

EXAMINATION BOOKLET

October 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. 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 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.

This page has been left blank.

Background

John is currently in a final salary pension scheme. Benefits payable from the scheme (upon retirement) are calculated using a formula based on the length of service with the employer and the salary at retirement. It has been proposed that the scheme is amended to be a career average pension scheme, but only in respect of future service. John is interested in knowing how this change might affect him. He is particularly interested in whether his pension at retirement will be higher or lower under the new proposal.

Your manager has asked you to calculate, for each year of future service, the accrued pension in respect of all future service up to the end of each year. He would like you to perform a separate set of calculations for the current and the proposed formulae, to determine whether John's pension would be higher or lower if the proposed changes were implemented.

The accrual rate under the final salary pension scheme is $1/60$ th.

Under the proposal, the career average accrual rate is $1/55$ th and revaluation is in line with inflation.

John's current annual salary (in year 1) is £30,000. He estimates that over the next 10 years his salary will increase at the start of each year by inflation plus 2.0% per annum and inflation plus 1.5% per annum thereafter.

Assume that inflation is 3.0% per annum for all future years and that the client will be in the scheme for up to 30 years into the future.

Note that additional guidance has been provided, to explain how the final salary and career average schemes work.

This page has been left blank.

PART 1

Your manager has asked you to construct a model to project the accrued pension under each formula (current and proposed) on an annual basis for the next 30 years. You are required to carry out checks throughout; there are 10 marks available for reasonableness checks and automated checks.

- (i) Set up a spreadsheet to include separate worksheets for the parameters and accrued pension. [2]
- (ii) Identify the parameters for the model and set these out in the parameters worksheet. [3]
- (iii) In the accrued pension worksheet, construct a table for the current scheme, for each future year (1–30) showing:
 - (a) service (years) at the end of that year.
 - (b) estimated salary.
 - (c) accrued pension at the end of the year. [7]
- (iv) In addition to your other checks, your manager has specifically requested that you ensure that by amending the parameters, the accrued pension under the proposed formula is the same as that under the existing formula in the case where salary increases are equal to inflation and the accrual rate is the same. [2]
- (v) Construct a second table in the same worksheet, for the proposed scheme, for each future year (1–30) showing:
 - (a) estimated salary.
 - (b) accrued pension at the start of the year.
 - (c) inflation adjustment.
 - (d) new accrued pension in the year.
 - (e) total accrued pension at the end of the year. [4]
- (vi) Construct a suitable chart to illustrate how the total accrued pension increases with service – comparing the current and proposed schemes. [3]
- (vii) John is also interested in different scenarios that might give rise to a higher or lower pension. Construct new worksheets to allow for the following scenarios:
 - (a) “High earner” scenario – re-calculate the figures using a salary increase of 3.0% per annum in excess of inflation.
 - (b) “Low earner” scenario – repeat scenario (a) using a salary increase that is equal to inflation.
 - (c) “Average earner” scenario – repeat scenario (a) using a salary increase of 1.0% per annum in excess of inflation [4]

- (viii) For the initial scenario and each scenario in part (vii), consider which scheme is “better” at the end of the 30 year period and identify the year in which the current scheme starts to become more beneficial than the proposed scheme. [3]
- (ix) Construct suitable charts to illustrate your answers to each scenario in part (vii). [3]
- (x) Create a separate summary worksheet to present the results of your analysis. The summary should show the accrued pension at 30 years, highlight which scheme is “better” and in which year the current scheme starts to become more beneficial than the proposed scheme. [2]

Marks available for spreadsheet model:

- Model accuracy, completeness and good modelling techniques (to include all parts except part (iv))** [31]
- Checks (to include part (iv))** [10]

[Sub-total 41]

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

- **Fellow Analyst student can review, check and modify the model** [10]
- **Written in clear English** [5]
- **Written in a logical order** [3]

Audit content

- **All model steps accurately covered** [17]
- **All checks clearly recorded** [10]
- **All steps clearly explained** [8]
- **Clear signposting** [3]
- **Clear labelling** [3]

[Sub-total 59]

[Total 100]

END OF PAPER

This page has been left blank.