

Exam CFED

Date: Friday, April 26, 2024

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.

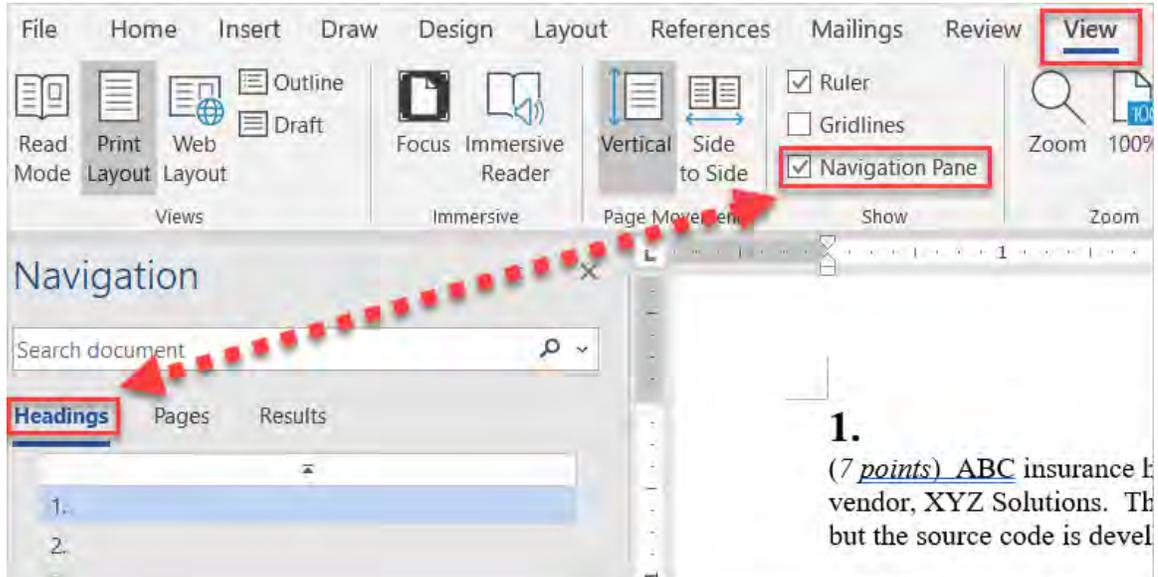
Written-Answer Instructions

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.

**Questions 1, 4 and 6 pertain to the Case Study.
Each question should be answered independently.**

1.

(7 points) You are an analyst preparing financial reports for Frenz (Case Study section 4.5).

(a) (1 point) Explain how inventory accounting choices impact the income statement.

ANSWER:

When you reviewed the 2021 year-end income statement, you noticed that the unit costs for coffee beans, supplies, and non-coffee products increased roughly 80% that year. However, the retail price for most of the products remained relatively stable, increasing by about 15%.

There are two inventory accounting choices being considered by Frenz:

- First in first out basis
- Weighted average cost basis

(b) (1 point) Describe how earnings for 2021 and future years would differ based on the two inventory accounting methods.

ANSWER:

(c) (3 points)

(i) Determine the reporting quality of Frenz according to the Quality Spectrum of Financial Reporting. Justify your answer.

ANSWER:

(ii) Recommend two ways to improve Frenz's reporting quality. Justify your recommendations.

ANSWER:

1. Continued

Frenz plans to sell its household coffee business in 2025 as its market share remains relatively small, and the business is not very profitable. In addition, Frenz would like to free up the capital for its expansion plan. It is planning to include this sale in its revenue in the 2025 year-end financial statements. Frenz plans to exclude any expenses related to this business in its income statement given the fact that the household coffee business will be gone soon.

- (d) (2 points) Evaluate the impact of the planned reporting changes on the quality of Frenz's financial statements.

ANSWER:

2.

(9 points) Company XYZ has a team of sales professionals who travel to various customers. XYZ is considering the following two business travel options for its sales professionals:

- I. Purchase cars for \$35,000 each
- II. Reimburse the sales professionals \$0.85 per mile for use of their personal vehicles

The company has made the following assumptions:

- The annual interest rate is fixed at 5%.
- Gasoline costs are \$0.10 per mile.
- A car is expected to last 100,000 miles or 5 years, whichever comes first. Assume that this car has no salvage value.
- Cars are purchased at the beginning of the year. Reimbursements and gasoline costs are paid at the end of the year.

- (a) (2 points) Calculate the cost of business travel for one sales professional using the equivalent annual benefit method under each of options I and II, assuming a sales professional averages 20,000 miles annually. Show your work.

