EXAMINATION

30 April 2010 (pm)

Subject CA3 — Communications

Time allowed: Three hours

INSTRUCTIONS TO THE CANDIDATE

1.   *Enter all the candidate and examination details as requested on the front of your answer booklet.*

2.   *You have 15 minutes before the start of the examination in which to read the questions. You are strongly encouraged to use this time for reading only, but notes may be made. You then have three hours to complete the paper.*

3.   *You must not start writing your answers in the booklet until instructed to do so by the supervisor.*

4.   *Attempt Question 1 AND Question 2.*

AT THE END OF THE EXAMINATION

Hand in BOTH your answer booklet, with any additional sheets firmly attached, and this question paper.

> *In addition to this paper you should have available the 2002 edition of the Formulae and Tables and your own electronic calculator from the approved list.*

1 You work in an actuarial pricing department for a company that offers annuities. The marketing manager has e-mailed you as follows:

John,

I am keen to find new ways to price our annuities to attract more business. In particular, I've read that people who are married often live for longer – which presumably means we could offer higher annuity income on "single life" cases. Two other areas that I'm interested in:

- Size of premium – expenses must be lower for larger premium sizes
- Geographic district – as some areas seem to have shorter lifespans

Therefore, I am keen to explore the opportunity of marketing to customers who are looking for a single-life annuity, with a large premium to invest, and in geographic areas with shorter lifespans. We should be able to attract these customers by offering better rates.

Please can you let me know if this might be attractive.

Regards,

Sam

A student in your team has provided the following information:

John,

Sam's email contains a mix of true and false points.

Here are some notes:

Single Life (ax) vs Joint Life ($ax + ax/y$)

Various published papers show that people who are married live for longer. In our last quarterly analysis of the profile of new business 48.23% were ax and 49.23% were ($ax + ax/y$). The remainder, i.e. 2.54%, were term certain annuities, independent of life contingency. By contrast, the proportion married in the general population at this age-group is about 68% of men and 78% of women. Hence some married people are taking ax policies and this is supported by our internal research. Also, ($ax + ax/y$) annuities could be taken by someone who is legally single – though from a legislative point it would be necessary to prove financial dependence or interdependence at the date of death between the primary and reversionary life assured.

Size of premium

There are three types of expenses to be considered:

1.   Direct Expenses

The direct expenses of an annuity – whether ax or $(ax + ax/y)$ – are much the same for a large case or a small case. This means that the direct costs as a percentage of the single premium are much smaller for the larger case.

2.   Overhead Expenses

Our expense apportionment allocates overhead costs as a percentage of premium. These overheads are equal as a percentage of premium.

3.   Commission Expenses

Commission is deducted directly from the premium. It is usually expressed as a percentage of the premium, though occasionally is expressed as a fixed amount.

When considering premium size, there is also a mortality consideration. We have extensive analysis of mortality experience data over the last 5 years, looking at the A/E ratio (the ratio of Actual to Expected deaths). This analysis shows that mortality experience is much lighter for larger premium sizes. This is a significantly larger impact than the expense apportionment impact.

Geographical district

- Sam is correct in his assertion that some areas have a shorter expectation of life than other areas. Government statistics give good statistical information on this. However there are some drawbacks with this information:

  - Government information reflects the mortality of the entire, heterogeneous population; whereas annuitants are a subset and could be unrepresentative. For example, annuitants are generally more wealthy than the population as a whole, and this will correlate with those who have longer expectations of life.

  - There may be anti-selection effects amongst people with smaller premiums who may be able to choose between taking a cash lump sum or an annuity.

  - There is a correlation between the different geographical areas and the premium sizes. Wealthy areas have more people with higher premium sizes, and this is part of the reason why their expectation of life is longer. It is not possible to untangle accurately the correlation between premium-size and geographical district from government data.

So although it is possible to allow for different expectations of life as a rating factor in setting annuity rates, it needs to be done in conjunction with premium size.

Draft a memo replying to the marketing manager in approximately 350 to 400 words.

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2   You work for a firm of consulting actuaries and have been asked by the Board of Directors of one of your clients, Company X, to comment on the relative merits of two capital projects.

Company X will be required to make an initial investment of £55 million in either Project A or Project B. The projects are expected to generate the following revenues over the next three years:

	Revenues at end of Year			NPV @ 10%	IRR (% p.a.)
	1	2	3		
Project A	£40m	£20m	£10m	£5.4m	17.1%
Project B	£10m	£20m	£45m	£4.4m	13.6%

Note:

(a)   NPV = Net Present Value = $\sum C_t/(1 + i)^t$ where C_t is the net cash flow in each year and i is the discount rate.

(b)   IRR = Internal Rate of Return (the discount rate at which NPV = 0).

The Board of Directors is uncertain as to how much it will cost to raise capital for either project and has therefore asked you to prepare alternative figures based on discount rates of 5% and 15%. They are concerned about the chance of a recession and have also asked you to comment on the position if revenues in year 1 were 10% lower than anticipated.

Draft a short presentation of 6–10 slides to the Board of Directors covering the following:

* an explanation of what the NPV and the IRR mean

* the NPV of each project based on the information above

* a comparison of Projects A and B according to how the NPV varies with discount rate

You should:

(i)   assume cashflows occur at the end of each year (apart from the initial investment which is at the start of year 1)

(ii)   assume that there is no economic value to either of the projects after three years

(iii)   state any other assumptions you make

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END OF PAPER