

INSTITUTE AND FACULTY OF ACTUARIES

EXAMINERS' REPORT

February 2016

Subject CA2 – Model Documentation, Analysis and Reporting

Introduction

The Examiners' Report is written by the Principal 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.

Possible models with an audit trail or summary are posted on the website. It should be noted that these include more detail than would ordinarily be possible within the time allowed for the examination.

The specimen solutions are based on one possible approach to modelling the assignment set but the examiners gave credit for any alternative approach or interpretation which they considered to be reasonable.

F Layton
Chairman of the Board of Examiners
May 2016

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

1. The aim of this subject is to ensure that the successful candidate can model data, document the work (including maintaining an audit trail for a fellow student and senior actuary), analyse the methods used and outputs generated and communicate to a senior actuary the approach, results and conclusions.
2. The subject is split into two papers, the first covers the objectives:
 - analysis of data.
 - development of a model with clear documentation.

The second paper covers:

- ability to analyse the methods used and the model's outputs.
 - ability to apply and interpret the results.
 - communication of the approach, results and conclusions to a senior actuary.
3. As the focus of the subject is on communication the majority of the marks are for the documentation and outputs generated rather than for technical modelling skills. For example, a technical mistake is only penalised once and students can still earn marks for accurate and clear communication of what was done.

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

PAPER ONE

Modelling

There were 30 marks available for accurate completion of the modelling steps and appropriate data checks.

Most students were able to identify and correct the data errors by checking for positive and increasing interest rates. Few students went beyond these checks for example to graph the interest rates or discuss the reasonableness of the household data.

Most candidates were able to attempt all the sections of the model. A number of approaches to the calculation of the fixed rate mortgage repayments were accepted because the exam paper mortgage projection guidance was only suitable for the variable rate mortgage. Some candidates made significant errors calculating annuity rates or did not divide the provided interest rates by 100 despite these errors creating highly unreasonable results. Some candidates did not ensure that fixed interest mortgage payments were fixed for five year periods. A few candidates did not complete the final household savings modelling.

Most students produced the savings fund graph correctly but only the strongest candidates produced all aspects of the mortgage payment graph, with many candidates omitting it entirely. Candidates should consider which type of graph would best show the relevant data.

Most candidates demonstrated reasonable modelling techniques and scored well in this area (up to 7 marks available).

Very few candidates managed to score well for the 'other (non-data) checks' where 8 marks were available. A large number of candidates are failing to score anything here. Candidates should be asking themselves whether the results they are seeing appear reasonable and what makes them reach that conclusion. For example, the candidates should have been able to comment on trends shown in the mortgage payments and savings funds graphs and why they were expected. Those making significant errors in the annuity or interest rate calculations should have been able to identify the calculated mortgage payments as unreasonable to demonstrate their understanding of the scenario.

Audit trail

The audit trails were mostly well structured. Most candidates prepared audit trails that followed the order of their model, starting with an overview of the model and stating assumptions that were required for the calculations. The stronger candidates provided sufficient detail explaining their calculations with the very strongest also explaining why steps were being performed. In some cases a strong audit trail correctly describing the modelling steps used could compensate for an incorrect model.

Almost all candidates were able to signpost in which sheet the calculations could be found, but the better prepared candidates were able to provide more signposting by saying where in the sheet specific calculations could be found, either by reference to tables or a combination of columns and rows, for example "in column F the five year forward rate is calculated by ...".

PAPER TWO

Modelling

There were 15 marks available for accurate completion of the additional modelling and production of the required charts. The modelling was mostly well done with most candidates able to construct the correct pattern of cashflows for franchises, however a large proportion of the candidates did not include self checks on their calculations. The quality of the graphs produced was generally good but students need to consider which chart types would best illustrate the results.

Summary

The structure of the summary produced was generally completed to a high standard. The examination question effectively provides an outline for the summary and the points to be included. The vast majority of candidates prepared a summary that followed the same order of the items they had been requested to include in the summary.

Most candidates could explain the different franchise scenarios that were modelled and the data used, but many did not provide any discussion on data validation. Most candidates were able to restate the assumptions provided in the questions and add a few value added

assumptions.

A number of candidates tended to reproduce portions of the audit trail in the methodology section of the summary. Whilst selective re-use of parts of the audit trail is acceptable, candidates are reminded that the audit trail and summary have different purposes so differences in style and depth are expected. The strongest candidates were able to provide a balanced level of method detail suitable to provide to a senior actuary.

Most candidates reproduced the charts in the results section and stated the year the client would need to start selling franchises to achieve profits of \$150,000 but few also included information regarding the actual profit figures and number of children projected at the end of the 10 years.

The discussion of the results was an area that let students down. Most candidates are failing to explain their observations. For example, many candidates were able to comment on some basic aspects of the population graph (i.e. there were no 0 year olds, an increasing population year on year) and that the profit for different franchise scenarios diverged after franchises began to be sold, but only the better prepared candidates were able to explain why these patterns were occurring or more detailed analysis of the shape of the graphs.

Often no overall conclusions were made (with conclusions sometimes just being restated results). Candidates that passed tended to have some explanation of the results and attempts at overall conclusions.

Most candidates were able to produce a list of next steps, however only the better prepared candidates were able to tailor the next steps fully to the questions (i.e. explain how tax or inflation are relevant and what parts of the model could be adapted to include these) and score strongly in this section.

45 of the marks are available for the commentary on the results and the conclusions and the next steps. Candidates are expected to show that they understand the results produced by the model by explaining them. A large number of candidates do not spend enough time on this section given how many marks are available here.

C. Comparative pass rates since the format of the exam was amended

<i>Year</i>	<i>%</i>
February 2016	51
November 2015	53
September 2015	68
May 2015	55
March 2015	52

Reasons for any significant change in pass rates in current diet to those in the past:

The pass rate is similar to the November 2015 exam, and in line with the March 2015 exam.

The September 2015 had a higher pass rate but evidence suggested that candidates were very well prepared for this particular exam, when the exam was close to the main exam session.

END OF EXAMINERS' REPORT