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

At the end of 1 year:

- If XYZ has purchased the cars, it can sell the cars for an unknown price.
 - If XYZ has provided mileage reimbursements, it can choose to purchase a fleet of cars.
- (b) (1 point) Describe the types of real options that XYZ owns if they initially purchase the cars.

ANSWER:

2. Continued

XYZ has an option to wait by reimbursing mileage for the first year. Assume the following:

- There is a 50% chance the sales professional drives 5,000 miles per year, and a 50% chance the sales professional drives 25,000 miles per year.
 - At the end of the first year, you will know with certainty whether the sales professional will drive 5,000 or 25,000 miles per year each subsequent year. It will match the number of miles driven in the first year.
 - At the end of the first year, a new car will cost \$38,000.
- (c) (5 points) Calculate the value of the real option to wait by reimbursing mileage for the first year, assuming a time horizon of 5 years from today (i.e., 4 years from the potential future purchase date). Show your work.

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

- (d) (1 point) Describe two shortcomings associated with the calculations you performed in part (c).

ANSWER:

3.

(8 points) Hibiscus Insurance Company is evaluating a newly issued stock to add to the equity portfolio. John, an ALM manager, is developing a risk prediction model for the stock. He has obtained two sets of data with a 1-year horizon of that stock, one from the accounting department and another from the investment department.

Emily, an analyst, suggests that John should use the investment department data.

Emily also observes that intraday movement will affect data accuracy.

(a) (1 point)

(i) Assess Emily's suggestion to use the investment department data.

ANSWER:

(ii) Recommend two methods to address the issue with data accuracy.

ANSWER:

(b) (2 points)

(i) Describe the purpose of back-testing in this context.

ANSWER:

(ii) Explain which CRISP-DM stage the back testing procedure belongs to.

ANSWER:

3. Continued

John proposes a standard normal model with Rosenblatt Transformation for back testing.

(c) (5 points)

- (i) Perform the Rosenblatt Transformation on the data provided in Excel tab Q3_c. Show your work.

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

- (ii) Determine if the null hypothesis can be accepted. Justify your answer.

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

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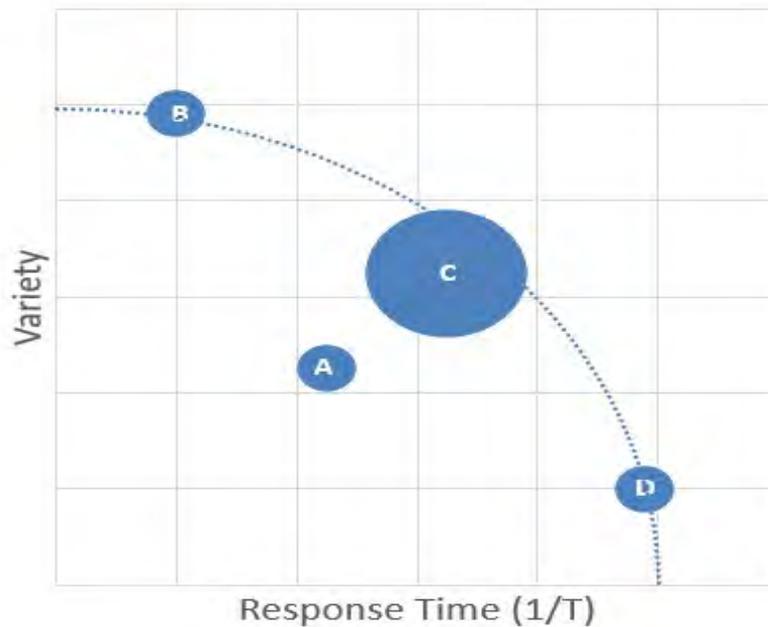
4.

(11 points) Frenz is considering the strategic position of its coffee shops (Case Study section 4).

- (a) (2 points) Explain two ways Frenz is attempting to achieve a sustained competitive advantage.

ANSWER:

Frenz is working with a consultant who prepares a competitive product space and associated operational frontier relative to two product attributes (variety (V) and response time (1/T)):



Point A represents Frenz's current competitive position. Point B represents a chain of gourmet food shops with industry leading variety but long wait times. Point D represents a gas station chain that offers no wait time but extremely limited variety.

4. Continued

The consultant makes the following statements:

- I. Frenz's current offerings give flexibility in determining the company's strategic positioning. There is room for Frenz to position itself in area C, offering customers a moderate variety of products with only a short wait time.
- II. Moving to area C would require Frenz to make strategic tradeoffs.
- III. The operational frontier is fixed, making it easier for Frenz to achieve area C.

