Foundations of CFE Exam

Exam CFEFD

Date: Wednesday, October 28, 2020

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This examination has 10 questions numbered 1 through 10 with a total of 100 points.

   The points for each question are indicated at the beginning of the question. Questions 1 – 9 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. The Word and Excel files that contain your answers must be uploaded before time expires.

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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.

1. (*12 points*) You work in the CFO's department of Blue Jay Air (BJA). You talk to Jane Doe, an outside director of BJA, about the possible acquisition of Seaplane Expeditions and Aviation Company (SEA).

Refer to Case Study Sections 2 and 9.

"Diversification is not a sufficient reason to justify the acquisition of SEA," says Doe.

(a) (*1 point*) Critique Doe's statement.

> ANSWER:

(b) (*2 points*) Explain the synergy and economies of scale that BJA would gain if it were to acquire SEA.

> ANSWER:

"I see that Bill Otterwien controls 60% of SEA but that his sister and the Otterwien Foundation each control 20%," Doe notes. "What happens if only Bill Otterwien cooperates with us on the acquisition?"

(c) (*2 points*) Explain Doe's concerns with respect to the following.

    (i) Probability of completing the acquisition of SEA

    (ii) Control of SEA

    (iii) Cost to purchase SEA

    (iv) Ability of BJA to unlock value in SEA

> ANSWER:

1. Continued

    (d)   (*2 points*) Recommend if BJA should retain SEA management upon acquisition. Justify your recommendation.

> ANSWER:

Doe also comments on leasing planes for any expansion. She says, "I don't believe that leasing planes would be any cheaper than buying the planes outright."

    (e)   (*1 point*) Critique Doe's statement.

> ANSWER:

    (f)   (*2 points*) Explain four benefits to BJA of leasing the additional planes.

> ANSWER:

    (g)   (*2 points*) Recommend a financing option to support leasing more planes to fulfill BJA's expansion plans. Justify your recommendation.

> ANSWER:

2. (*10 points*) You are performing due diligence for a potential investment opportunity of Blue Jay Tire (BJT) (Case Study Section 3.4). You have questions about the quality of the financial reports. You are aware of the following actions that BJT has taken:

- BJT encouraged customers to order more goods through discount offers with extensive rights to return their purchases.
- BJT classified some payments due to suppliers for the next 6 months as non-current liabilities.
- BJT reclassified interest paid as operating cashflows in 2018 as opposed to financing cashflows.

(a) (*3 points*) Evaluate how each action individually impacts BJT's financial statements.

ANSWER:

In addition, as part of your analysis of BJT, you decided to compare some of its activity metrics to the industry averages:

Metric	Industry Average
Day's Sales Outstanding	85.5
Accounts Receivable Turnover	82.1

(b) (*2 points*)

(i) Analyze Day's Sales Outstanding and Accounts Receivable Turnover for BJT for financial reporting year 2018 and 2019. Show your work.

ANSWER:

(ii) Evaluate BJT's sales and receivables as compared to industry norms.

ANSWER:

2. Continued

You investigate whether there might be any leading indicators to suggest significant future financial troubles for BJT. You plan to use the Altman's Z-score and the Beneish Model:

> Altman's Z-score = 1.2 (Net working capital/Total assets) + 1.4 (Retained earnings/Total assets) + 3.3 (EBIT/Total assets) + 0.6 (Market value of equity/Book value of liabilities) + 1.0 (Sales/Total assets)

(c) (*2 points*)

   (i)   Assess the likelihood of bankruptcy using Altman's Z-score on BJT's 2019 financials, replacing Market Value of Equity with the Book Value. Show your work.

   (ii) Recommend four ways for BJT to improve its current Altman's Z-score. Justify your recommendation.

ANSWER:

(d) (*2 points*)

   (i)   Explain specific implications for BJT based on the components of the Beneish Model below. Show your work.

   > I.   Gross Margin Index (GMI)
   > II. Sales Growth Index (SGI)

   (ii) Assess the likelihood of misreporting for BJT if M-score is -1.47. Show your work.

ANSWER:

(e) (*1 point*) Explain two specific areas of concern for any investment decision in BJT.

ANSWER:

3.   (*7 points*) Frenz (Case Study Section 4) is considering investing in a project with the
following information.

Scenario	Probability	NPV
Unfavorable	85%	-$15,000,000
Favorable	15%	$40,000,000

Assume Frenz executives have the following deferred compensation:

	Present Value of Future Pension	Value of Stock + Options
Chief Executive Officer	$1,000,000	$1,530,000
Chief Finance Officer	$550,000	$275,000
Chief Accounting Officer	$475,000	$470,000
Chief Risk Officer	$800,000	$600,000

(a)   (*2 points*) Evaluate which executive(s) would be most likely to encourage
investment in the project based on the deferred compensation package provided
above. Justify your response and show your work.

