

CFE FD Model Solutions

Fall 2021

1. Learning Objectives:

1. The candidate will understand how a company optimizes its corporate finance decisions based on its business objectives.
5. The candidate will understand the application of quantitative methods and techniques with a risk management focus to business problems for financial and non-financial companies.

Learning Outcomes:

- (1b) Compare and contrast methods to determine the value of a business or project, including the impact on capital budgeting and allocation decisions.
- (1d) Assess the impact of business strategies such as acquisitions, divestitures, and/or restructurings.
- (5c) Evaluate results of deterministic, stress-testing, stochastic and simulation methods and models
- (5d) Assess techniques to measure risks given limited information

Sources:

Jonathan Berk and Peter Demarzo, Corporate Finance, Fifth Edition, Ch 18: Capital Budgeting and Valuation with Leverage

Jonathan Berk and Peter Demarzo, Corporate Finance, Fifth Edition, Ch 31 International Corporate Finance

Hubbard, How to Measure Anything 3rd Ed, Ch 9: Sampling Reality: How Observing Some Things Tells Us About All Things

Dowd, Measuring Market Risk 2nd ed, Ch 9 Applications of Stochastic Risk Measurement Methods

1. Continued

Solution:

(a)

- (i) Calculate Company X's Weighted Average Cost of Capital (WACC). Show your work.
- (ii) Recommend which proposal Company X should accept using the projection information above, Company X's WACC and the current Spot exchange rate. Show your work and justify your recommendation.
- (i) $(300 / 500) * .12 + (200 / 500) * .05 * (1 - .21) = 8.78\%$
- (ii) This is best done by comparing NPVs, and this is best done by looking at Free Cash Flows calculated from an income statement. Based on NPVs take proposal B

Checking the NVP for manufacture in US, Proposal A											
Units are in Millions in USD											
Year	0	1	2	3	4	5	6	7	8	9	10
Sales(Convert to USD)		40.00	42.00	44.10	46.31	48.62	51.05	53.60	56.28	59.10	62.05
Cost of Goods Sold		(20.00)	(21.00)	(22.05)	(23.15)	(24.31)	(25.53)	(26.80)	(28.14)	(29.55)	(31.03)
Gross Profit	-	20.00	21.00	22.05	23.15	24.31	25.53	26.80	28.14	29.55	31.03
Expenses (Operating)	-	(8.00)	(8.40)	(8.82)	(9.26)	(9.72)	(10.21)	(10.72)	(11.26)	(11.82)	(12.41)
Depreciation	-	(1.60)	(1.60)	(1.60)	(1.60)	(1.60)	(1.60)	(1.60)	(1.60)	(1.60)	(1.60)
EBIT	-	10.40	11.00	11.63	12.29	12.99	13.72	14.48	15.29	16.13	17.02
Income Tax @ 21%	-	(2.18)	(2.31)	(2.44)	(2.58)	(2.73)	(2.88)	(3.04)	(3.21)	(3.39)	(3.57)
Unlevered Net Income	-	8.22	8.69	9.19	9.71	10.26	10.84	11.44	12.08	12.74	13.44
Free Cash Flow											
Plus Depreciation		1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60
Less: Capital Expenditures	(36.00)										
Less: Increases in NWC											
Free Cash Flow In USD	(36.0)	9.816	10.290	10.788	11.310	11.859	12.435	13.040	13.675	14.342	15.043
Discount at WACC	(36.0)	9.0	8.7	8.4	8.1	7.8	7.5	7.2	7.0	6.7	6.5
Total NPV Proposal A	40.887	41.08	43.45	45.94	48.55	51.29	54.18	57.20	60.38	63.71	67.21

