Contributions to the Discussion

Invited Discussant 1

Suchada Kiranandana - Bangkok, Thailand

Professors Norberg and Klugman's perspectives on actuarial education are very interesting and, to a great extent, I share their views. But before starting my discussion, let me first fill in the global picture by presenting the situation in some Southeast Asian countries.

Most of the countries in this region offer actuarial statistics as a major in the Bachelor's and Master's degree programmes, although the objectives of such programmes vary. Some aim at preparing students for examinations given by either the national actuarial societies or the American or UK ones. For example, the University of the Philippines offers Actuarial Mathematics as a major in the BS and MS (Applied Mathematics) programmes, preparing students for the Actuarial Society examinations. Others aim at educating actuaries or actuarial personnel without any examination requirement. The situation in Thailand is rather atypical since actuarial statistics started as a major in the statistics programme in the Department of Statistics, Chulalongkorn University and the pattern had been copied by many other universities. For the BS in Statistics programme here, the curriculum of the actuarial statistics major comprises courses in five areas, each carrying approximately equal credits, namely, (1) Mathematics, (2) Statistics, (3) Actuarial Science, (4) Business and related subjects (computing, accountancy, management, and law) and (5) Liberal Arts and Social Sciences. Most of the actuaries in the majority of locally-owned insurance companies are graduates of the programme and no societal examinations are required. Both the Thai Actuarial Association and the Casualty Insurance Association are active, but not in qualifying actuaries. For the foreign-affiliated companies, actuaries are motivated to pass either the American or UK examinations.

I do agree with Professor Norberg that actuarial statistics deserves its place as an academic degree programme in the university. However, whether the programme should emphasise merely expert technical knowledge or allow for broader knowledge including management in particular, is still debatable. I would put the emphasis on technical knowledge but must state that good mathematical and statistical foundation, together with some knowledge of accounting, law, computing, and management are necessary. This is especially true for the Bachelor's degree programme, whereas the Master's degree programme can be more research-oriented. Note also that the rapid socio-economic and

environmental changes will have great impact on the insurance business. Therefore, actuaries are expected to be able to monitor the change through data collection, analysis, and modelling in order to quantify risks, to formulate new solutions, and to cope with the dynamic situation. This obviously calls for better knowledge of statistics. Besides, the situation also emphasises the importance of communication skills in addition to expertise in technical knowledge.

Professor Klugman's suggestion to eliminate examinations on calculus, linear algebra, numerical analysis, operations research, and economics, but make these subjects prerequisite for subsequent examinations, should be well accepted. Taking such courses should better attend to the development of critical thinking ability than memorising preset answers. It can also be argued that the university environment generates the better conceptual and analytical thinking necessary for more advanced technical knowledge.

The suggestion to offer an introductory course in actuarial science as an elective in insurance, mathematics and statistics programmes is a good one. In fact, this should be carried further since statistics has proved to accommodate actuarial science very well. My suggestion would be to offer such a course also as an elective in management science and accounting majors. This will provide the necessary link for the much needed interface between the technical actuaries and the managers in the organisation. However, the course may lean towards concepts more than mathematics.

Invited Discussant 2

John Pollard - Sydney, Australia

An outsider to this discussion today might be excused for being confused. He or she might wonder: "What is an Actuary? What is actuarial work?" From the papers today, it is clear that "being an actuary" means very different things in different countries. As Ragnar Norberg points out, actuarial work "depends very much on legislation, and social and economic structures". Because of the way they are structured and funded, for example, retirement benefit schemes in France and Australia present completely different problems to the actuary; inflation is almost irrelevant in the French context, but extremely important in the Australian benefit-promise system. In Germany, life insurance premium and valuation formulae and bases are set by the statutory authorities. For these purposes therefore, the actuary does not need to consider the implications for investment return and expenses of developments in the economy. The situation is quite the reverse in many English-speaking countries. We also see in many countries, for example Mexico, the so-called "Social Security Actuary".

In my view, Ragnar Norberg adopts a very narrow definition of Actuary: a "liability risk mathematician". Leigh Roberts on the other hand has a much wider definition, and one closer to my own view. The wider definition means that many subjects which are not "actuarial statistics" (the subject of today's programme) must also go into an actuarial education course of studies.

I have great difficulty accepting that an actuary is merely a "liability risk mathematician". How can one really judge whether or not a premium is adequate

without taking account of investment earnings? This is particularly true of longer-term life contracts, but it also applies to other shorter contracts. Admittedly, one can calculate premiums by the traditional life contingencies methods at zero interest, but the premiums are unlikely to be accepted in the market. Of course asset risk models are complicated, more difficult in my view than liability risk models. It is important to realise also that the two are not necessarily independent. A down-turn in the economy can have a negative effect on the investments held by a mortgage insurer, for example, at the same time as that insurer experiences heavier claims. A natural disaster can also have a negative effect on the assets of an insurer at the same time as its claims experience deteriorates.

