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GUEST EDITORIAL

BY R. NORBERG

I would like to thank my colleagues in the *British Actuarial Journal* for the gracious invitation to unfold in a guest editorial. I take this opportunity to speak about a matter which is of vital concern for us actuaries, and which I especially have at heart: communication skills.

Actuarial code says literacy is just as important as numeracy. The legend is that we must be able to explain our numbers in plain language to managers and customers. I agree, but here I will play a different drum; we must be able to explain our numbers in mathematical language to ourselves. My concern is that mathematical literacy be cultivated in our profession so that we do not lose out to others what used to be the core of actuarial science: insurance mathematics.

There is a claim that, in the present high-tech based and competitive economy, the day of the generalist is gone — today is the day of the specialist. This may not be quite true for the actuary. If so, could it be because the insurance industry remains subject to relatively strict regulation, the pronounced purpose of which is to ensure solvency and protect consumers, and a tacitly accepted by-product of which is protection of the industry and of the job-market for the actuarial profession? Is the role of the actuary something the profession could comfortably stage to pursue general career interests in a sheltered and prosperous homeland, rather than something that would meet the demand for expertise in an open and competitive world?

I will not answer these provocative questions, only state that, for a profession to play a leading and lasting part in our society, it needs to possess a speciality — something sophisticated that it knows better than anyone else, and that it continually shapes and develops. Actuaries need to be the specialists in insurance mathematics.

Then, what is insurance mathematics? In the broad sense it is just a branch of applied mathematics dealing with quantitative methods in insurance. It is the direction of the application rather than the unity of models and methods that defines its subject matter, and it borrows extensively from mathematics, statistics, mathematical economics and finance. Still, in a narrower sense, it can be precisely delimited as a scientific discipline, with its characteristic basic problems: what is risk; how can it be quantified and measured; and how can risk carried by individual agents be mitigated or eliminated by insurance schemes? The language spoken here is probability — the mathematics of uncertainty — and it has afforded formulation of models and methods that are characteristic of the area,

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notably in life insurance, and in the theories of ruin, ordering of risks and risk exchanges.

The founding fathers of insurance mathematics were not actuaries, simply because the actuarial profession was not yet formed at the time. They were physicists (Huygens), astronomers (Halley), and mathematicians (De Witt, Hudde, Bernoulli, De Moivre) of the late renaissance and enlightenment periods — curious and lucid minds, attracted mainly by the intellectual challenge and, a little bit, by the need of understanding (De Witt and Hudde, also lawyers, were leading politicians in a state that was selling life annuities).

Only during the second half of the 19th century did actuaries set up their organisations, congresses, and journals.

Actuaries built a huge body of life insurance mathematics, rich in mathematical techniques, abundant in notation, but poor in genuinely novel concepts; the paradigm of De Witt and his contemporaries prevailed, calculating expected discounted values of future benefits less premiums, and equating to zero to obtain the equivalence premium. Notions of risk were totally absent: life history uncertainty was diversified away by the law of large numbers (portfolios), and indiversifiable risks, like uncertain interest rates, were not brought to the surface. One might say: "Why worry, when we can just charge premiums in excess of what is likely to be needed, and pay out the surplus as dividends at the end of the day?" A recent failure of a major local life insurer tells us that there is every reason to worry about interest rate variations. In that case, though, a smattering of economic history might have sufficed — it was not so much a question of knowing the mathematics. This is all different when it comes to model-based pricing of, for instance, the interest rate guarantee built into the participating policy; the uncertain interest rate must then be worked into the model as a stochastic process.

Anyway, actuaries were the uncontested masters of life insurance mathematics. There is a trend, however, to be seen in *B.A.J.* and its predecessors. Early volumes contributed greatly to the theory and boasted a number of key references — theorems with proofs in mathematical language. Articles in recent volumes are largely composed in the English language. They present new ideas and new products, and are thus highly stimulating, but it seems that mathematical words do not come easy to the authors who struggle with these quantitative problems. A further sign of the lack of communication skills is that the stochastic process point of view in life insurance, which (late in coming) was in place in continental Europe some thirty years ago, was imported to the United Kingdom only much later, and still appears in the syllabus of the Institute of Actuaries and the Faculty of Actuaries only in a rudimentary form that does not make full use of its great powers.

The post World War II period saw the formation of ASTIN and the rapid development of non-life insurance mathematics. Now mean values were no longer adequate; risk became the major issue. Mathematical statistics was the suitable language in which to formulate notions and theories of risk orders, credibility, total claims distributions and other topics central to risk assessment and management. These activities took place mainly outside the U.K. domain, at universities where actuarial science was seen as a vital branch of applied mathematics.

So far I have dealt with the past, and my beat has been muffled. Turning now to the present and the future, I will bang the big drum. The last quarter of the 20th century saw the advent of modern financial mathematics and its amazingly quick development into a full-fledged science, maybe the most flourishing academic discipline at the turn of the millennium. Alongside this process, in the wake of the so-called financial services revolution, with deregulation and dismantling of walls between the financial industries, we have witnessed the emergence of entirely novel concepts and products in the interface of banking and insurance, key words being index-linked insurance, alternative risk transfer, and securitisation. Mathematical models are at work on a large scale in banking and trading. Securities houses employ highly specialised financial mathematicians in huge numbers, and the leading ones have built strong research departments. It is alarming that, in the British context, insurance companies have not set up a similar infrastructure, and very few actuaries are at the forefront of basic and applied research in the area. The language used here is stochastic analysis, which is taught at Master's level in universities, but does not find its needed prerequisites in an actuarial education restrained by too narrow ideas about communication skills and by pure gags like 'actuaries need only know simple models'.

History repeats itself, as we are once more in a situation where the symbol analysts in insurance mathematics are not actuaries. This time, however, actuaries are around, but the problem is that they are unable to read the symbols. The theories of risk which are currently being developed by financial mathematicians and other applied probabilists are very closely related to those of traditional insurance mathematics. The model framework is extended with a financial market with various investment opportunities, and dynamic investment strategies are to be designed so as to achieve goals formulated in clear mathematical terms. Key tools are taken from theories of risk minimisation in incomplete markets and dynamic stochastic control.

We cannot rely on regulation to ensure survival of the actuarial species in this fiercely competitive environment. My survival analysis for this case tells me that the future of the actuary is entirely dependent on the actuarial education of the present, and here is my humble advice to the Institute and the Faculty. Upgrade the role of insurance mathematics in the syllabus, that is, give more emphasis to mathematical literacy (basic methodology) that would enable candidates to solve new problems; more emphasis on numeracy in the sense of scientific computation; less emphasis on current practices and routines; and no more paging about in tables. The profession must remain the major party in the discussion of what actuarial science is and what it is not, and it must be continually maintaining a guiding syllabus. Set it out in broad features, listing topics to be covered and indicating the level, but entrust the university teachers with filling in contents that are up-to-date and consistent with, and on a par with, other university courses and programmes. Teaching at the universities is research-based, and such creative activity should not be regulated in too great detail.

The profession has done a great deal to help universities set up and run actuarial programmes. I am convinced that both parties — and, of course, actuarial students and candidates — would benefit from it if we could rethink the division of powers and responsibilities in education matters.

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