- (b) (3 points) Evaluate each of the consultant's statements, I-III, based on the operational frontier above.

ANSWER:

Frenz's procurement department wants to develop a comprehensive view of the supply chain vulnerabilities, focusing on the following two risks:

- A. Risk of absolute shortage
- B. Risk of supplier defaults

The procurement department wants to conduct an analysis of Frenz's primary suppliers for five key ingredients (coffee, tea, cups, straws, and dairy products). The analysis will prioritize the risks by assigning a number from 1 to 3, where 1 is the highest risk and requires immediate action, 2 is moderate risk requiring a mitigation strategy in the medium term, and 3 is the lowest risk.

- (c) (3.5 points) For each supplier:

- (i) Assign a risk priority from 1 to 3 for each risk A and B in the Excel chart in tab Q4_c.

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

- (ii) Justify your prioritizations in (i) using information from Section 4.3 from the Case Study.

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

4. Continued

- (d) (2.5 points) Recommend an appropriate mitigation strategy for Frenz to consider for each supplier.

ANSWER:

5.

(9 points) Company KNO back-tested a revised accelerated underwriting (AUW) platform against the 5,000 applications scored by its original platform. The AUW platform classifies applicants into one of six categories below for Non Tobacco (NT), Tobacco (Tob), and full underwriting (Full UW). Relative mortality shows the mortality of each risk class relative to the NT Risk Class 3. Performance results are in the matrix below:

		Prediction using revised AUW platform								
		Relative Mortality	NT Risk Class 1	NT Risk Class 2	NT Risk Class 3	Tob Risk Class 1	Tob Risk Class 2	Full UW	total	
Target= Original AUW Platform	NT Risk Class 1	58%	1800	288	96	0	0	216	2400	82.4%
	NT Risk Class 2	78%	240	1120	112	0	0	128	1600	76.1%
	NT Risk Class 3	100%	0	10	450	0	0	40	500	97.8%
	Tob Risk Class 1	156%	0	0	0	273	0	27	300	100.0%
	Tob Risk Class 2	200%	0	0	0	0	90	10	100	100.0%
	Rated	300%	0	1	2	2	5	40	50	80.0%
	Decline	400%	0	0	1	2	2	45	50	90.0%
ROC Index			88.2%	78.9%	68.1%	98.6%	92.8%		5000	
			79%							

(a) (2 points)

(i) Explain the false negatives and true positives in the confusion matrix above.

ANSWER:

(ii) Explain how recall and precision have been calculated above.

ANSWER:

(b) (3 points)

(i) Calculate the accuracy and average class accuracy. Show your work.

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

(ii) Evaluate each of the performance measures in (i) vs a 79% ROC index.

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

5. Continued

KNO uses mortality slippage to measure the cost of misclassification.

(c) (4 points) Using the mortality slippage cost table provided in the Excel tab Q5_c:

(i) Construct the gain/loss matrix of the misclassifications. Show your work.

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

(ii) Analyze the components of the gain/loss.

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

(iii) Evaluate the overall performance of the revised AUW platform.

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

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6.

(10 points) Blue Jay Air (BJA) completed an initial estimate of its 2023 forecast in June 2023, including the deferred tax assets and liabilities per Note 7 of the BJA financial statements (Case Study section 2.7). The initial estimates are shown in Excel tabs Q6_Statement of Operations, Q6_Stmt. of Financial Position, and Q6_a.

(a) (2 points)

- (i) Explain why the amounts of the deferred tax assets and liabilities displayed in the balance sheet are different from Note 7.

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

- (ii) Calculate the TBD elements in the table in Excel. Show your work.

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

There are some tax-related items that are not yet reflected in the forecast:

- I. The Tax team advises it is possible that \$22 million of deferred tax assets may not be recovered.
- II. New equipment is purchased in 2023 with a depreciation amount of \$2 million. The Tax team advises that, per IRS rules, the depreciation amount for tax purposes is \$10 million.
- III. There is a decrease in the fair value of assets of \$14 million.
- IV. Due to a change in accounting policy, income has increased by \$15 million.
- V. BJA may need to write down goodwill by \$8 million.

(b) (3 points) Analyze the impact to the deferred taxes/liabilities for each of these items.

