

# EXAMINATION BOOKLET

March 2015

## Module 5: Models and Audit Trails

**This document must be destroyed after the examination has been completed**

**Please note that the content of this booklet is confidential and students are not to discuss or reveal the contents under any circumstances.**

### Examination instructions

1. You must download the exam assignment at the start of the exam time stated. All times given are UK times. Please note that it will not be available to you at any other time. The exam period commences at 09:00 and ends at 12:15. The exam paper is three hours plus 15 minutes reading time. **It is your responsibility to ensure that all of your files are submitted within this time limit. Failure to do so will result in your assignment not being marked.** To submit your assignment please upload as instructed or email your files to [online\\_exams@actuaries.org.uk](mailto:online_exams@actuaries.org.uk). Only your first submissions will be accepted and marked.
2. You may refer to any written or electronic reference material provided as part of the Module 5 exam. You have been supplied with all data electronically at the start of the exam time. It is recommended that you use the first 15 minutes as reading and planning time.
3. The work you submit **MUST** be saved in Microsoft 2007 format, i.e. using docx (Word) or xlsx (Excel) file extensions. Do not embed documents in your spreadsheet.
4. You must build your model from scratch and not use an imported e-template.
5. You are required to work through the exam assignment without assistance from another person. The assessment regulations of the Institute and Faculty of Actuaries apply as set out in the Examination Regulations except that you may refer to reference material. By submitting your files you are confirming that all material is entirely your own work and you wish this to be taken into account for this assessment.
6. Save your work regularly. You do not have to print out your work but you may choose to do so from time to time if you prefer to check a printed copy. Saving your work is your responsibility so failure to do so will not be a significant mitigating circumstance.
7. You must not discuss or disclose the material. To do otherwise may lead to a disciplinary case.
8. You are reminded that by undertaking this exam you are bound by the Institute and Faculty of Actuaries' Examination Rules and Regulations.
9. At the end of the allotted time or when you have completed your exam, you need to submit your work.

Your filenames must include your ARN (e.g. Summary\_90XXXXXX.docx) and each file should also contain your ARN as a header or footer on at least one page. You will receive an acknowledgement by email from the Online Exams Team confirming receipt. The Online Exams Team will send you an email after the exam requesting you to delete all your files relating to the exam, together with your planning notes and any print-outs. If you experience difficulties in submitting your work, you must inform the Online Exams Team immediately at [online\\_exams@actuaries.org.uk](mailto:online_exams@actuaries.org.uk) or T. +44 (0)1865 268 255.

**Professional behaviour is mandatory and no material relating to the exam may be disclosed or discussed with others, nor used in a further attempt at the exam.**

**Failure to comply with this will be deemed to be a breach of examination regulations and may result in disciplinary action.**

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## **Background**

On 1 July 2015, Joe Bloggs intends to donate £5000 to set up an account which will be used to fund a prize to be awarded at the annual “Analyst of the Year” dinner each year for the next 50 years.

The donation will be invested in a savings account which is expected to accumulate interest at an initial rate of 5.0% per annum effective for the first 5 years and then 3.0% per annum effective for the remaining 45 years.

At the end of each year a sum of money will be taken from the account in order to purchase a prize. The prize at the end of the first year will be £150 and thereafter it is expected that the cost of the prize will increase with inflation at a rate of 2.0% per annum.

At the end of the 50th year, after the final prize has been purchased, the account will be closed and should contain no surplus funds. Your manager is concerned that the £5,000 donation may be insufficient to cover the cost of all future prizes and may therefore require additional investment.

You should assume that all prizes are purchased at the end of each calendar year and that there are 365 days in all years.

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# PART 1

Your manager has asked you to create a model for the prize account and carry out checks throughout your calculations in order to validate the results; there are 10 marks available for reasonableness checks and automated checks.

- (i) Set up a spreadsheet to include separate worksheets for the parameters and account cashflows. [2]
- (ii) Identify the parameters for this model and set these out in the parameters worksheet. [3]
- (iii) In the account cashflows worksheet, construct a table to project the account values, showing, for each year:
  - (a) the account value, immediately before the cost of the prize is withdrawn.
  - (b) the cost of the prize.
  - (c) the account value, immediately after the cost of the prize is withdrawn. [7]
- (iv) Calculate the number of prizes that can be paid for by the initial investment. [1]
- (v) Repeat part (iii) in order to calculate any additional initial investment required to ensure there are sufficient funds to pay for all future prizes. [5]
- (vi) Construct a chart to illustrate the account value projections over the period with and without the additional investment. [3]
- (vii) By making a copy of the account cashflows worksheet and changing as necessary, determine the amount of initial funding that would be required if the inflation rate was assumed to be 2.5% per annum. [4]
- (viii) Repeat the analysis in part (vii) using a future inflation rate of 3.0% per annum. [3]
- (ix) Create a summary worksheet to present the results of your analysis. [2]

**Marks available for spreadsheet model:**

**Model accuracy, completeness and good modelling techniques [30]**

**Checks [10]**

**[Sub-total 40]**

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## PART 2

You need to document all your work in an audit trail so that a fellow Analyst student (with similar experience to yourself) could:

- peer review and check your model.
- continue to work on your model.
- use your model again for a similar purpose in the future.

Your audit trail should include the following aspects:

- the purpose of the model
- any assumptions you have made
- any limitations of your assumptions or of the model
- your methodology, i.e. a description of what you have done, and how and where in the model you have done it
- an explanation of all the checks you have performed
- a description of your summary of the results and of the charts you have produced

The audit trail can be in a separate worksheet within your Excel model or in a separate Word document.

### **Marks available for audit trail:**

#### **Audit approach**

<b>Fellow Analyst student can review, check and modify the model</b>	<b>[10]</b>
<b>Written in clear English</b>	<b>[5]</b>
<b>Written in a logical order</b>	<b>[3]</b>

#### **Audit content**

<b>All model steps accurately covered</b>	<b>[18]</b>
<b>All checks clearly recorded</b>	<b>[10]</b>
<b>All steps clearly explained</b>	<b>[8]</b>
<b>Clear signposting</b>	<b>[3]</b>
<b>Clear labelling</b>	<b>[3]</b>

**[Sub-total 60]**

**[Total 100]**

**END OF PAPER**

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