ANSWER:

Consider the following scenarios:

I.   Frenz issues an additional $20,000,000 in stock. Assume that the liabilities
and executive deferred compensation structure of Frenz remain unchanged.

II. The executive deferred compensation packages are restructured such that the
allocation between future pension and stock + options are based on the
average of the current structure of all executives. The total compensation of
each executive does not change.

(b)   (*2 points*) Assess the expected impact on each executive's incentive to have
Frenz invest in the above project for each of the scenarios I and II. Show your
work.

ANSWER:

3. Continued

(c)   (*3 points*) Frenz is considering paying a special dividend, which is unexpected by the market.

        (i)   Describe two reasons that Frenz's ability to pay this special dividend might be limited.

        (ii)   Explain three reasons why the executives of Frenz may be opposed to the payment of this special dividend.

        (iii)   Explain three potential market signals that Frenz could be trying to convey by electing to pay a special dividend instead of repurchasing shares.

ANSWER:

4. (*12 points*) Mr. Patel has hired you to review Big Ben's model risk (Case Study Section 6). He provides RPPC's Model Risk Framework (Case Study Section 1.3.10).

(a) (*2 points*) Recommend two improvements to RPPC's Model Risk Management Framework to strengthen the model validation process. Justify your recommendation.

> ANSWER:

You begin your review with Big Ben's stress testing models. Patel says, "Stress tests have limited value because you don't know their likelihood."

(b) (*2 points*) Critique Patel's statement.

> ANSWER:

(c) (*3 points*)

> (i) Critique Big Ben's stress testing.
>
> (ii) Recommend two improvements to Big Ben's stress testing. Justify your recommendation.

> ANSWER:

4. Continued

You then turn your attention to Big Ben's backtesting results. You are concerned that you are only provided the statement: "The model has been deemed to have passed the backtesting because recent tests have shown that after-tax profits are not systematically under or over estimated."

(d) (*2 points*)

(i) Describe two pieces of important backtesting information not provided in the above statement.

(ii) Explain how the missing information described in (i) can be a concern to Big Ben.

ANSWER:

You request daily time series data to review the backtesting results. The following table provides forecasted and observed profits for five consecutive trading days. Profits are assumed to be normally distributed.

Observation Day	Realized P/L	Forecast Mean	Forecast Standard Deviation
T	4,065	3,250	967
T+1	4,297	5,665	1,629
T+2	2,981	2,275	838
T+3	3,505	4,051	650
T+4	2,977	1,922	1,252

(e) (*3 points*)

(i) Interpret the backtesting results above.

(ii) Recommend whether further action is needed based on the results above. Justify your recommendation.

ANSWER:

5. (*9 points*) Blue Jay Air (BJA) (Case Study 2.1) is reviewing its supply chain risk.

(a) (*2 points*) Describe one example that applies to BJA for each of the supply chain risk categories.

ANSWER:

(b) (*2 points*) Apply the top-down value hierarchy framework to each of the key supply-chain risks discussed in the Commercial Airline Industry Profile (Case Study 2.1).

ANSWER:

Other airlines are available for acquisition, such as the Seaplane Expedition and Aviation Company (SEA) (Case Study section 9). BJA wants to apply the key success factors for the airline industry to assess whether SEA is a good prospect for acquisition.

A consultant recommended using SMART methodology to analyze acquisition candidates. He concluded the following five factors are the most important to determine whether an acquisition will be successful:

Factor	Factor Description
Market Position	Company's market position, including its route and hub network
Alliances	Business alliances and partnerships
Market Share	Company's market share
Reputation	Service standard/quality and reputation
Philosophy	Management philosophy, strategy, and financial risk policies

(c) (*3 points*) Critique the consultant's choice of factors proposed to BJA for assessing the acquisition of SEA. Justify your answer.

ANSWER:

5. Continued

The consultant has provided the following scores of SEA and two other airline companies based on the five factors recommended.

Factor	Factor Rating	SEA	Company B	Company C
Market Position	0.9	0.8	0.9	0.7
Alliances	0.7	0.6	0.3	0.8
Market Share	1.0	0.5	0.9	0.6
Reputation	0.8	1.0	0.4	0.7
Philosophy	0.6	0.7	0.3	0.5

(d)   (*1 point*) Determine which company to acquire using the SMART method proposed by the consultant. Show your work.

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

(e)   (*1 point*) Describe two shortfalls of the SMART method.

> ANSWER:

6. (*11 points*) The newly appointed CRO of RPPC, Julia Reich, is concerned about the high volatility of operating income of Blue Jay Tire (BJT) (Case Study Section 3). She decides to evaluate risk mitigation strategies for commodity price risk using hedging techniques.

