

INSTITUTE AND FACULTY OF ACTUARIES

EXAMINERS' REPORT

April 2019 Examinations

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
July 2019

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

1. The aim of Financial Mathematics and Loss Reserving subject 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 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. General 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 in this exam projecting run-off triangles but tended to have more difficulty with the Merton model and derivative pricing.

C. Pass Mark

The Pass Mark for this exam was 60.

Solutions

Q1

Most students scored full marks in parts (i), (ii) and (iii). A significant proportion of students scored full marks in (iv) as well, demonstrating a good knowledge of projecting run-off triangles.

Mistakes tended to be in (iv) and were usually caused by incorrect timing of the inflation adjustment or using the development factors from (i) instead of calculating new development factors.

Q2

This question required students to apply a variation of the Merton model to a Company with share capital, debt and other assets. In (i) many students struggled to calculate the redemption value of the debt by projecting the current debt with interest. The key here was to goal-seek the volatility to achieve the correct call value in the Merton model (where equity is seen as a call option on the company's assets). Partial credit was given to students who recognised that this was the approach needed even if it was not completed correctly.

Students who completed part (i) tended to do well on the rest of the question, as did students who failed to complete (i) but picked a sensible volatility to assume and used it in the rest of the question.

Q3

Parts (i) to (v) of this question were answered well by many students. The most common mistakes were assuming an equal probability for each share price in parts (iv) and (v) instead of using the probability distribution provided.

Part (vi) was answered less well, with many students creating a portfolio that had a higher initial value than the investor's starting portfolio, which is not possible if the investor has limited funds. Part (vii) allowed marks for any valid comments but many students did not attempt it.

The question paper for Q3 asked students to work with 2-year options but the Excel file provided included a data table suggesting that they were 5-year options. Answers using an option term of 2 or 5 years were accepted and awarded marks equally.

Q4

This question asked students to work with simulated asset returns. A number of students lost marks by averaging the simulations or trying to work with a probability distribution instead of projecting the investor's assets in each simulation.

Many students scored well when required to use utility functions and most students made some good comments in the final question part.

END OF EXAMINERS' REPORT