A.A.S. **1**, II, 199-201 (2006)

GUEST EDITORIAL

ACTUARIAL EDUCATION: DOES IT COMPUTE?

By A. S. Macdonald

A few years ago, I carried out an informal census in Blackwell's bookshop in Charing Cross Road, London. It had a good finance and investment section, including pensions and insurance, and I counted roughly 300 books on these subjects, ranging from the elementary to the heavily mathematical, full of stochastic calculus. There was just one, lonely, actuarial book — and it was a history of the last 150 years. Does this tell us something about our profession?

Two profound upheavals in the actuary's working environment began about 25 or more years ago: corporate change; and computers. Until then actuaries had worked for generations (usually an exaggeration, but in this case actually true) applying more or less the same toolkit to products which would have been recognisable 50 years before, in the service of institutions which would have been recognisable 150 years before. Actuarial science, although based on mathematical facility, largely comprised methods of data analysis and numerical analysis needed to manage these institutions in pre-computing days. Actuaries filled this niche very well, but rarely escaped in any numbers into the wider world. This began to matter when the constraints of pre-computer days started to disappear, and perhaps the clearest milestone was the arrival of the desktop computer.

Gradually, what has come to the front is not the actuary's particular brand of numerical cleverness, but a deeper understanding of the tools needed to model and manage risks, both personal and (increasingly) corporate. Longevity risk provides an outstanding current example.

Corporate change meant that institutions which had automatically, almost organically, turned to actuaries as the obvious experts were themselves evolving. Demutualisation, globalisation, and a more brutal marketplace have chipped away at the actuaries' old heartland. When the profession looks around now, it sees many, mainly younger, disciplines: economists, corporate financiers, financial economists, bankers.... It does not end with financial professions either; take a modern look at the data analysis and modelling which underpin insurance, and there are statisticians, demographers, gerontologists, econometricians....

So, the profession is being challenged from without and has to respond. I will focus on education, and ask: "How well is it doing so far?" I offer the following assessment: high marks for syllabus development, but lower marks for effective implementation of those new syllabuses. Two aspects of this

process will illustrate my reservations: the current place of computers in actuarial education; and diffusion throughout the profession. I should say that these remarks mainly apply to those parts of the world where the actuarial professions themselves are responsible for educating actuaries, following what might be called the Anglo-Saxon pattern:

(a) Statistics is a profession very closely allied to ours, indeed much of what we do is statistical in nature. Over the last 25 years, the education of the professional statistician has been revolutionised by computers. It is now easy to implement techniques which used to be well within the reach of theory, but impossible to put into practice. Rather like the actuary's, much of the old statistician's art was shaped by what could actually be done with pencil and paper, hence the dominance of the Normal distribution.

Freed from these restrictions, statistical theory and statistical software have developed side by side, to the extent that practitioners could be accused of unprofessional conduct if they stuck with pencil-and-paper methods. Education has evolved accordingly. The student who is introduced in the classroom to the bootstrap, or simulation, or GLMs, or MCMC estimation, gets the chance to play with them in the computer lab, or even at home (one of the best statistics packages, R, is public domain software). Thus they learn, or at least have a fair opportunity to learn.

Those actuarial professions whose qualifications are rigidly based on written examinations have not made the leap into the modern world which the statisticians have, because they still dwell in the pencil-and-paper world. Take multiple-state models for example, now a common feature in life insurance mathematics. They earn their place by being the natural extension of the life table to underpin more complicated products, such as disability insurance. Almost all concrete calculations, however, involve the solution of differential equations — Kolmogorov's equations for probabilities, or Thiele's equations for expected present values. These can easily be put in the syllabus (and, in the United Kingdom, they have been); but actually solving them, in realistic settings, needs a computer. Plenty of standard packages (such as Matlab, Mathematica, or Maple) will do the job, because these are just ordinary linear equations. Unless this is an integral part of education, the loop is never closed. The students see the theory, but not the results. Thus they only learn what they must memorise to pass the written test, which leads nowhere.

This example is replicated over and over, generally whenever anything truly modern is too important to leave out of the syllabus.

(b) Next, let me ask a question of older readers, namely those who qualified before modern financial mathematics, and its underpinning stochastic theory, entered the actuarial syllabus. These will be basic tools for the

https://doi.org/10.1017/S1748499500000129 Published online by Cambridge University Press

actuary of the future, just as compound interest and life tables were 150 years ago. Would you say that your reaction to these developments has been closer to: (A) "This is important, I had better equip myself to be an actuary of the future"; or, more humanly, (B) "Thank goodness I qualified in time to avoid these"?

Now, can you imagine a surgeon of 150 years ago saying: "Thank goodness I passed Amputations in time to avoid the new Anaesthetics exam"? The answer may well be 'yes', but you, who could at any time become the surgeon's client, might hope that CPD would catch up sooner rather than later. Changing the syllabus and waiting for 40 years might strike you as a somewhat passive approach to diffusing new knowledge through the ranks of the surgical profession.

To summarise, the syllabus may be up-to-date and eminently credible, but that does not imply that the education process which it is meant to drive is equally satisfactory. Arguably, it lacks push from below and pull from above, and the first of these may be the more serious, because we could be letting down the students who have every right to expect their profession to equip them well.

It would be unfair to leave the impression that the professional bodies have reached this position through negligence, for they have not. The model of learning at a distance, with examinations run all across the world, makes it very awkward to bring computers into tuition and assessment in a meaningful way. For some years, it would have been impossible to assume that all students had access to computing facilities, but that time has surely passed (or, at least, can no longer outweigh other considerations). There have been creditable moves in the right direction, such as the introduction of the Society of Actuaries residential modelling course. It may be asked, however, if such an incremental approach to the distance learning model goes far enough, or if the system needs a more fundamental overhaul.

In this context, developments in the U.K. may be of wider interest. The U.K. profession's new education strategy embraces university education much more than before, and this may be the key. Instead of awarding exemptions based entirely on written examinations, other methods of assessment will be admitted as part of a more flexible accreditation process. Here, at last, is an opportunity to bring hands-on use of modern techniques into tuition and assessment. I hope that participating universities will seize it; but I also hope that the profession will see this as just the start, and will be as inventive as it can be in bringing modern applications into the hands of students of all ages.