

Exam CFED

Date: Friday, April 28, 2023

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This examination has 8 questions numbered 1 through 8 with a total of 70 points.

The points for each question are indicated at the beginning of the question. Questions 1-4 and 6 pertain to the Case Study.

2. While every attempt is made to avoid defective questions, sometimes they do occur. If you believe a question is defective, the supervisor or proctor cannot give you any guidance beyond the instructions provided in this document.

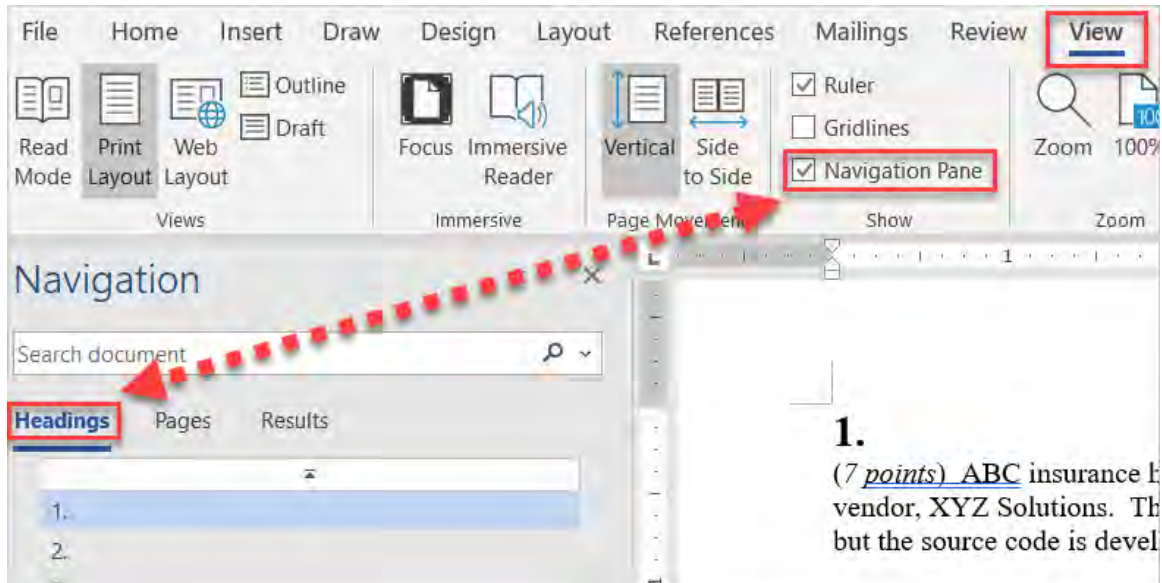
Written-Answer Instructions

1. Each question part or subpart should be answered either in the Word document or the Excel file as directed. Graders will only look at work in the indicated file.
 - a) In the Word document, answers should be entered in the box marked ANSWER. The box will expand as lines of text are added. There is no need to use special characters or subscripts (though they may be used). For example, β_1 can be typed as beta_1 (and ^ used to indicate a superscript).
 - b) In the Excel document formulas should be entered. Performing calculations on scratch paper or with a calculator and then entering the answer in the cell will not earn full credit. Formatting of cells or rounding is not required for credit.
 - c) Individual exams may provide additional directions that apply throughout the exam or to individual items.
2. The answer should be confined to the question as set.
3. Prior to uploading your Word and Excel files, each file should be saved and renamed with your five-digit candidate number in the filename.
4. The Word and Excel files that contain your answers must be uploaded before time expires.

Navigation Instructions

Open the Navigation Pane to jump to questions.

Press Ctrl+F, or click View > Navigation Pane:



CASE STUDY INSTRUCTIONS

The case study will be used as a basis for some examination questions. Be sure to answer the question asked by referring to the case study. For example, when asked for advantages of a particular plan design to a company referenced in the case study, your response should be limited to that company. Other advantages should not be listed, as they are extraneous to the question and will result in no additional credit. Further, if they conflict with the applicable advantages, no credit will be given.

Question 1 pertains to the Case Study.

1.

