not use in the future. Our education systems will need to prepare us to tackle all of the new problems that we may face, rather than overfill our brains with too many models from too many topics. Nothing new, here, Michel de Montaigne said it already in the 16th century, "Mieux vaut la tête bien faite que bien pleine". Better a brain well built than well filled.

I know that it is easier to add new material to a curriculum than to delete material, but this has to be done. We need to control the time it takes the average student to become a fully-qualified actuary. Yes, we are highly specialized practitioners with a mathematical brain, and it takes time to acquire the necessary knowledge, but brain surgeons we are not; we should not study until the age of 27 or 28 to attain actuarial certification. This new, global, competitive world that we live in, will force us to deliver actuarial service at an affordable price, and this means reduced education time. Otherwise our jobs may be outsourced to India.

If we cannot control this explosion of material, we will face a great danger, the danger of losing great minds to competition. In the future, it will become more difficult to attract the brightest students to our field. First, the overall level of prosperity that many countries have achieved may result in a certain disinclination to enrol in very demanding studies. Second, the duration and difficulty of our training systems results in the loss of qualified students, who find faster and easier ways to earn a good living. I see this every year in the actuarial program of my School. The brightest minority students in America do not choose to become actuaries, they get a graduate degree in statistics or an MBA and access high salaries much faster than actuaries. As actuaries we generally feel very satisfied with our position in society, and the high salaries we command when we get our certification. But did you look at the starting salaries of 26-year old graduates of a doctoral program in finance, or accounting? Or MBAs from a top university? If you do, you will be convinced that we are not the only experts of the financial world, nor are we getting the best compensation package.

Given this constraint on education time, and given that education has to be based on a vision of future skills, what are the skills that actuaries need to develop to remain competitive in the 21st century? Three, I believe

1. Actuarial Common Sense. By this I mean an in-depth knowledge of probability, statistics, and stochastic actuarial modelling, not exclusively life, non-life, or Workers Compensation, as I believe these distinctions will progressively fade away;
2. Creativity;
- and
3. Communication Skills.

### **Actuarial Common Sense**

In my opinion, we need to combine a profound mastery of the tools that make us unique with creativity to compete with other specialists of financial risks. The 21<sup>st</sup> century world constantly invents new ways to transfer risk, innovative ways to reduce the financial impact of economic suffering and human disappointment. We must be ready to attach probabilities to these events and price these risks. Here are a few risks that actuaries had to price recently, new policies for which we had to use, not our knowledge of copulas, but creativity, and in-depth knowledge of probabilistic and actuarial models.

1. **Millenium bug policies:** coverage of the legal risk linked to computer failure due to the Millenium bug
2. **Belgian National Lottery policy:** protection of the Belgian National Lottery against the risk of printing twice the winning ticket
3. **Asbestos Contractors' Liability.** Some contractors specialize in removing asbestos from schools and hospitals in the US. This is done by enveloping the

whole school in a gigantic plastic bag, and decreasing the air pressure inside the bag. What is the probability that, due to a hole in the plastic bag, some asbestos particles are released in the atmosphere, and inhaled by some pedestrian who dies from lung cancer 20 years later, with his widow suing the contractor? Obviously an incredibly small probability, but it had to be estimated, the contractor's liability policy had to be priced and issued, after approval of the model by a regulator. No liability policy, no work done in the US!

4. **Golf hole-in-one insurance.** Organizers of charity golf tournaments often attempt to make their competition attractive by offering a million dollars as a prize to anyone who can score a hole in one. This can be insured these days. Rating classification variables are the distance to the hole, the number of males and females in the tournament, and the number of club and tour professionals. The probability of a hole in one is about 1/10,000 for a good player.

5. **Environmental liability policy.** In several states of the US, when you buy a piece of real estate, you are responsible for what is under it. If you find the treasure of a Caribbean pirate, good for you. If you find a leaking oil tank, too bad, you have to remove it and clean up the property. This now can be insured.

6. **Frequent-flyer mileage insurance.** With so many airlines in trouble these days, frequent flyers face the risk of losing all the miles they have patiently accumulated over the years. This can now be insured at a very reasonable cost.