1. Continued

Check the NPV of Manufacturing in Country Y, Proposal B											
Units are in Millions in Tatl											
Year	0	1	2	3	4	5	6	7	8	9	10
Sales		200.00	210.00	220.50	231.53	243.10	255.26	268.02	281.42	295.49	310.27
Cost of Goods Sold		(60.00)	(63.00)	(66.15)	(69.46)	(72.93)	(76.58)	(80.41)	(84.43)	(88.65)	(93.08)
Gross Profit		140.00	147.00	154.35	162.07	170.17	178.68	187.61	196.99	206.84	217.19
Operating	-	(20.00)	(21.00)	(22.05)	(23.15)	(24.31)	(25.53)	(26.80)	(28.14)	(29.55)	(31.03)
Depreciation	-	(10.00)	(10.00)	(10.00)	(10.00)	(10.00)	(10.00)	(10.00)	(10.00)	(10.00)	(10.00)
EBIT	-	110.00	116.00	122.30	128.92	135.86	143.15	150.81	158.85	167.29	176.16
Income Tax @ 34%	-	(37.40)	(39.44)	(41.58)	(43.83)	(46.19)	(48.67)	(51.28)	(54.01)	(56.88)	(59.89)
Unlevered Net Income	-	72.60	76.56	80.72	85.08	89.67	94.48	99.54	104.84	110.41	116.27
Free Cash Flow											
Plus Depreciation		10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Less: Capital Expenditures	(220.00)										
Less: Increases in NWC											
Free Cash Flow in Tatl	(220.00)	82.60	86.56	90.72	95.08	99.67	104.48	109.54	114.84	120.41	126.27
Free Cash Flow in USD	(44.00)	16.52	17.31	18.14	19.02	19.93	20.90	21.91	22.97	24.08	25.25
Discount at WACC	(44.000)	15.187	14.630	14.095	13.581	13.087	12.612	12.155	11.715	11.292	10.885
Total NPV Proposal B	85.239										

Using the current spot rates and WACC which is the same for each country, the profit over the next 10 years is highest in proposal B, which involved making the goods in country Y. However, this is based on the current spot rates and does not consider the risk that is involved with inflation or exchange rates, and does not consider that operational risks given this will be the first time company X takes on a proposal like this of building in a foreign country. Therefore, more should be considered and analyzed before choosing proposal B based on the current projected profits.

- (c) Explain how the 95th percentile for exchange rates will change as Company X learns more information about the Country Y exchange rate.

As more information becomes known, the exchange rate will become more stable rather than largely uncertain as it is now. This will impact the 95th percentile by making it more precise, and could move it up or down depending on the type of information learned.

- (d) Explain two shortfalls of your modeling approach.

1. Continued

1. The COGS and exchange rates scenarios are independent, but in reality, we can expect there to be some correlation between them.
2. The 95th percentile VaR is not coherent and it ignores tail risk, which may distort the results of the scenarios given the company is concerned with large losses and these may not be captured by choosing a single pointing he risk distribution.

(e)

- (i) Explain how Company X could use its model to establish a stop-loss strategy for operating in Country Y.
 - (ii) Explain how the size of the loss limit impacts the modeled VaR.
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- (i) If a stop-loss strategy is in place, company X would stop operations in country Y if losses were to exceed a certain number. This would mitigate further losses by the company rather than continued operations that are not profitable.
 - (ii) Stop-loss reduces the tail risks in the distribution by limiting losses above a certain number. If the loss is set at a value that is below the current VaR, this would decrease the modeled VaR to be capped at the limit of the stop-loss strategy. However, if the stop-loss is set at a number that is above the current VaR, then VaR would not change as it ignores the risks in the tail beyond the chosen percentile.

2. Learning Objectives:

1. The candidate will understand how a company optimizes its corporate finance decisions based on its business objectives.

Learning Outcomes:

- (1b) Compare and contrast methods to determine the value of a business or project, including the impact on capital budgeting and allocation decisions.
- (1d) Assess the impact of business strategies such as acquisitions, divestitures, and/or restructurings.

Sources:

Jonathan Berk and Peter Demarzo, Corporate Finance, Fifth Edition, Ch 22: Real Options

Commentary on Question:

This question was assessing candidates' abilities to assess the financial and strategic impacts of a potential acquisition along with the ability to effectively compare valuation methods to help drive capital budgeting decisions. The most successful candidates were able to apply the syllabus content to the real-world capital budgeting decision presented in the case study.

Solution:

- (a)
 - (i) Identify four key insights from real options.
 - (ii) Assess how each key insight could impact BJT's current business decisions and strategies. Provide one specific example from the case study for each insight.

Commentary on Question:

Candidates generally performed well on this section.