(6 points) You have been hired as a consultant for Darwin Life Insurance Company (Case Study section 6). Darwin’s CEO, Gabriela Martinez, would like to diversify Darwin’s sales channels and has identified two alternatives to sell online, direct to consumer.

Alternative I. Buying an existing online sales company by acquiring “TP Life Company”

TP Life is a privately owned online life insurance sales company that specializes in marketing and acquiring customers. It provides quotes from various insurance carriers and collects a commission when a policy is sold. It offers products from several insurance companies, but the only product offered is term insurance. Darwin believes it can acquire TP Life for \$80 million.

Alternative II. Building the capability internally by implementing Project Amplify

Project Amplify is a potential project to develop Darwin’s own website to drive sales. It has strong backing from the VP Life, Anne Kofsky. Anne believes that Darwin can develop the website in a cost-effective way, for only \$20 million, that also gives Darwin more control.

Gabriela has asked you to compare these two alternatives using the following assumptions:

If Darwin purchases TP Life (Alternative I), Darwin will offer only its own products on the platform and not products from other insurance carriers. Darwin expects the following profit stream:

End of Year	1	2	3	4	5	6+
After Tax Profits(\$millions)	2	4	6	8	10	10

Project Amplify (Alternative II) is expected to have the same profit stream as TP Life 30% of the time, and a profit stream of zeroes 70% of the time.

RPPC’s Weighted Average Cost of Capital (WACC) should be used for the comparison.

1. Continued

- (a) (1 point) Critique the use of RPPC's WACC for both alternatives.

ANSWER:

- (b) (1 point)

- (i) Calculate the NPV for each of the two alternatives using RPPC's WACC. Show your work.

The response for this part is to be provided in the Excel spreadsheet.

- (ii) Recommend which alternative Darwin should choose based on NPV. Justify your recommendation.

ANSWER:

1. Continued

After seeing your NPV calculation, Anne argues that the timing to deploy capital was not accurately reflected in the initial analysis:

- The organization has an option to only invest \$10 million now to get a pilot started.
- The success rate is still only 30%, and success or failure will be known after one year.
- If successful:
 - Alternative II will have earned \$2 million at the end of year 1.
 - The additional \$10 million investment will be made at the start of year 2.
 - The projected profit stream in years 2+ remains the same as originally projected.
- If unsuccessful, Alternative II will have earned \$0 at the end of year 1 and will be abandoned.

(c) (2 points)

- (i) Calculate the value of the option, using a decision tree. Show your work.

The response for this part is to be provided in the Excel spreadsheet.

- (ii) Describe two factors that could affect the value of the option you have calculated in (i).

ANSWER:

In addition to NPV, you are considering other aspects of Darwin's business profile and operation practice for the comparison of the two alternatives.

- (d) (2 points) Explain four important factors (other than NPV) that could influence Darwin's decision to move forward with either TP Life or Project Amplify, or neither.

ANSWER:

Question 2 pertains to the Case Study.

2.

(9 points)

(a) *(2 points)*

(i) Contrast high-quality financial reporting and high-quality earnings.

ANSWER:

(ii) Explain how financial reporting quality and earnings quality are related.

ANSWER:

2. Continued

SEA is found in Case Study section 8.

In its 2021 financial statements, SEA presents a new additional exhibit labeled “Normal Net Operating Statement”, as shown below.

Normal Net Operating Statement (in CAD 000s)			
	2021	2020	2019
Passenger revenues	7,235	7,024	6,820
Freight, charters, aircraft sales, and other	3,685	3,722	3,760
Total normal operating revenues	10,920	10,746	10,580
Operating expenses:			
Salaries, wages and benefits	3,058	3,009	2,962
Aircraft fuel	2,099	2,063	2,021
Aircraft maintenance, material, repairs, and other	3,362	3,336	3,312
Depreciation and amortization	393	387	381
Other operating expense	1,103	1,114	1,125
Total normal operating expenses	10,014	9,909	9,801
Normal operating income	906	838	778
Interest expense, net	(123)	(126)	(129)
Income (loss) before incomes taxes	783	712	649
Income tax benefit (expense)	(117)	(211)	(227)
Normal net income (loss)	666	501	422

Disclosure note: Normal net income reflects the profitability of our business after normalizing certain expenses. These values better reflect SEA’s past performance and allow for more accurate future projections.