7. **Infertility insurance for Smarty Jones.** Who is Smarty Jones? Smarty Jones is a horse, who finished second in the Belmont Stakes, a very important race in New York. Had he won that race, he would have won the so-called "Triple Crown" and finished the season undefeated, nine victories for nine races, a rare event that has not occurred since 1977. Despite that loss, Smarty Jones is now going to retire, at the age of 3, after having worked a grand total of 18 minutes in his life (at a rate of about two minutes per race) and earned about \$9 million. Not too bad for a compensation package! And it is only a beginning. Smarty Jones is going to be mated twice a day, with the most fit female horses, at a charge that may fetch \$500,000 each time. From February to May each year, he is going to tour the United States. Then, after a well-deserved month of rest in June, he will be shipped to Australia in July to perform the same services. On his way back, if he still has some time and energy, he will make stops in Japan, Saudi Arabia, and Europe, for a grandiose annual world sex tour with the cutest three-year old females available. What is the biggest risk faced by Smarty Jones' owners (and Smarty Jones' active retirement plan)? Infertility – hence the multi-million dollar infertility insurance policy that the owners are reportedly negotiating. The next step would be to develop non-pregnancy insurance for the purchasers of Smarty Jones' services. Indeed, for their \$500,000 fee, they receive absolutely no guarantee – no second service for free or at a reduced rate if the horse does not get pregnant – another potential opportunity for creative actuaries to develop a new product.

For comparison purposes, if I visit a sperm bank in Philadelphia to provide a donation, I will be compensated at a rate of about \$20 dollars, a very humbling evaluation of my genetic make-up when compared to Smarty Jones. And this horse does not even know compound interest and mortality tables!

**8. Football World Cup Policy.** In 1986 I bet \$10 million of my company's money that the Belgian team would not win the Football World Cup held in Mexico. That year, a leading German television manufacturer launched a major advertising campaign before the World Cup: you buy a colour TV from us before May 1<sup>st</sup>, and we will not cash in your check as long as Belgium is still playing. And if Belgium wins the World Cup, we will not cash in your check at all: a free TV.

Such a promotion in Germany or Brazil may have not been the greatest idea. The same promotion in Luxembourg or Andorra may not have resulted in the sale of many television sets. But, in Belgium, the promotion proved to be one of the all-time greatest marketing ideas, and the manufacturer made a killing, selling about \$10 million dollars of TVs, a proof that Belgians have a tendency to be optimistic during World Cup times. Belgium won its first game, against Irak, 2-1. And then the Vice-President for Marketing of the TV company all of a sudden lost sleep. What if Belgium does win? Can we insure that? And they did, I took the risk, against the payment of a single premium of one million dollars, after checking with several bookmakers in London that Belgium's odds of winning were at 24 to 1 at that time.

Belgium then lost to Mexico 2-1 and tied Paraguay 2-2, just enough to reach the next round. Belgium then beat the Soviet Union 4-3 to reach the final eight. In the quarter finals, Belgium eliminated Spain on penalty kicks to reach the final four. At that time, I was beginning to have some trouble sleeping. Still, I was rooting for Belgium when they took up Argentina in the semi-finals, where, fortunately for me and my company, and unfortunately for every other Belgian, the Belgian defense could not contain Maradona that day. I assume that, to this day, Maradona does not know that he saved my company \$10 million dollars. I certainly did not send him a thank-you note!

These are all examples of pricing problems that could not have been taught in an actuarial program, with our constantly changing legal and economic environment. There was a demand for each policy; each risk was priced, using basic statistical and actuarial models, and a creative mind to look for the best data available and design an actuarial model based on the data. A regulator approved each policy, and each policyholder reduced its risk through the purchase.

What about insurance contracts that may emerge in the future? Nowadays, as shown by the previous examples, we can buy all kinds of policies to reduce risk in our lives, but usually very specific risks: flood, earthquake, travel risks, Smarty Jones' potency, or the vulnerability of the Belgian defense against Argentina. But we are still exposed to many risks in our lives, much broader risks: risk that we lose our job, that our income decreases, that the stock market crashes, that the value of our house collapses.