For Part (i), valid responses should communicate the same themes as the items listed below. They may vary slightly in wording.

For part (ii), a reasonable understanding of each key insight must be demonstrated by providing an assessment applicable to BJT's business. A range of responses were accepted given they were applied based on information in the Case Study.

1) Out of the Money Real Options Have Value: Just because BJT has evaluated the commodity agreement with Almond Bank to be too big an outlay at this time, BJT should continue to monitor their assumptions and market conditions to determine if an agreement of this kind would be worthwhile moving forward.

2. Continued

2) **In-the-Money Real options need not be Exercised Immediately:**

Management has implemented a program for former Canadian BJT plant operators to conduct quality management training for existing staff. Just because this approach will hopefully lower BJT's manufacturing risk, analysis should be performed to determine if taking this approach immediately was the most effective way to lower manufacturing risk. Waiting for even safer manufacturing equipment could be considered.

3) **Waiting is Valuable:** BJT has been considering catastrophe insurance to cover disruption of supplier operations from disruption or pandemic. Management should carefully weigh the costs and benefits of waiting to acquire this insurance. There is value in waiting to shop the coverage with multiple insurance companies and negotiate the quotes. Waiting too long could result in an uncovered disaster or pandemic that shuts down BJT's supply chain

4) **Delay Investment Expenses as Much as Possible:** BJT Management has been evaluating environmental risk. Management could decide to expand its recycling capabilities to get ahead of changing regulation and pressure from environmental groups. However, BJT should monitor environmental pressure and delay significant investment as there is no need to deploy capital at this time. Making the best decision can be made after potential legislation is announced to maximize the value received from investment.

5) **Tackle the Hardest Problem First:** BJA should not invest in other non- road tire expansion related items until it has made the decision on if it will build its own capabilities or buy.

6) **Create Value by Exploiting Real Options:** BJT should utilize real options analysis to evaluate the possible product expansion into non-road tires. Real options analysis will help BJT determine if and when True North Tire (TNT) should be purchased, or, if BJT should or build its own specialty tire plant.

(b)

- (i) Determine the value of the option to wait to acquire TNT. Show your work.
- (ii) Recommend whether BJT Management should acquire TNT today, wait one year, or never acquire TNT. Justify your response using results from part (i).
- (iii) Determine the volatility in TNT's value at which BJT would be indifferent between waiting and acquiring TNT today. Show your work.

2. Continued

Commentary on Question:

To receive full credit, a candidate needed to properly apply the Black-Scholes formula to this real-options scenario. Many candidates leveraged a model based Goal-Seek approach to solve part (iii)

(i)

$$S = \text{Value of the Asset} = \$10M / (12\% - 3\%) = \$111.11M$$

$$PV(K) = \$100M / 1.02 = \$98.04M$$

T = 1 Year

Risk Free Rate = 2%

Volatility = 25%

Div = \$10M

$$S_x = S - PV(\text{Div}) = \$111.11M - 10M/1.12 = \$102.18M$$

$$d_1 = \frac{\ln[S_x / PV(K)]}{\sigma \sqrt{T}} + \frac{\sigma \sqrt{T}}{2} = \frac{\ln[\$102.18M / (98.04M)]}{25\% * \sqrt{1}} + \frac{25\% * \sqrt{1}}{2} = 0.2905$$

$$d_2 = d_1 - \sigma \sqrt{T} = 0.2904 - 25\% * \sqrt{1} = 0.0405$$

$$N(d_1) = N(0.2904) = 0.6143$$

$$N(d_2) = N(0.0404) = 0.5162$$

$$C = S_x * N(d_1) - PV(K) * N(d_2) = \$12.17M$$

Value of waiting to acquire TNT = \$12.17M

(ii)

NPV of Acquiring TNT Today = \$111.11M - \$100M = \$11.11M NPV

NPV of Waiting = Value of Real Option to Wait - Price of Option to Wait:

$$\$12.16M - \$0.50M = \$11.66M \text{ NPV}$$

NPV of Not Acquiring TNT (no action): \$0M

Based on analysis performed in part (i), BJT should choose to wait to acquire TNT. This option provides an NPV that is \$0.55M (\$11.66M - \$11.11M) higher than the NPV of purchasing TNT today. Despite paying the contract holding fee, the investment is not fully committed. This means BJT can cancel its plans if the value of TNT declines significantly within the next year. By acquiring today, BJT gives up the option to walk away if the value of TNT significantly declines over the next year.

