

INSTITUTE AND FACULTY OF ACTUARIES

EXAMINERS' REPORT

April 2021

Subject CM1 – Actuarial Mathematics Core Principles Paper B

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.

Paul Nicholas
Chair of the Board of Examiners
July 2021

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

1. CM1 provides 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. The worksheets provided to candidates for each question give 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 worksheets 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. Comments on *candidate performance in this diet of the examination*.

1. The comments that follow 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. There appeared to be a large number of ill-prepared candidates who had underestimated the quantity of study required for the subject and/or who had insufficient expertise in Excel to make a meaningful attempt at the CM1B paper with 21% of candidates scoring 30 or less on the paper.

C. Pass Mark

The Pass Mark was 58.

1,856 presented themselves and 941 passed.

Solutions for CM1A – April 2021 – please refer to excel file

Q1

As a whole Q1 was surprisingly poorly answered. Many candidates struggled to translate the description of the required mortality rates into a practical method for deriving the rates.

Candidates applied a wide range of methods to answer Q1. Credit was given for any valid approach. Whilst part (a) was generally well answered, parts (b) and (c) were poorly answered.

*Common errors throughout the question included: -
Starting the calculations at the wrong age;
Including mortality rates for ages 58 (male) and 60 (female).*

For part (c) it appeared that many candidates did not understand the mortality probability they were being asked to calculate. Most candidates calculated a one year deferred mortality rate for the female life at age 59 and ignored the probability of death of the female at each previous age.

Q2

The early parts of Q2 were generally well answered, with the later parts less so.

One common error throughout was to treat the provided effective annual yields as one-year forward rates.

For part (i), many candidates correctly calculated the present value of coupon payments, but failed to use these to calculate the par yield. A common error in the calculation of the par yield was to omit the redemption payment.

For part (ii), candidates frequently miscalculated the required forward rates. Errors included:

Omitting the appropriate accumulation of spot yields and instead evaluating the relative difference of individual spot yields;

Referencing spot yields of the incorrect term from the Base tab.

For part (iv), a common error was to use a sum of undiscounted payments to incorrectly calculate the effective rate of return, rather than discounting the payments individually.

For part (v), many candidates did not use their answers to part (iii), often referencing their part (iv) answers instead. Candidates are also reminded that marks are deducted for not using the correct units in a duration calculation.

Q3

Q3 was generally well answered.

For part (i) many candidates did not understand the concept of a net premium reserve and so a common error was to use the office premium rather than a calculated net premium when calculating the reserves.

Part (ii) was well answered by most candidates. Many candidates did not understand that as surrenders occurred evenly throughout the year, in order to calculate the dependent rates of mortality and surrender, the forces of mortality and surrender needed to be derived from the independent rates.

Part (iii) was well answered by most candidates, although poor time management may have prevented many candidates from completing answering the question. Common errors included: -

Missing the claim acceleration adjustment from the surrender payments and surrender claim expenses.

Making no allowance for the cost of the increase in the net premium reserves.

The calculation of the present value of premiums often used an incorrect probability of being in force and /or an incorrect discounting factor.

[Paper Total 100]

END OF EXAMINERS' REPORT