These risks are very real, and currently, for the most part, uninsurable. I am a prime witness of these risks right now. I live in a small town near Philadelphia, where the research facility of the fourth-largest pharmaceutical company in the world is situated. This company employs 10,000 researchers in my township, 65,000 worldwide, and has suffered several setbacks lately. Management has decided to lay off over four thousand workers, including several hundreds in my town. These people are suffering a quadruple hit: their income is lost; their retirement dreams are taking a hit, as they are only entitled to the reserve of their defined-benefit plan; most employees receive a substantial part of their income in the form of stock options, and none of these options is in the money, as the value of the company's stock has dropped significantly; and finally, as several hundreds of employees are going to sell their house, the local real estate market is likely to suffer a downturn, and laid-off employees will lose on the sale of their home.

Wouldn't it be nice if these employees had insurance to protect them against these risks? Maybe such policies are not so far away down the road, at least if you believe the ideas of a thought-provoking book<sup>1</sup>, authored by Yale University finance professor Robert Schiller. According to this colleague, information technology has reached a point where the following insurance policies and risk-reducing devices could be implemented soon.

### **1. Home equity insurance**

This insurance would protect the economic value of a home, going far beyond today's homeowners' policies by protecting not just against specific risks such as fire, but also against all risks that may reduce the value of a house – such as massive lay-offs. A benefit would be paid whenever the selling price of a house does not reach a given threshold.

A crazy academic idea? Maybe not. Actually, this idea has been experimented, as early as 1977, in Oak Park, a suburb of Chicago, where the township initiated a "Home Equity Insurance Program" to help stop the so-called "white flight", the common behavior of white people to move to more distant and affluent suburbs when an area becomes more diversified racially. The township was afraid that many whites would sell their property as soon as they saw a hint of racial change, because they feared a decline in the value of their home. These sales are of course regrettable, as they create a segregation of neighborhoods. And in many cases, the fear of declining real estate prices becomes a self-fulfilling prophecy: so many people sell their house for fear of a decrease in home prices that actually, the real estate market does crash. Insurance, based on individual home values, was offered by the township, and it worked so well that house prices did not decrease (which actually prevented researchers from evaluating the experiment).

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<sup>1</sup> Robert J. Schiller. *The New Financial Order: Risk in the 21<sup>st</sup> Century*. Princeton University Press, 2003.

Similar programs are currently being implemented. The city of Syracuse, New York, has developed a mortgage-based product that adjusts the outstanding principal of a loan as housing prices vary.

These programs are based on the individual value of houses, and there lies the potential of some moral hazard, the risk that homeowners would be sloppy in the maintenance of their home, given the protection offered by the program. To reduce this problem, claims could be settled based on indexes of home prices in the area, not individual prices.

## 2. Income-linked loans

Our legal system to deal with mounting debt is not very good: when someone has trouble making loan payments, our society lets financial problems built up until they reach a breaking point, creating great distress and very often humiliation through bankruptcy proceedings. This is a severe problem in the United States, where 1,660,000 individuals filed for bankruptcy in 2003.

A better system would provide a smooth adjustment of debts as a function of new economic circumstances. This system may include loans whose repayment terms would be tied to either individual or aggregate income. A future loan may be: we'll lend you \$500,000 for 30 years, and you pay us 9% of your income during that time. Or – to reduce moral hazard – you pay us 2% of your income and 7% of the income of an index of similar borrowers. The latter option is probably better, since it would reduce the risk that people work less or retire earlier to reduce their loan payments. Also, it would reduce the selection bias, the risk that only those in less-demanding, low-paying jobs, would apply.

With this new type of loan, those with lower income would pay less interest and principal, payments automatically would partially offset fluctuations in the borrower's income and reduce the risk of bankruptcy.

A crazy academic idea? Maybe not. In 2000 Swiss Re New Markets and Société Générale created a Gross Domestic Product linked loan to Michelin. Michelin was given a \$1 billion borrowing facility, contingent on GDP growth in its main markets falling short of a threshold. GDP growth for Michelin is a proxy of revenue growth, so it is close to personal income for individuals. This borrowing facility enabled Michelin to pursue business opportunities with less risk.