(iii)

Given the same parameterization and calculation approach in part (i), a volatility assumption of 23.6% would make BJT indifferent between waiting and acquiring today.

2. Continued

- (c) Assess whether BJT should purchase TNT now given the Profitability Index. Justify your assessment.

For investments that can be delayed, the Profitability Index rule of thumb is to invest when the calculated index exceeds a specified level. In this circumstance, the Profitability Index for the potential acquisition of TNT is calculated as:

$$\text{Profitability Index} = \text{NPV} / (\text{Initial Investment}) = \$11.11\text{M} / \$100\text{M} = 0.1111$$

The calculated profitability Index of 0.11 is well below the requirement of 0.50. Therefore, BJT should not invest now in the acquisition of TNT.

- (d) Describe two advantages and two disadvantages for each approach – the option pricing approach from part (b) and the Profitability Index Rule from part (c).

Commentary on Question:

Acceptable answers are not limited to the list below

Black Scholes Option Pricing Approach:

- + Robust risk model which should be familiar to financial and technical audiences.
- + The model's parameters can be adjusted to easily represent a number of real option scenarios and risk frameworks
- + The model provides a framework to calculate a specific "value of waiting" to make a capital budgeting decision.
- Difficult to implement requiring an extensive amount of time & financial expertise
- Difficult to properly represent and model parameters and other sources of uncertainty
- Difficult to explain methodology to a non-financial audience.
- Risk of investment may not fit symmetric nature assumed by Black Scholes formula (skewness)
- Does not easily reflect bimodal risk profiles as it is a continuous model.

Profitability Index Approach:

- + Quick rule of thumb that is easy to calculate and does not require much time or financial expertise.
- + Easy to explain methodology to a non-technical audience.
- Arbitrary threshold is set and used to drive investment decisions.
- Does not calculate a specific "value of waiting" to guide decisions on how much to pay for this ability.
- Does not adjust investment criterion based on specific risk profile of investment opportunity.

3. Learning Objectives:

1. The candidate will understand how a company optimizes its corporate finance decisions based on its business objectives.
4. The candidate will understand how to apply and recommend appropriate ERM frameworks, principles and strategies to manage, evaluate, analyze and mitigate risk exposures faced by an entity and to ensure operational excellence in any industry.

Learning Outcomes:

- (1a) Recommend an optimal capital structure for given business objectives and the competitive environment.
- (4a) Assess the potential impact of risks faced by an entity in any industry, including the extent to which risks are hedgeable or non-hedgeable.
- (4b) Evaluate risk measurement, modeling, and management of financial and non-financial risks.
- (4e) Recommend best practices in business and ERM processes to achieve operational excellence.

Sources:

Lam, Implementing Enterprise Risk Management from Methods to Applications

- Chapter 16: Risk-Based Performance Management
- Chapter 17: Integration of KPIs and KRIs
- Chapter 18: ERM Dashboard Reporting

Jonathan Berk and Peter Demarzo, Corporate Finance, Fifth Edition

- Chapter 18: Capital Budgeting and Valuation with Leverage

Case study

Commentary on Question:

Candidates should

- *Demonstrate the knowledge on the characteristic and attributes of KPIs and KRI and steps needed to implement a dashboard*
- *Recommend and set KPIs and KRIs based on the information given to meet the measurement requirements between the business units and head office*
- *Describe the trade-off of financing through debt funding and equity funding*

3. Continued

Solution:

(a)

- (i) List the four attributes of good Key Performance Indicator (KPI) development.
- (ii) Describe four characteristics of an effective Key Risk Indicator (KRI).