    (a)   (*1 point*) Describe one pro and one con to each of the following strategies.

        (i)   Do nothing

        (ii)   Hedge using derivative instruments

    ANSWER:

Reich is considering hedging using natural rubber forward and futures contracts.

    (b)   (*1 point*)

        (i)   Describe how a futures contract can be used to hedge the rubber cost.

        (ii)   List two key differences between a futures contract and a forward contract.

    ANSWER:

Reich is also considering a zero cost collar as she argues that there is no associated cost.

    (c)   (*2 points*)

        (i)   Describe how a zero cost collar can be structured to hedge the rubber cost.

        (ii)   Critique Reich's argument that there is no cost associated with the zero cost collar hedging strategy.

    ANSWER:

6. Continued

BJT uses Value-at-Risk (VaR) metric to evaluate the volatility of operating income. To mitigate commodity price risk fluctuations, Reich is evaluating the three hedging instruments described above: forward, futures, and zero-cost collar.

(d)   (*2 points*)

   (i)   Evaluate the expected outcome of each of the three instruments on Value-at-Risk (VaR) for BJT's operating income.

   (ii)   Explain which of the above instruments reduces VaR for BJT's operating income the most.

   ANSWER:

Houben Huang, RPPC's CFO, wants to understand the potential accounting treatment of the hedging instruments.

(e)   (*2 points*)

   (i)   Explain the benefit of using cash flow hedge accounting treatment.

   (ii)   Describe the condition that prohibits the use of hedge accounting for hedging cash flow.

   (iii)   Explain the drawbacks of not using hedge accounting.

   ANSWER:

Huang decided to use simulation to calculate VaR for BJT's operating income.

(f)   (*3 points*)

   (i)   Describe the four essential steps of a simulation process of the VaR calculation for BJT's operating income.

   (ii)   Identify three material risk drivers for BJT's operating income may require simulation. Justify your response.

   ANSWER:

7. (*14 points*) RPPC (Case Study Section 1) is considering a potential acquisition of Seaplane Expeditions and Aviation Company (SEA) (Case Study Section 9).

(a) (*2 points*)

   (i) Explain the purpose of each of the Activity, Liquidity, Solvency, and Profitability ratios.

   (ii) Recommend a specific ratio within each ratio type in (i) that will be useful to analyze the potential acquisition. Justify your recommendation.

   ANSWER:

RPPC wants to compare SEA with its existing subsidiary, Blue Jay Air (BJA) (Case Study Section 2). You are asked to perform DuPont decomposition as a form of Integrated Financial Ratio Analysis.

(b) (*4 points*)

   (i) Perform a DuPont analysis using the five-way decomposition method on the 2019 financials for both BJA and SEA. Show your work.

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

   (ii) Contrast three structural differences between BJA and SEA, based on the DuPont analysis.

   ANSWER:

7. **Continued**

One missing piece of information in DuPont decomposition is liquidity analysis.

(c)   (*2 points*)

   (i)   Perform a horizontal analysis over 2017-2019 for each of BJA and SEA using an appropriate liquidity ratio. Show your work.

   (ii)   Compare BJA's and SEA's ability to meet liquidity needs over the past 3 years.

   > ANSWER:

(d)   (*3 points*) Recommend whether SEA should be acquired as a direct subsidiary of RPPC or incorporated into BJA. Justify your response.

   > ANSWER:

(e)   (*3 points*) Based on the Framework for Board Oversight of Enterprise Risk,

   (i)   Describe four areas the RPPC Board should focus on during the due diligence process.

   (ii)   Evaluate the level of involvement the RPPC Board would have with respect to each of the risks listed in SEA's Risk Profile (Case Study Section 9.3) after acquisition.

   > ANSWER:

8. (*9 points*) You are reviewing the risk management framework for Frenz's commodity risk (Case Study Section 4).

(a) (*4 points*)

(i) Propose a contract that Frenz can enter into with its supplier to manage its coffee price volatility. Justify your answer.

(ii) Describe how a catastrophe bond with a parametric trigger can help Frenz manage the supply-chain risk of coffee beans.

(iii) Evaluate the effectiveness of the two instruments in (i) and (ii) to mitigate the stated risks.

ANSWER:

Due to recent climate change, securing sufficient coffee supply has become more expensive. Frenz decided to set aside extra capital for this risk.

(b) (*2 points*) Assess whether adding a risk margin is appropriate for the following risks.

I. Coffee price volatility
II. Supply-chain risk

ANSWER:

The Frenz Board would like to know what risk margin should be held to mitigate the riskiness of the expansion into Asian markets.