Another example: the Tuition Postponement Option that Yale University ran in the 1970s. Students borrowing money under this program would not reimburse their student loan right away, but rather pay 0.4% of their annual income per \$1,000 borrowed for 35 years. In other words, an income-linked loan. This program did not work, because there was no provision for the future career of students. The program was biased in favor of those who expected to go into social services or low income jobs. Part of the program lives on, as the Yale Law School Career Option Assistance Program, that reduces the loan amount to the students who take low-paying but socially conscious or socially useful jobs, so that they would not have to take a highly paid job, just to reimburse their student loans.



### 3. Livelihood insurance

Consider a young scientist thinking about an advanced degree in biochemistry with a specialty in a narrow but promising field, such as DNA technology. He could write his dissertation in a specialized laboratory. If successful, he could have a remarkable career and maybe find a new cure for some disease. However, there are serious risks involved: DNA technology may become essential to the future of medical services, or it may be a disappointment. His job could go the same way as nuclear engineers, now much less in demand than 20 years ago given that many countries have stopped building nuclear plants.

Given these risks, our scientist may decide not to start such a risky career and shift his dissertation topic away from such a narrow field. This would be a pity given the promise of this new technology; the risk is very small when considered from the viewpoint of society as a whole.

Society could offer livelihood insurance, which would protect the scientist against a decline of incomes in his field, and against his own economic misfortune. He would purchase the policy by committing to pay a fraction of his future income. An income floor would be guaranteed, with the prospect of a lucrative career if he is successful.

Livelihood insurance would have a much broader scope than life or disability insurance, as it would cover losses from all causes, not just specific disasters. The policy would have to be designed correctly. It would need to be based on reliable data on career incomes available over long periods of time. It should be designed to take into account the risk of cancellation by those who are doing well. Cancellations should be restricted, or an up-front payment should be mandatory. Moral hazard would have to be a central consideration. That is why Dr. Schiller proposes to design the policy to insure individuals against an index of aggregate risks, over which an individual has no control. Moral hazard could also be fought with co-payments. For instance only half of the decline in income would be reimbursed, possibly with a floor and a ceiling.

A crazy academic idea? Maybe not. Consider academic tenure, which has been described as a system whereby risk-averse individuals gain guaranteed lifetime employment in return for a compensation that is lower than what they could obtain in the industry. Universities guarantee lifetime employment at a satisfactory income to professors who were high achievers when young. Young researchers are encouraged to take risks with their field of research. To reduce moral hazard, the university incurs high monitoring costs, but in the end this system of risk management results in universities providing a wide diversity of expertise, a clear plus for society.

Will these ideas lead to new policies some day? Maybe, maybe not. Certainly actuaries will want to discuss moral hazard and adverse selection with Dr. Schiller. But before dismissing these ideas as academic nonsense, remember that the same author published in 2001 a book entitled "Irrational exuberance", in which he predicted a major downturn in stocks. He got that prediction right! At the very least, Dr. Schiller's ideas demonstrate that we should interact more with insurance economists. Insurance economics is a whole field of insurance, with its own meetings, its own journals. There are, at least in the US, more

academics teaching insurance economics than actuarial science, and yet, the intersection between these two fields is very narrow.

Another example of a case where actuaries should have had more communication with insurance economists is the Terrorism Insurance Coverage Act that was signed by President Bush in November 2002, in the aftermath of the September 11 terrorist attacks. These attacks have caused the largest ever recorded loss, with estimates now in the range of \$40 to \$50 billion. The previous largest worldwide insured loss was Florida's hurricane Andrew in 1992, slightly under \$20 billion.

This terrorism act basically nullifies the terrorism exclusion rules that many insurers introduced in their policy wording after 9/11. It requires insurance companies to provide coverage for certified foreign acts of terrorism in property/casualty lines, under the same conditions as the underlying policy. In exchange for this mandate, the government agreed to indemnify 90% of the insurer's 2003 losses above a retention level of 7% of the 2002 direct earned premiums. The retention is to increase to 10% of the 2003 premiums in 2004, 15% of the 2004 premiums in 2005. The designing principle of the act was to provide help only on a temporary basis to the private insurance market. The act has a sunset clause at the end of 2004, with a provision for the Treasury Secretary to extend it for one year.

Covered losses are limited to \$100 billion. The Act is financed out of the government's general revenue. However, similar to state-level guarantee funds, the Treasury Secretary can recoup some of the government losses with policyholder surcharges provided that the aggregate value of these charges plus the retention of insurers falls below \$10 billion in 2003 (\$12.5 billion in 2004, \$15 billion in 2005).

