CAA GLOBAL

EXAMINATION

28 October 2020 (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 Examinations team at T. 0044 (0) 1865 268 255.

This page has been left blank.

Background

You work for a large investment company, InvestX, which provides loans to companies that are building large infrastructure projects such as railways and bridges.

Your manager, who is Head of Investments at InvestX, has provided you with data on the 20 current outstanding loans held by the company and asked you to check the data for any errors. The company only provides loans in the currencies of British pound sterling (GBP) and US dollars (USD).

The company has $250,000 to invest and wants to offer the full amount as a loan to one of the following companies. All of the companies will pay interest annually in advance on the initial loan amount and repay the initial loan at the end of the term of the loan. The three companies being considered are:

- Company A, which would like a 15-year loan at a rate of interest of 4% p.a.
- Company B, which would like a 25-year loan at a rate of interest of 5% p.a.
- Company C, which would like a 35-year loan at a rate of interest of 6% p.a.

The discount rate InvestX uses when evaluating these investments varies by the total term of the investment.

- For a 15-year investment, InvestX uses a discount rate of 3% p.a.
- For a 25-year investment, InvestX uses a discount rate of 3.5% p.a.
- For a 35-year investment, InvestX uses a discount rate of 4% p.a.

InvestX also allows for the default risk on loans by assuming a 0.5% probability of default each year, from the start of year 2 onwards (i.e. the probability of default for the first cashflow at the start of year 1 is zero).

You have been asked to analyse the three options and produce some results and charts for your manager to use in a report they are preparing to discuss the three potential investments.

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:

- You do not need to apply any currency conversions on the data provided or when analysing the investment options.
- The rates of interest on the loans are constant across the term of the loan.
- The discount rates are constant across the term of the loan.
- The probability of default is constant for each company and across the term of the loan (from the start of year 2 onwards).
- The probability of default in each year is independent of all other years.

PART 1

(i)   Construct a spreadsheet model to include separate worksheets for the data, data statistics, parameters, NPV calculations, IRR calculations, results 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 sensible, given the information that has been provided. You are NOT required to make any alterations to the data. [5]

(iii) Calculate the maximum, minimum and mean original loan amount separately for GBP loans and USD loans in the 'data statistics' worksheet. [4]

(iv) Plot your results from part (iii) on a suitable chart. [3]

(v)   Identify and set out the parameters for the model you are going to use to evaluate the investment options in the 'parameters' worksheet. [4]

(vi) Determine the annual cashflows received by InvestX for each of the three potential investments (i.e. the loans to companies A, B and C) in the 'NPV calculations' worksheet. (Note: See the additional guidance section at the end of the paper.) [5]

(vii) Determine the Net Present Value (NPV) for each of the three potential investments in the 'NPV calculations' worksheet. (Note: See the additional guidance section.) [4]

(viii) Determine the Internal Rate of Return (IRR) for each of the three potential investments in the 'IRR calculations' worksheet. (Note: The IRR is the discount rate that makes the NPV zero.) [5]

(ix) Construct a table of results in the 'results' worksheet for your manager to present in their report. The table should set out the term, interest rate, NPV (rounded to the nearest thousand) and IRR for each of the three potential investments. [3]

(x)   Construct a suitable chart in the 'results' worksheet for your manager's report that shows the NPV for each of the three potential investments. [3]

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

Loan cashflows

Each company has set out the term of the loan they would like and the interest rate they will pay. Interest is paid annually in advance. The annual interest paid by the company to InvestX at time t, where t < total term, is equal to:

initial loan × annual rate of interest rate × (1 – probability of default$_t$).

At maturity, the initial loan is repaid. The cashflow at time t, where t = total term, is therefore equal to:

Initial loan × (1 – probability of default).

Net present value

The Net Present Value (NPV) of the potential investment can be determined as follows, where M is the term of the loan and i is the discount rate:

$$\sum_{t=0}^{M} \text{LoanCashFlow} \times (1 + i)^{-t} - \text{InitialLoan}$$

Note that the formula allows for the loan cashflows as inflows for InvestX, and the initial loan as an outflow at time zero.

END OF PAPER