2. Continued

(b) (3 points)

- (i) Determine where on the quality spectrum SEA's financial reports fall, based only on the financial statements in the case study. Justify your response.

ANSWER:

- (ii) Determine where on the quality spectrum SEA's financial reports fall, using the new exhibit and disclosure. Justify your response.

ANSWER:

- (iii) Critique management's decision to include this new exhibit.

ANSWER:

(c) (3 points)

- (i) Explain four possible motivations that might lead SEA management to issue low-quality financial reports.

ANSWER:

- (ii) Propose, for each motivation in (i), additional disclosures that would help the user of financial statements to assess whether SEA's management acted on that motivation.

ANSWER:

(d) (1 point) Describe the two conditions in addition to motivation that typically exist when companies issue low-quality financial reports.

ANSWER:

Question 3 pertains to the Case Study.

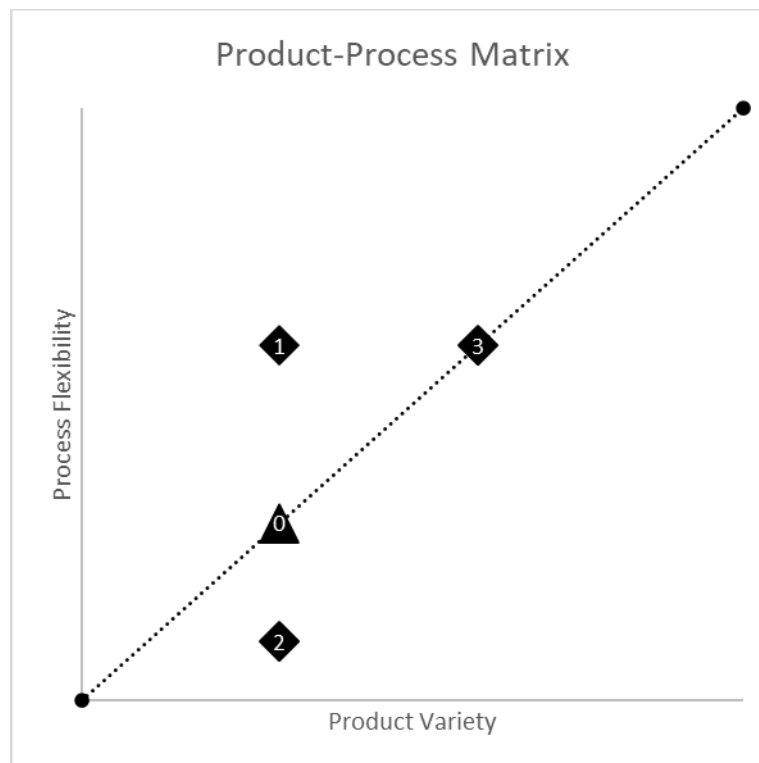
3.

(7 points) Blue Jay Tire Co. (BJT) is looking to expand its operations into non-road tires (Case Study section 3.4). The firm needs to evaluate its business processes and operations strategy.

- (a) (1 point) Identify the type of strategic fit approach BJT is pursuing with its expansion into non-road tires. Justify your response.

ANSWER:

The COO's team developed the following product-process matrix to evaluate BJT's current position as well as the potential positions following the product expansion. The current position is represented by a triangle (labeled 0), the potential positions are represented by diamonds (labeled 1-3), and the diagonal is represented by a dotted line.



3. Continued

(b) (2.5 points)

- (i) Explain what the current position 0 and all three potential positions 1-3 represent on the product-process matrix.