Commentary on Question:

Acceptable answers are not limited to those on the list below

- (i) The attributes of KPIs development include:
 - Quantifiable: KPIs must be objectively measurable;
 - Relevant: KPIs are tied directly to business objectives, actionable;
 - Critical: KPIs should have a direct impact to the bottom line; and
 - Timely: KPIs should be able to be measured quickly ("real time") so that management can act on the data quickly.
 - (ii) The characteristics of effective KRIs include:
 - Consistent methodologies and standards;
 - Incorporation of risk drivers - exposure, probability, severity, and Correlation;
 - Quantification by dollar amount, percentage, or number;
 - Tracking against standards or limits;
 - Link to risk owner, objectives, and risk categories;
 - Balance between leading and lagging indicators;
 - Support business decisions and actions;
 - Benchmark internally and externally;
 - Timely and cost effective measure; and
 - Simply risk without being simplistic.
- (b) Explain the process of creating an ERM dashboard for SEA including specific considerations to meet Gilroy's needs.

Commentary on Question:

Answers should be relevant to the company

The considerations should include:

- Identify risk and performance targets of SEA - in particular new risks that RPPC is not otherwise exposed to;
- Select KPIs and KRIs relevant to SEA;
- Define measurement method for the KPIs and KRIs;
- Map the responsible parties to evaluate KPIs and KRIs;

3. Continued

- Set monitoring standards; and
- Meet RPPC standards on KPIa and KRIs indicators and approval process and follow the best Practice
 - Considerations of the objectives of RPPC and SEA;
 - Leverage those indicators already used by RPPC and SEA;
 - Only use the most relevant indicators; and
 - Establish reporting frequency

(c)

- (i) Recommend two KPIs and two KRIs useful to RPPC in assessing SEA. Justify your recommendation.
- (ii) Calculate those four indicators from 2019 to 2021 using the Excel worksheet that is provided.

Commentary on Question:

Reasonable and common KPIs and KRIs used by the industry are acceptable [considerations should be given to those can be derived from the actual financial data information and the assumptions for year 2021]

- (i) Examples of KPIs include:
 - Net Margin = Net Income/Total Operating Revenue;
 - Return of Assets = Net Income/Average Total Assets;
 - Return of Equity = Net Income/Average Equity;
 - Return of Economic Capital = Net Income/Average Economic Capital;
 - Net Income After Cost of Capital (NIACC)Examples of KRIs include:
 - Return of Economic Capital > Cost of Capital
 - Owner Equity Exceeds 1-100 Events or Economic Capital exceeds 1-100 Tail Event

[Justification should relate back to the RPPC risk appetite statement in the case study.]

- (ii) See Excel
- (d) Develop a one-page ERM dashboard for Gilroy using the Excel template that is provided, including qualitative and quantitative attributes.

Commentary on Question:

- *Display the quantitative results (years 2019 to 2021), explain the results, indicate the level of the risk and*
- *Highlight the qualitative description and indicate the level of risk*

See Excel

3. Continued

- (e) Describe four considerations for whether a capital infusion in the form of debt or in the form of equity would be preferable for SEA.

Commentary on Question:

Answers should be relevant to the company

The considerations may include:

- What is SEAs weighted cost of capital?
- How does the SEA weighted cost of capital compare to the industry or competitors?
- What's the ultimate tax rate of SEA?
- What level of dilution / ownership is SEA willing to cede to RPPC (from equity funding)?
- What is an acceptable level of ongoing debt cost that can be serviced by SEA?
- Will SEA's debt cost be changed due to additional borrowing needs on the horizon?

[Other reasonable SEA or RPPC specific considerations are also acceptable]

4. Learning Objectives:

1. The candidate will understand how a company optimizes its corporate finance decisions based on its business objectives.
2. The candidate will understand how to gauge a company's performance through an evaluation of its financial reports.

Learning Outcomes:

- (1b) Compare and contrast methods to determine the value of a business or project, including the impact on capital budgeting and allocation decisions.
- (1c) Evaluate the impact of non-financial factors on capital structure or capital budgeting decisions.
- (2c) Analyze the impact of tax accounting and policies, local regulations, and foreign exchange rates.

Sources:

Robinson et al., International Financial Statement Analysis 4th Ed, Ch. 15 Multinational Operations

Jonathan Berk and Peter Demarzo, Corporate Finance, Fifth Edition, Ch 31 International Corporate Finance

Robinson et al., International Financial Statement Analysis 4th Ed, Ch. 6 Financial Analysis Techniques

Commentary on Question:

This question tests the general understanding of translation methods and why to choose one method over another. Understanding of the implications of high inflationary economies on the translation method.