There are some reasons for having government assistance to mitigate the potential impact of terrorism acts: the large size of potential losses, the difficulty in pricing the losses, the government's already existing role as guarantor of last resort, the correlation between terrorism losses and government military policies. There are also reasons not to use government: US capital markets routinely gain or lose \$100 billion in a day, and often several trillion \$ in a month, enormously more than the \$100 billion limit of the Terrorist Act. Why cover one type of losses and not the other?

There is a very interesting literature on the topic, summarized by an excellent paper by Dr. Kent Smetters<sup>2</sup>. Noteworthy is the fact that this literature was written nearly exclusively by insurance economists. With the exception of a single Public Policy Monograph by the American Academy of Actuaries<sup>3</sup>, Dr. Smetters' article does not mention a single actuarial paper on the issue. Another lost opportunity to demonstrate our creativity in the design of an important policy.

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<sup>2</sup> Kent Smetters. Insuring against terrorism: the policy challenge. The Brookings-Wharton Papers on Financial Services, 2004.

<sup>3</sup> American Academy of Actuaries. Terrorism insurance coverage in the aftermath of September 11th, 2002.

## 2. Creativity

I believe that creativity will be an essential tool for actuaries in the future. How do you develop creativity? Not easily. But certainly not through a gruelling series of multiple-choice exams, that you can only pass by studying the official required material, memorize hundreds of formulas, and solve all the past exam questions you can handle, because future questions are not going to be very different. Not in some university courses where the instructor selects a textbook and follows it page by page.

I am not going to start discussing the pros and cons of exam-based and university-based actuarial training. I just would like to point out that, even in exam-based systems, it is possible to make room for creativity-building examinations. The Society of Actuaries had such an experiment a few years ago, a one-week intensive residential seminar on applied statistical methods. Groups of 30 to 40 students stayed for a week on university campuses during summer break. On the Monday morning, a statistical software was introduced, followed by a day and a half of real-life data hands-on modelling of regression and time-series problems. On the Wednesday, a guest business instructor, a practising actuary, was invited to present real-life problems that he had faced; the instructors brought their data and were able to lead the students through their thinking and their data analysis. More hands-on data analysis took place on Thursday. On the Thursday evening, students were given a practical project, a new data set, and they had until the Friday afternoon to turn in their project.

For many years, this intensive seminar was the only way actuarial students could get credit towards associateship without passing a multiple choice exam. The projects were graded, but the pass rate of this exam was set very high, at 90%. The grading procedure was non-creative, as graders were given a grid. Durbin Watson test? Two points. A sentence about collinearity? One point. The only way to fail this exam was to show some creativity and get out of the model answer. But the pass rate was 90% and the students knew ahead of time that they had to go through the motions of writing the report as suggested.

In the end, the seminar collapsed, because of cost and time, but to me, the experiment was a success: for one full week, students were actively learning how to process data, with the guidance of experts who showed how they had been creative. Much better than passively memorizing formulas and gathering past exam sets.

This is the path we should be taking. We could go even further: instead of a pass rate of 90%, why not a pass rate of 100%? Why do we always have to glue together the education process and the sanction process? Why not education without sanction, occasionally? In an education system that has 10 exams, students who can pass the first eight can pass exams nine and ten, given time and commitment. Why not reduce the education time by awarding certification after eight exams, while requiring students to attend an intensive seminar or two, instead of exams 9 and 10. Actuarial associations are devoting a lot of energy to continuing education these days, an acknowledgment of the fact that, no matter how long and hard an education process is, actuaries will still need to learn about new developments. Why not end the formal certification

process earlier on? Otherwise I fear that very talented Indian or Chinese mathematicians will start offering their actuarial services in Bangalore and Shanghai; as demonstrated by their exam passing rates, they will offer outstanding services, and they will be cheaper than US or European consulting firms.