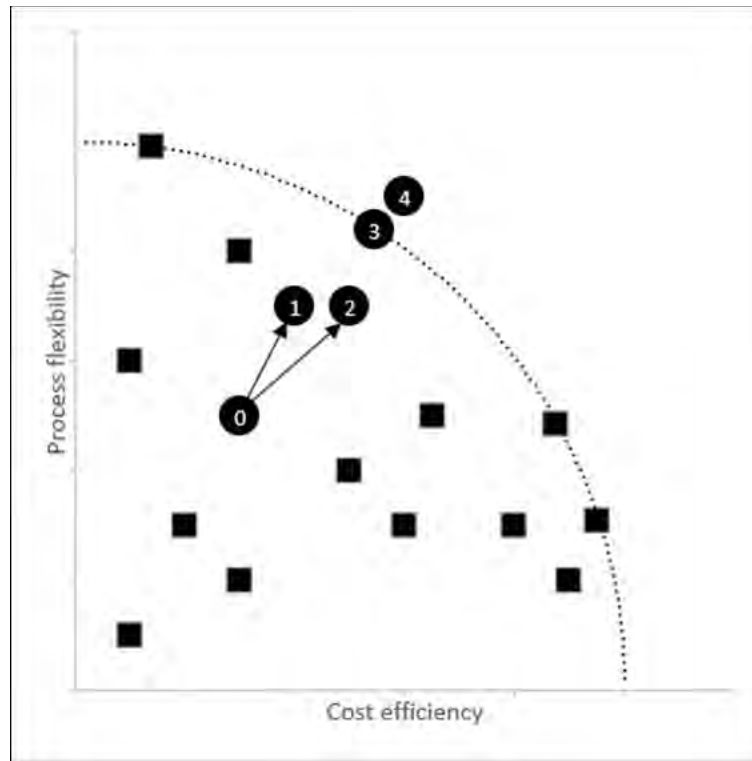
ANSWER:

- (ii) Recommend which position(s) on the product-process matrix would be best for BJT. Justify your recommendation.

ANSWER:

3. Continued

The COO's team developed the following graph to evaluate BJT's position relative to other firms in the industry. Competitors' positions, represented by squares, are either on or within the dotted line.



BJT's current position is position 0. Following the product expansion, BJT will be in position 1 or 2, depending on which of the two possible expansion approaches (acquiring TNT or building its own specialty tire plant) is taken.

(c) (1.5 points) Describe the information that this graph provides for the following in relationship to the two possible approaches to expansion:

(i) Positions 1 and 2.

ANSWER:

(ii) The dotted line.

ANSWER:

3. Continued

- (iii) The arrows between positions 0 and 1, and 0 and 2

ANSWER:

The COO wants BJT to be considered a top contender in the market for road and non-road tires. To reach this goal, the COO has identified two possible ideal positions to be in, represented by positions 3 and 4 on the graph.

- (d) (2 points)

- (i) Evaluate BJT's capacity to become more operationally efficient by reaching position 3.

ANSWER:

- (ii) Explain BJT's ability to reach position 4.

ANSWER:

Question 4 pertains to the Case Study.

4.

(10 points) Snappy Life (Case Study section 7) is currently evaluating the profitability of its products. As part of this exercise, Snappy is reconsidering its approach to allocating certain expenses to individual lines of business.

(a) (1 point)

(i) Describe the three primary reasons companies allocate fixed costs to individual cost centers.

ANSWER:

(ii) Explain which reason is most relevant to Snappy.

ANSWER:

4. Continued

The CFO, Corrie Caille, has identified the following fixed costs to be allocated to Snappy's product lines:

- Cloud Computing Costs = \$500,000
- Aggregate Sales Performance Bonuses = \$1,625,000
- IT Salary Overhead = \$935,000
- Software Licensing = \$62,500

Snappy is considering four approaches to allocate its fixed costs above:

- I. Evenly allocated across line of business
- II. Allocation by employee count
- III. Allocation by policy count
- IV. Allocation by face amount

(b) (2 points)

- (i) Assess if each of the approaches, I-IV, is an insulating or noninsulating allocation method. Justify your response.

ANSWER:

- (ii) Describe one advantage and one disadvantage of noninsulating allocation systems with regards to management behavior and performance.

ANSWER:

4. Continued

Snappy's CEO, Frank Veltro, would like to see the profitability percentage KPI evaluated by line of business under the various approaches, I-IV, as of January 1, 2022, using a discount rate of 5%.

(c) (4 points)

- (i) Determine the profitability percentage for each line of business before allocation of fixed costs. Show your work.

The response for this part is to be provided in the Excel spreadsheet.

- (ii) Determine which line of business benefits most from each of the four proposed allocation approaches, I-IV. Justify your response.

