CAA GLOBAL

EXAMINATION

18 May 2022 (am)

Module 5 – Models and Audit Trails

Time allowed: Three hours and fifteen minutes

INSTRUCTIONS TO THE CANDIDATE

1.   You are given this question paper and an Excel file.

2.   Mark allocations are shown in brackets.

3.   Attempt all questions. Questions are to be answered as per 'exam requirements'.

If you encounter any issues during the examination please contact the Assessment Team at T. 0044 (0) 1865 268 873.

Background

You work for a large investment company, FundCo, which is considering launching a new unit-linked investment product. You have been asked to create a model to help determine the profitability of this product.

Customers can invest either a single premium or regular annual premiums in the product for a fixed 10-year term. A monthly fund management charge of 0.5% is paid to FundCo at the start of the month. Customers will not have a choice of funds to invest in – all premiums will be invested in a single fund.

You have been provided with the projected monthly fund returns for the next 10 years. The Fund Value (FV) at the end of each month can be calculated as follows:

$$FV_{\text{End of month}} = FV_{\text{Start of month}} \times (1 - \text{charge}) \times (1 + \text{fund return})$$

For each individual product sold, FundCo incurs the following expenses:

- Initial expenses of £300 to be paid immediately at the start of the 10-year period
- Fixed monthly expenses of £18 to be paid at the start of each month
- Fund-linked monthly expenses of 0.2% of the fund value at the start of the month to be paid at the start of each month.

FundCo measures the profitability of products using the Net Present Value (NPV) method using a discount rate of 0.3% per month. The net monthly cashflows to FundCo for each product will be equal to charges less expenses at the start of each month.

You have been asked to perform a range of calculations to show how the fund values and profitability vary depending on the size of the premium and whether the single or regular premium option has been chosen by the customer.

Details of the work you are required to carry out are provided in Part 1 below. Part 2 explains what should be included in your audit trail.

Additional information

When performing the calculations, you should assume the following:

- No customers will withdraw their investment before the end of the 10-year period.
- You do not need to make any allowance for potential death or illness of the policyholders.
- You do not need to make any allowance for overhead expenses.
- You do not need to make any allowance for inflation.
- Single premiums will be invested immediately at the start of the 10-year period. Regular premiums will be invested at the start of each year.

PART 1

(i)   Construct a spreadsheet model to include separate worksheets for data, data checks and charts, parameters, fund values, regular premium NPV, regular premium results, single premium NPV and any other worksheets as required.   [2]

(ii)   Carry out a range of checks on the data provided and comment on whether the data appears to be reasonable, given the information that has been provided. You are NOT required to make any alterations to the data.   [4]

(iii)   Plot the maximum, minimum and median monthly fund return on a suitable chart.
[3]

(iv)   Identify and set out the parameters for the model you are going to use in the 'parameters' worksheet.   [3]

(v)   Calculate the fund value at the end of the 10-year period for a £5,000 single premium investment.   [4]

(vi)   Calculate the fund value at the end of the 10-year period for a £500 regular annual premium investment.   [3]

(vii)   Plot the monthly fund values across the 10-year period for the single and regular premium investments from parts (v) and (vi) on a single chart.   [3]

(viii) Calculate the monthly cashflows for FundCo for the £500 regular annual premium investment.   [3]

(ix)   Calculate the NPV for FundCo for the £500 regular annual premium investment using your results from part (viii).   [2]

(x)   Calculate the NPV separately for regular annual premiums of £1,000, £1,500 and £2,000 using the same method you used for part (ix).   [2]

(xi)   Create a table summarising the NPV results for each level of regular premium from parts (ix) and (x).   [2]

(xii)   Plot the NPV result for each regular premium from part (xi) on a suitable chart.   [3]

(xiii) Calculate the net monthly cashflows for FundCo for the £5,000 single premium investment from part (v).   [2]

(xiv)   Calculate the minimum single premium FundCo should accept to ensure that the NPV is at least zero, using GOALSEEK or otherwise.   [2]

Marks available for spreadsheet model:

Model accuracy, completeness and good modelling techniques and data validation of initial data (part (ii)).   **[38]**

Reasonableness and automated checks, other than in part (ii).   [4]
[Sub-total 42]

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.
- run your model on different assumptions or extend your model to allow for extra data fields or scenarios.

Your audit trail should include the following aspects:

- the purpose of the model
- a description of the data used
- 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 to calculate the required values, and how and where in the model you have done it
- an explanation of all the checks you have performed
- your key results
- a description of the charts you have produced.

The audit trail should be in a separate Word document.

Marks available for audit trail:

Audit approach

- Fellow analyst student can review, check and modify the model.   [8]
- Written in clear English.   [4]
- Written in a logical order.   [3]

Audit content

- All model steps accurately included.   [21]
- All checks clearly recorded.   [8]
- All steps clearly explained.   [8]
- Clear signposting and labelling.   [6]

[Sub-total 58]
[Total 100]

Additional guidance

Useful Excel functions

GOALSEEK

The GOALSEEK function in Excel can be used to determine the input values needed to achieve a specific goal. In the Data Tools group of the Data menu tab, GOALSEEK may be found in the What-If Analysis menu. It allows you to set a chosen cell to a specified value by altering a given input value.

NPV

The NPV can be calculated using the following formula:

$$\mathbf{NPV} = \sum_{t=0}^{n-1} \frac{CF_t}{(1+r)^t}$$

where:

- t is the time (in months) of each cashflow.
- n is the total number of cashflows.
- CF_t is the cashflow at time t.
- r is the monthly discount rate.

END OF PAPER