

INSTITUTE AND FACULTY OF ACTUARIES

EXAMINERS' REPORT

April 2019 Examinations

Subject CM1B – Actuarial Mathematics

Introduction

The Examiners' Report is written by the Chief Examiner with the aim of helping candidates, both those who are sitting the examination for the first time and using past papers as a revision aid and also those who have previously failed the subject.

The Examiners are charged by Council with examining the published syllabus. The Examiners have access to the Core Reading, which is designed to interpret the syllabus, and will generally base questions around it but are not required to examine the content of Core Reading specifically or exclusively.

For numerical questions the Examiners' preferred approach to the solution is reproduced in this report; other valid approaches are given appropriate credit. For essay-style questions, particularly the open-ended questions in the later subjects, the report may contain more points than the Examiners will expect from a solution that scores full marks.

The report is written based on the legislative and regulatory context pertaining to the date that the examination was set. Candidates should take into account the possibility that circumstances may have changed if using these reports for revision.

Mike Hammer
Chair of the Board of Examiners
July 2019

A. General comments on the *aims of this subject and how it is marked*

1. The Aim of the Actuarial Mathematics subject is to provide a grounding in the principles of modelling as applied to actuarial work – focusing particularly on deterministic models which can be used to model and value known cashflows as well as those which are dependent on death, survival, or other uncertain risks.
2. Candidates were provided with a workbook for each question which gave a suggested format for part or all of the solution and the methodology used in the model solutions follow these suggested formats. Candidates are not penalised for using a valid alternative approach. The workbooks are also designed so that the final numerical answers for some questions are to be shown on a specified 'Answers' sheet. Candidates are not penalised for not using these sheets if their final answers are clearly shown on their working sheets.
3. Candidates may lose marks where insufficient working is shown.
4. The exam is not designed to be a test of Excel skills. Thus, some functionality which may be preferred in a real-world work environment is not necessarily required to answer the questions. However, some good practices are useful to the student e.g. including variables/parameters the question states will change as inputs rather than hard coding these into formulae.

B. General comments on *student performance in this diet of the examination*

1. The comments that follow the questions concentrate on areas where candidates could have improved their performance. Where no comment is made, the question was generally answered well by most candidates. The examiners look most closely at the performance of the candidates close to the pass mark and the comments therefore often relate to those candidates.
2. This was a new large subject which was broadly a merging of the old CT1 and CT5 subjects. There appeared to be a large number of ill-prepared candidates who had underestimated the quantity of study required for the new larger subject and/or who had insufficient expertise in Excel to make a meaningful attempt at the CM1B paper with 14% of candidates scoring 20 or less on this paper. However, given this is a new subject and this paper involves a new method of assessment, it is difficult to compare the performance of candidates in this diet with those in previous years.

C. Pass Mark

The Pass Mark for this exam in combination with CM1A was 58.

Solutions

Q1

This question was designed by the examiners as a relatively straightforward introduction to this method of assessment and, as such, was generally done well by candidates.

The model solution uses a formula to calculate the repayment although nearly all candidates used a 'goal seek' approach that was given full credit.

Common errors included:

- *ignoring the initial deferred payment period;*
- *ignoring the change of interest rate or incorrectly determining when this took place;*
- *using 0.0035/12 and 0.0075/12 as the monthly interest rates;*
- *starting the month numbering at zero, which led to some confusion over when repayments started, at which point the interest rate changed and the term of the loan.*

Q2

Part (i)(a) was generally done well by a large proportion of candidates and nearly half the candidates went on to score full marks on the rest of part (i) and part (ii) whilst most of the remaining candidates scored little or nothing on these parts.

Nearly half the candidates, including some who otherwise performed strongly, made no meaningful attempt at part (iii) which required some comments on the answers. This performance is consistent with that for similar questions asked within traditional papers in previous years.

Common errors included:

- *making no allowance for the income and staff/maintenance costs being received/incurred continuously. Candidates who assumed that these payments were, on average, received midway through the month were given partial credit;*
- *ignoring the annual increases in staff/maintenance costs or incorrectly determining when these took place;*
- *starting the month numbering at zero (as in Q1);*
- *giving the DPP as a date rather than as a length of time measured in months;*
- *applying the 5% price increase as a one-off event in part (ii) rather than as an annual increase and/or incorrectly determining the timing of the price increases.*

Q3

Part (i) was attempted by most candidates with a relatively even spread of marks obtained and comparatively few candidates scoring full marks. The most common error was not recognising that with surrenders taking place at the end of the year, the dependent death rate was equal to the independent rate. Many students also incorrectly included lapses in the final policy year.

Part (ii) was generally done well by those candidates who attempted the question. Candidates whose answers were incorrect only because of errors made in part (i) were given full credit. Common errors included

- including surrender and maturity payments in the non-unit fund cashflows (whereas these would have been funded entirely from the unit fund);*
- incorrect signage of charges levied on the unit fund that feed through as items of income to the non-unit fund (particularly the bid-offer spread and annual management charges);*
- using the same discount factors to calculate the present value of premiums as were used to calculate the net present value of profit.*

Part (iii) was not attempted at all by many candidates presumably because of time pressure. Some candidates seemed to be confused about how to profit test an AWP contract although the principles are exactly the same as for conventional with-profits contracts. The accumulation of the AWP fund was done well by those candidates who attempted this part but few candidates made much further headway with the question.

END OF EXAMINERS' REPORT