The response for this part is to be provided in the Excel spreadsheet.

- (iii) Determine which allocation Veltro would prefer. Justify your response.

The response for this part is to be provided in the Excel spreadsheet.

- (d) (1 point) Identify a shared cost from Snappy that Corrie has not identified for cost allocation. Justify your response.

ANSWER:

4. Continued

Corrie is considering an activity-based costing (ABC) approach for Snappy's product lines, as she believes it will most equitably distribute costs among the products.

After reviewing the ABC alternatives proposed by Corrie, Veltro states "ABC is all too complicated for just allocating costs. Use face amount to allocate the fixed costs instead! At the end of the year, the product line with the highest profitability percentage will receive an additional year-end bonus, which will be excluded from the profitability percentage calculation."

- (e) (2 points) Critique Veltro's statement.

ANSWER:

5.

(12 points) You are an actuary working in the ERM department of a large insurance carrier, and you plan to develop a stochastic model to calculate the solvency capital requirements for the company for a term life insurance product.

- (a) (1 point) Describe one advantage and one disadvantage of stochastic models.

ANSWER:

You have determined a proxy model will be used for the calculations. Management prefers a proxy model where the individual risk components (e.g., interest rate, mortality, lapse, and credit spread) can be optimized. The following proxy formulas are being considered for the model:

- Replicating Portfolios
- Replicating Polynomial
- Commutation Functions

- (b) (2 points)

- (i) Compare and contrast the three proxy formulas across the following:

- I. Formula structure
- II. Regression versus interpolation
- III. Optimization

ANSWER:

- (ii) Recommend a proxy formula that will satisfy management's preference. Justify your recommendation.

ANSWER:

5. Continued

Your manager, the head of ERM, says, “A proxy model mimics the key behaviors in the heavy model, so we can rely on all the results of your proxy model at the scenario level going forward.”

- (c) (2 points) Critique your manager’s statement.

ANSWER:

1,000 calibration scenarios have been run in the selected proxy model, with the output provided in the Excel spreadsheet, Q5_d. The results of the heavy model for the same 1,000 scenarios are also provided in the Excel spreadsheet.

- (d) (1.5 points)

- (i) Calculate the 1-in-200 VaR of the calibration scenarios. Show your work.

The response for this part is to be provided in the Excel spreadsheet.

- (ii) Calculate the 95th Percentile Error of the proxy model. Show your work.

The response for this part is to be provided in the Excel spreadsheet.

- (e) (3.5 points) Assess the appropriateness of the fit of the proxy model.

The response for this part is to be provided in the Excel spreadsheet.

5. Continued

The results of sample stress testing of the model are provided in the table below.

Risk Factor	Marginal Impact of Risk Factor
Interest Rate	5
Mortality	2
Lapse	4
Credit Spread	2.5
Combined Scenarios	15

The formula component for non-linearity between any two risks above (excluding Combined) is of the form: $c_1xy + c_2xy^2 + c_3x^2y + c_4x^2y^2$ where c_1 , c_2 , c_3 , and c_4 are constants.

(f) (2 points)

- (i) Calculate the Combined Non-Linearity Surface of the stress test. Show your work.

The response for this part is to be provided in the Excel spreadsheet.

- (ii) Determine the number of heavy lift calculations required to calibrate the formulas of each of the potential risk factor pairings. Show your work.

The response for this part is to be provided in the Excel spreadsheet.

Question 6 pertains to the Case Study.

6.

(10 points) Given RPPC Dynasty's priority to broaden and strengthen risk capabilities, it is adopting a Market Consistent Embedded Value (MCEV) framework for its financial business groups.

- (a) (1 point) Explain two other reasons why RPPC might benefit from adopting an MCEV framework.

ANSWER:

- (b) (2 points) Describe four considerations for the treatment of financial options and guarantees under an MCEV framework.

ANSWER:

Aliyah Jackson, CRO of Darwin Life, is proactively analyzing Darwin Life's product portfolio under an MCEV framework.

- (c) (4 points) Determine two design features or operation issues that exist within each of the following Darwin product lines that may negatively influence MCEV:

- (i) Variable Annuities
- (ii) Universal Life with Secondary Guarantees

Justify your responses.