(c) (*3 points*)

(i) Describe how Frenz can use the modified assumptions approach and its supply-demand economic model to calculate its supply-chain risk margin.

(ii) Evaluate two limitations of Frenz's application of the modified assumption approach.

ANSWER:

9. (*7 points*) Snappy Life Insurance (Case Study Section 8) is contemplating the purchase of a cyber insurance policy to insure against cyber risk. You are asked to generate cyber risk scenarios.

(a)   (*3 points*)

(i)   Define systemic and symptomatic vulnerabilities in a cyber risk context.

(ii)   Describe an example scenario for each of a systemic and a symptomatic vulnerability that would impact Snappy.

(iii)   Identify the form of cyber risk insurance that would address each scenario in (ii). Justify your response.

ANSWER:

You are estimating the cyber risk exposure of Snappy using the following information:

Parameter	Probability of Loss	Magnitude of Loss	Confidence Level
Low investment in Internet security	2%	$700,000	90%
Use of mobile application for underwriting	3%	$200,000	75%
Exposure from third-party software	1%	$400,000	50%

(b)   (*2 points*) Using the Applied Information Economics (AIE) approach:

(i)   Recommend the parameter that would benefit the most from the value of information analysis. Justify your recommendation.

(ii)   Describe how you could improve your information on the parameter identified in (i).

ANSWER:

9. Continued

Frank Veltro, CEO of Snappy, comments: "Forget improving our system security. We should focus on our core competency of selling good life insurance products and transfer the cyber risk to an insurance company."

(c) (*2 points*) Critique Veltro's comment from the perspective of:

(i)   Snappy

(ii)   An insurance company offering cyber insurance to Snappy

ANSWER:

10. (*9 points*) ABC Credit Card Company (ABC) wants to speed up its credit limit review by introducing a predictive model. Current practice is to manually review each customer's credit, which takes one business day. ABC's goals are to reduce average review time by 50% and to achieve 90% average class accuracy.

(a) (*1 point*) Describe two best practices recommended in Actuarial Standard of Practice No. 56 to evaluate a predictive model.

> ANSWER:

ABC selected a portion of historical data to train a binary predictive model to categorize customers as either "Premier" or "Standard".

Below is the resulting confusion matrix when the remaining historical data are run through the predictive model as well as an estimated relative profit table based on historical data.

2-Class Confusion Matrix

		Prediction ('000)		
		Premier	Standard	Recall
Target	Premier	120	5	0.96
('000)	Standard	16	20	0.56
	Precision	0.88	0.8	

Profit Matrix per Customer

		Prediction ('000)	
		Premier	Standard
Target	Premier	100	-100
('000)	Standard	-750	50

If the 2-class model is accepted, customers will receive results instantaneously.

ABC's CEO reviews the results and states: "The model results look great. Our main concern should be the accuracy of the Premier category because it is the most profitable and we have over three times as many customers in this category as in the Standard category."

(b) (*3 points*)

(i) Interpret the Recall results.

(ii) Interpret the Precision results.

(iii) Critique the CEO's statement.

> ANSWER:

10. Continued

ABC decides to refine the model to reflect its customer base. ABC builds a 5-class model using the same data to train and test the model as it used for the 2-class model. The 5-class model uses separate algorithms to break down the "Premier" and "Standard" classes.

5-Class Confusion Matrix

		Prediction ('000)					
		Premier +	Premier	Standard ++	Standard +	Standard	Recall
Target ('000)	Premier +	48	2	0	0	0	0.96
	Premier	2	72	1	0	0	0.96
	Standard ++	0	3	9	5	1	0.50
	Standard +	0	1	3	7	2	0.54
	Standard	0	0	1	1	3	0.60
	Precision	0.96	0.92	0.64	0.54	0.50	

Processing time of the 5-class model is the same as the 2-class model.

(c)   (3 *points*) Recommend a credit review approach that meets ABC's goals. Justify your recommendation.

> ANSWER:

10. Continued

ABC implemented the 5-class model and collected the following data samples to monitor performance.

Target	Original Count	Sample at T_1 Count	Sample at T_1 Stability Index	Sample at T_2 Count	Sample at T_2 Stability Index
Premier +	50	100	0.023	150	0.045
Premier	75	150	0.034	225	0.067
Standard ++	18	90	0.061	180	0.104
Standard +	13	65	0.044	130	0.075
Standard	5	25	0.017	50	0.029
Sum	**161**	**430**	**0.179**	**735**	**0.320**

(d)   (*2 points*)

(i)   Explain the downside to relying on stability index results.

(ii)   Recommend next steps for ABC based on the stability index results. Justify your recommendation.

ANSWER:

END OF EXAMINATION