ANSWER:

6. Continued

Based on the 2023 forecast, you are asked to follow the financial analysis framework and BJA's risk management Guiding Principles and Specific Risk Tolerances (Case Study Section 2.4) to examine:

- I. Activity (Q6_c_Activity tab)
- II. Liquidity (Q6_c_Liquidity tab)

(c) (3.5 points)

- (i) Recommend a quantifiable financial ratio for each of I-II above. Justify your recommendation.

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

- (ii) Calculate each ratio you recommended in (i) for each of 2021, 2022 and 2023. Show your work.

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

- (iii) Interpret the results in (ii).

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

(d) (1.5 points) Describe two potential follow-up items for the 2023 forecast that should be examined further based on your recommendations in part (c).

ANSWER:

7.

(8 points) The Big Guys Private Equity Firm (BGPEF), a private equity firm with no insurance presence, has approached Epoch Life Insurance Company (Epoch), a medium sized privately held individual life and variable annuity business, about a potential acquisition.

(a) (2 points) Describe how BGPEF would view an acquisition of Epoch with regards to each of the following:

(i) Capital

ANSWER:

(ii) Economies of scale

ANSWER:

(iii) Vertical integration

ANSWER:

Relevant financial information for the acquisition is shown below:

- Epoch Assets = \$1.35 Billion
- Epoch Liabilities = \$1.11 Billion
- Acquisition Synergies Per Year (first 3 years) = \$9.5 million
- Assume all cash flows happen at the beginning of the year.
- BGPEF has offered 110% of book value to acquire Epoch.
- BGPEF uses a weighted-average cost of capital (WACC) of 5%.

(b) (2 points) Assess the proposed acquisition price. Show your work.

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

7. Continued

BGPEF's head of operations, Hugo Grande, has proposed 3 opportunities to undertake after acquiring Epoch. He has summarized the projected metric for each of the opportunities in the table below.

	Break Even Year	NPV @ BGPEF WACC = 5%	NPV @ 15%	5yr IRR	10yr IRR	30yr IRR
1. Operational/IT Improvement	7	\$43,444.55	\$7,003.32	-15%	13%	23%
2. Capital Efficiency	6	\$10,097.73	\$2,078.61	-21%	23%	33%
3. Investment Performance	3	\$244.77	\$102.33	35%	49%	50%

BGPEF uses a hurdle rate of 15% IRR over 10 years as its criteria to rank all potential investments.

(c) (2.5 points)

(i) Explain which opportunities BGPEF would pursue given its criteria.

ANSWER:

(ii) Critique BGPEF's criteria.

ANSWER:

(d) (1.5 points) Rank each opportunity, ignoring BGPEF's specific criteria and considering the application to Epoch. Justify your ranking.

ANSWER:

8.

(8 points) Melissa Martingale is Chief Actuary of Synergy Insurance Company (SIC), which primarily sells a simple annuity product. SIC plans to develop a complex equity-linked annuity product with an embedded Long-Term Care (LTC) rider.

As a starting point for the analysis, Melissa asks her Lead Pricing Actuary, Lisa Lemma, to convert the most recent simple annuity pricing model to a suitable pricing model for the new product.

(a) (2 points)

- (i) Describe two common sources of model risk that should be considered when adapting the existing model for use with the new product.

ANSWER:

- (ii) Propose two risk management approaches to mitigate the risks identified in part (i).

ANSWER:

Lisa has adapted the simple annuity model to price the new product. Melissa has asked Lisa to quantify the model risk. Lisa responds,

“There isn’t a model risk to quantify, as we are using best estimate pricing assumptions and we have validated the calculations using an independent replicating model. The model output is, by definition, the best estimate of the new product’s cost.”

(b) (2 points)

- (i) Critique Lisa’s statement on model risk quantification.

ANSWER:

- (ii) Propose an approach to quantify one potential type of model risk present in the new pricing model.

ANSWER:

8. Continued

Melissa believes there are a number of key assumptions for modeling the appropriate cost of the new product, including morbidity, mortality, economic environment, and policyholder behavior. Melissa would like to model the cost using a multivariate stochastic process on these assumptions.

- (c) (0.5 points) Describe two challenges in modeling with a multivariate stochastic process.

ANSWER:

As an alternative to modeling a multivariate stochastic process, Lisa proposes performing both:

- I. Principal Component Simulation
- II. Scenario Simulation

- (d) (2.5 points) For each simulation technique, I and II:
- (i) Define the simulation technique.

ANSWER:

- (ii) Propose a specific approach for modeling the new product's assumptions using the simulation technique.

ANSWER:

- (e) (1 point) Compare and contrast a full multivariate approach, principal component simulation, and scenario simulation.

ANSWER:

****END OF EXAMINATION****