ANSWER:

6. Continued

Aliyah is considering the following approaches to increase the MCEV of the Variable Annuity business:

- I. Reinsuring a portion of the block
- II. Hedging differently

(d) (3 points) Explain how each approach, I and II, could be applied effectively to increase MCEV.

ANSWER:

7.

(8 points) Conglomerate Holdings, a US multinational organization has a wholly owned subsidiary, Sunshine Spot Insurance, established Jan 1, 2020, in the Sunshine Islands, a tax free zone. The Sunshine Islands currency is the Sunshine Islands Shinee, Š.

(a) (2 points)

(i) Describe three appropriate disclosures related to statement translation.

ANSWER:

(ii) Identify three considerations for Conglomerate Holdings as it prepares Sunshine Spot Insurance's translated statements.

ANSWER:

The relevant income and balance sheet tables are included in Excel tab Q7_b for this exam.

For the year 2020, the exchange rates between the Š and \$US strengthened as follows:

Date	\$US per Š
Jan 1, 2020	0.75
Average 2020	0.79
Weighted avg when non-monetary assets/liabilities acquired	0.78
December 15, 2020 when dividends were declared	0.83
December 31, 2020	0.85

Sunshine Spot Insurance is required to provide a dividend to its parent equal to 40% of Net Income. This needs to be reflected in the balance sheet and income statement. Retained earnings at the end of 2019 were Š 0. Assume statutory reserves are a non-monetary asset.

7. Continued

(b) (5 points) Provide the income statement and balance sheet (including dividend impact) for Sunshine Spot Insurance for 2020, ignoring taxes, as it will appear in the parent's consolidated financial statements under:

(i) The current rate method.

The response for this part is to be provided in the Excel spreadsheet.

(ii) The temporal method.

The response for this part is to be provided in the Excel spreadsheet.

Your manager wants to choose the current rate method to reduce volatility.

(c) (1 point) Critique your manager's suggestion.

ANSWER:

8.

(8 points) Your company is interested in purchasing a competitor's existing block of fixed deferred annuities with minimum interest rate guarantees ranging from 1% to 4%. When interest rates increase rapidly, the product experiences higher than normal lapses because the product's portfolio crediting rate cannot keep up with new money crediting rates.

- (a) (1 point) Identify two distinctive features that need to be considered in selecting a suitable stochastic process to model interest rates.

ANSWER:

You are interested in understanding projected lapses under different market conditions, and possibly applying machine learning techniques. The seller has provided historical monthly data on a set of 100,000 policies for a period of ten years. A data summary report is provided in Excel tab Q8_b.

- (b) (1 point) Identify two data quality issues indicated by the data summary report provided in Excel.

<i>The response for this part is to be provided in the Excel spreadsheet.</i>

8. Continued

As part of evaluating the purchase of the block, the company is considering a hedge program to protect against interest rate risk. You have been asked to determine the appropriate strike prices for both interest rate caps and floors.

- The risk tolerance level is 90% VaR of net losses, including hedge costs.
- The distribution of net losses generated under a set of stochastic scenarios is provided in Excel tab Q8_c.

(c) (2 points) Describe two pros and two cons of using stress testing for this model.

The response for this part is to be provided in the Excel spreadsheet.

You are looking at the backtesting results of two models,

- In your current model, you observed 93 instances where the net losses exceeded your risk tolerance.
- In an industry model (based on 500 observations generated under a different distribution, but that uses the same risk tolerance metric), you observed 62 instances where the net losses exceeded your risk tolerance.

(d) (3 points)

(i) Compare the two models based on backtesting results.

The response for this part is to be provided in the Excel spreadsheet.

(ii) Recommend the best model to use. Justify your recommendation.

The response for this part is to be provided in the Excel spreadsheet.

8. Continued

You have been asked to present the results of this analysis for decision making to the Risk Committee. You know that the Risk Committee has often taken the view that the decision should be whatever the model says.

- (e) (*1 point*) Summarize the key points that you should highlight to the Risk Committee to help them think more broadly about using model results to make decisions.

ANSWER:

****END OF EXAMINATION****