One of the dangers with the modern life contingency textbooks, I believe, is that they treat life contingencies stochastically, but only stochastically in respect to mortality. For any moderately large insurer, mortality variation is of minor consequence. The law of large numbers takes care of it, but it does not take care of stochastic variations in investment earnings, which remain a significant consideration. Students are misled into believing that mortality variation ("liability risk") is the only important consideration. Lest it be thought that I am opposed to the stochastic approach being applied to mortality, let me comment that I was co-author in 1969 of perhaps the first paper in this area of more recent times.

Australasia is comprised of many islands, the more important ones being the North Island, the South Island and the Great West Island. Leigh Roberts has mentioned the main recent developments in the North and South Islands, but has said little of developments in the Great West Island (also known as Australia).

To qualify as a Fellow of the Institute of Actuaries of Australia, one must pass each of ten examinations. Since 1968, students obtaining A or B grades in the relevant Macquarie University units have been exempted from having to sit the corresponding examinations of the Institute of Actuaries of Australia, or the Institute of Actuaries (London). This was a Macquarie University first, and has now been copied in other English-speaking countries. Stuart Klugman mentioned the programme at the University of Waterloo. We would see this as a very similar department in many ways as our own, with a similar size staff. At the same time, its programme (of the sandwich type) is markedly different, and the students there are not eligible for exemptions. Both departments enjoy strong leadership roles within the profession in their respective countries.

One thing I would like to stress is our independence. Whilst we have tended to use the standard textbooks of the profession, our courses have not been merely courses for cramming the professional material. From the late 1960s, for example, we included some stochastic elements in our life contingencies courses. Books by Macquarie staff are also now used by the profession itself.

Actuarial studies can now be undertaken at the University of Melbourne and at the Australian National University, the specifically actuarial units being provided on an external basis from Macquarie. These arrangements have now been in place for several years and seem to work well. Macquarie staff go to the other university a couple of times per semester, to provide face-to-face tuition for extended weekends.

Two other developments are about to take place at Macquarie University. First, a Diploma programme to enable graduates from other areas with majors in statistics to gain the earlier exemptions from the professional examinations by the fast track.

Second, a Master's programme which will enable students to obtain exemption from the final four professional examinations at the standard level. (They will then only need to sit two subjects at a more advanced level.)

The Master's programme with exemptions will be another "first" in the English-speaking world for the Actuarial Studies programme at Macquarie. It has been possible, I believe, because of the leadership within the profession of the Macquarie staff and Macquarie graduates. (More than a quarter of Australian actuaries are Macquarie graduates.)

Like all earlier speakers, I believe that university education of actuaries is the way to go. I also believe that the programme should be broadly-based. There is a danger that the resulting graduates will be "jacks-of-all-trades" and masters of none. They should, however, know how to think and where to look for techniques and advice when these are required. Above all, they will need to update their knowledge continually throughout their professional lives. Techniques taught in great detail today are likely to be redundant tomorrow.

Reply

Ragnar Norberg - Copenhagen, Denmark

I find that my answers to Pollard's discussion can to a large extent be compiled from my lecture, and would urge the reader to have another look at Section 3, the third to last paragraph of Section 4, and Section 6. A few additional remarks are, however, in order.

I think I cannot be criticised of adopting a narrow definition of actuary. Actually, I have deliberately avoided any attempt to define the mentioned creature because I think that would derail the discussion of the topic "Actuarial Statistics in the University Curriculum". One must rather define actuarial statistics as a branch of science and discuss how research and higher education in this field should be organised on a par with other university disciplines. There is certainly a need for scientific study and higher education in both asset risks and insurance liability risks. What I maintain is that there is no possibility of combining, within the framework of one education of normal duration, studies that go in sufficient depth in both these fields. In fact, studies in liability risk need to be strengthened in the actuarial study programmes. I dare to say that analyses of liability risks performed by actuaries are often amateurish and tell of a regrettable lack of contact with the current developments in general statistics. Therefore, in an up-to-date study programme centering on liability risks - and such must exist - there are strict limits to the possibilities of including studies of financial risk, not to speak of all the other ingredients, partly non-academic, that are lumped into many actuarial educations of today. In conclusion, the combined efforts of experts of two kinds are required to solve the problem of assessing and matching assets and liabilities in insurance.

Pollard's final remark gives me an opportunity to illustrate my point. I fully agree with him on the necessity of introducing stochastic interest rates in life insurance

mathematics. In my opinion, this would require as a first step that actuaries be given a strong background in stochastic modelling, in particular the theory of stochastic processes. For reasons already given, I am not very optimistic about the possibilities of making actuaries the experts in social sciences and economics who could understand fully the complex mechanisms governing investment earnings and interest fluctuations, and I can see no reason why this should be essential. Again, I will point to the necessity of combining different kinds of expertise, and allowing the actuaries to implement in their models some assumptions, or maybe just estimates made by people with know-how in finance. An analogy is right at hand: I give Pollard some right in stating that mortality variations are of minor consequence, but only under the assumption that the mortality law remains unaltered over the ages. Now, this assumption is not realistic as everybody knows (key-words are socio-economic changes, progress in medical science, emergence of AIDS and other epidemic diseases). Therefore, also, stochastic variations in the mortality law have to be encountered in a realistic model for life insurance, but it cannot be a requisite that the actuary be an educated epidemiologist. Similar remarks can be made about administration expenses, which are of major importance to the result of an insurance business.