

INSTITUTE AND FACULTY OF ACTUARIES

EXAMINERS' REPORTS

September 2019

Subject CM2B – Financial Mathematics and Loss Reserving

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
September 2019

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

1. The aim of Subject CM2 is to develop the necessary skills to construct asset liability models, value financial derivatives and calculate reserves for insurance or guarantees. These skills are also required to communicate with other financial professionals and to critically evaluate modern financial theories.
2. The marking approach for CM2 is flexible in the sense that different answers to those shown in the solution can earn marks if they are relevant and appropriate. Marks for the methodology are also awarded including marks for using the right method even if an error in an earlier part of the question prevents the final answer from being correct. The marking focusses on rewarding students' understanding of the concepts, including their ability to articulate arguments clearly.

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

1. Students who scored well were those who were able to set out their workings clearly and follow through later question parts even if they had made a mistake in an earlier part. This allowed them to score marks for their method even if their final answers were not correct.
2. Students performed well on the whole, with average marks in the B paper higher than those in the A paper. The most common loss of marks was through not giving enough detail for the number of marks on offer in the later question parts that required thinking and explanation. There were also common mistakes in calculating an expected utility in question 3 (see overleaf).
3. Students should note that showing their full calculations is vital in the B paper. In future exam sittings, any answers without workings will score zero marks.

C. Pass Mark

The Pass Mark for this exam was 61.

Q1

This question was answered well by most students, showing a good knowledge of option and forward pricing.

The most common reason for missing out on marks was not formatting and labelling the chart clearly in (iii). Students also often failed to give enough detail in (iv) for the four marks on offer.

Q2

Parts (i) and (ii) were answered well by most students.

Part (iii) was trickier and only the better students produced the correct surplus process (which dipped just below zero at time $t=0.73$). Part (iv) was a little more straightforward and credit was given for a correct method even if the underlying surplus process from (iii) was incorrect.

Parts (v) and (vi) were more straightforward and were generally answered well, though many students didn't provide enough detail in part (vi) for the six marks on offer.

Q3

This question was answered fairly well but a number of students failed to recognise how an expected utility should be calculated. The expected utility is not the same as the utility of the expected value (unless the utility function is linear) so we need to calculate the utility of each possible outcome then apply probabilities to produce an expectation.

Part (v) was answered well but part (vi) was often not, with many students not recognising that the utility function provided will produce a narrowing range of acceptable insurance premiums as wealth increases.

Q4

Part (i) of this question was answered correctly by many students, but some tried to produce their own simulations using a random number generator when we instead needed to apply statistical analysis to the problem.

Part (ii) used simulated values and was answered better, but the key here was to project the fund value in each simulation then calculate statistics from the results. Some students first averaged the simulated returns to produce a single projection which did not produce the correct answer.

Part (iii) was answered well, but as with some other questions there was not always enough detail in the answer for the number of marks on offer.

END OF MARKING SCHEDULE