### 3. Communication

Actuaries and the insurance industry are not too good at getting their message across to the public. There are exceptions, of course: the UK Genetics Committee is an excellent example of cooperation and communication between all stakeholders in insurance: industry, government, regulators, and policyholders. But, generally speaking, we are poor communicators, and, as a result, the industry has a very poor image with the general public and with politicians. Whenever a new society issue arises, such as unisex rating or the use of genetic tests in underwriting, we always react by opposing any change. Maybe we are conservative by training. We are trained to study the past to make forecasts, so all of our education makes us hate shocks and change. By rejecting change and compromise, we create antagonism with other stakeholders, and regulators rule against us because they do not understand our message.

Consider the example of the European Union draft directive on equal treatment of men and women outside the workplace, which would ban insurers from charging different premiums to men and women in life and automobile insurance. That Directive, approved by the European Commission upon a recommendation by the Commissioner for Employment and Social Affairs, Ms Diamantopoulou, would force insurers to change their pricing to a unisex tariff within six years, depending on how quickly their own national legislature transforms the Directive into a national law. The Directive still needs to be approved unanimously by the European Council, after consultation with the European Parliament. So it is not a done deal, and the insurance industry and the actuarial profession are trying to get an exemption. My guess is that we will lose, because we always lose those fights. We always lose, because we are poor communicators and because the insurance industry is viewed in a negative way by consumers all over the world, which is also related to poor communication.

This is the old debate about what constitutes fair discrimination, and what is unfair discrimination. English and most European languages have more than one definition of the word “discrimination”. Consumers and politicians understand discrimination to be the unfair treatment of a person based on prejudice, such as on gender, racial group, or age (according to Webster’s, “to make a difference in treatment or favor on a basis other than individual merit”). Actuaries understand discrimination as the ability to identify differences and distinctions (for Webster’s, “to mark or perceive the distinguishing or peculiar features of ...”). The European Commissioner believes in the first definition and states that gender is not the main reason why women live longer or men are likelier to have car accidents. She claims that “studies show that sex is not the main determining factor for life expectancy” and that “insurers appear to be using a person’s sex as a proxy for lifestyles factors [such as marital status,

employment, territory] because it's easy". Or "Other factors have been shown to be more relevant, such as marital status, socio-economic factors ... and nutrition habits".

We believe in the second definition of discrimination and that she is flat out wrong. We point out that women do not die from prostate cancer, that males do not die of ovarian cancer, that males have a higher heart-disease mortality than females in all countries of the world, independently of behavior. Even before birth, male fetuses have a higher mortality than female fetuses, and that cannot be explained by behavior.

We believe strongly that we are right, but we do not seem to be able to get our message across. Others did. Hairdressers have been more successful lobbyists than we were, and consequently they will still be allowed to cut hair with discrimination. We need lobbying and communication lessons from our hairdressers.

I do not know the outcome of this disagreement, but I am afraid that we will lose, because we always lose, and because American actuaries and insurers have lost the same fight years ago. In 1983 the US Supreme Court reached a similar decision based on very similar arguments in a famous case<sup>4</sup>. It ruled that using gender-based actuarial table violates Title VII that makes it an unlawful employment practice to discriminate against any individual because of such individuals' race, color, religion, sex, or national origin, and that, consequently, unisex tables need to be used for the calculation of retirement employee benefits<sup>5</sup>. The Court rejected the notion that, because women, as a class, live longer than men, an employer may adopt a retirement plan that treats every single individual woman less favorably than every single individual man. In other words, the Supreme Court did not accept the notion of equal actuarial present values, one of the basic principles by which we live. The very same mention that other factors than sex contribute to longevity was used, with similar words, even similar sentences. Same story across both sides of the Atlantic: unless we manage to improve our communication skills, we will not be able to improve our image, and we will lose these fights. We used to have no contact with policyholders; our jobs have changed, a more consumer-oriented approach has emerged, and we need to adapt to it.

These are my ideas about the future of our profession. Many of them are undoubtedly controversial, and I look forward to discuss them with you. I hope that, next year during our XXXVIth Colloquium in Zurich, somebody else will be given the assignment to think about our future, and I will be delighted to listen to his or her talk while being comfortably seated in the audience. Thank you.

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<sup>4</sup> Arizona Governing Committee for Tax Deferred Annuity and Deferred Compensation Plans v. Norris

<sup>5</sup> With the exception of the state of Montana that mandates unisex pricing, American insurers have retained the right to use gender-differentiated tables for all other policies.