Solution:

- (a) State four reasons why Mobia's local currency, Mobucks, should be the functional currency for Ishmael instead of Euros.

Commentary on Question:

Candidates are expected to list four valid reasons to receive full credits. Most of candidates were able to list three to four out of the list below and received most of the credits.

- It is the currency that mainly influences sales prices for goods and services.
- It is the currency of the country whose competitive forces and regulations mainly determine the sales price of its goods and services.
- It is the currency that mainly influences labor, material, and other costs of providing goods and services.

4. Continued

- It is the currency in which receipts from operating activities are usually retained.
- The activities of Ishmael roasters are carried out with a significant amount of autonomy.
- Transactions with Frenz are not a large proportion of Ishmael Roasters' activities.

(b)

- (i) Identify the appropriate currency translation method.
- (ii) Explain how to translate each of assets, liabilities, equity, revenue and expenses.

Commentary on Question:

Candidates are expected to correctly identify the current rate method and correctly list how to translate each item to receive full credit. Candidates scored well in this part.

(i) Foreign currency is the functional currency - this means the current rate method is appropriate.

(ii)

Assets and Liabilities - translated at the current exchange rate at the balance sheet date.

Equity - translated at historical exchange rates.

Revenues and expenses - translated at the exchange rate that existed when the transactions took place. For practical reasons, a rate that approximates the exchange rates at the dates of the transactions, such as an average exchange rate, may be used.

- (c) Explain the advantage that being a subsidiary of Frenz brings Ishmael from a funding perspective.

Commentary on Question:

Candidates are expected to answer Ishmael's advantage from a funding perspective.

Association with Frenz should lower Ishmael Roasters cost of funding relative to other firms who are less well known.

4. Continued

As Frenz is a well known public company that regularly provides investors and analysts information, debt and equity holders will be likely to charge less for access to capital as there is a lower likelihood of asymmetric information.

"In some cases, a country's risk-free securities are internationally integrated but markets for a specific firm's securities are not. Firms may face differential access to markets if there is any kind of asymmetry with respect to information about them."

- (d)
- (i) Describe the implications of the prior year's price index change on the translation of Ishmael's financial statements.
 - (ii) Explain how the translation of the financial statements will differ from part (b)(ii).

Commentary on Question:

Candidates are expected to identify Mobia as highly inflationary economy and answer based on that. Most candidates scored okay in part (i) but only some candidates were able to provide a complete explanation for part (ii)

(i) Mobia is considered a 'highly inflationary economy', which makes the 'entity's function currency irrelevant in determining how to translate its foreign currency financial statements into the parent's presentation currency'

This is known because the general price index increased by 125% in a one year period.

'IAS 29 indicates that a cumulative inflation rate approaching or exceeding 100% over three years would be an indicator of hyperinflation.'

(ii) IFRS requires the foreign entity's financial statements first be restated for local inflation' ... 'then, the inflation restate foreign currency financial statements are translated into the parent's presentation currency using the current exchange rate.'

- (e) Assess if Ishmael had a purchasing power gain or loss in 2020 from the price index change. Justify your response.

Commentary on Question:

Candidates are expected to compare the monetary liabilities and monetary assets over the year and then come up with the assessment to receive full credit. Simply stating purchasing power gain/loss due to inflation lost most credit in the part.

4. Continued

'A net purchasing power gain will arise when a company holds a greater amount of monetary liabilities than monetary assets, and a net purchasing power loss will result when the opposite situation exists'

Ishmael roasters had a purchasing power loss during 2020.

Monetary liabilities (accounts payable) were less than monetary assets (cash) over the year.

- (f) Explain how the above action would impact the methodology of calculating the NPV of Ishmael distributable earnings.

Commentary on Question:

Candidates are expected to touch on both converting cashflow using forward exchange rate and use the appropriate WACC to receive full credit. About half of the candidates didn't mention the cashflow conversion and only received partial credit.

Frenz will need to separate the cash flows by currency and convert using the forward exchange rate (either convert Euro based free cash flows to Mobucks or Mobucks free cash flows to Euro). Then use the appropriate WACC to discount the free cash flows.

Whenever a project has cash flows that depend on the values of multiple currencies, the most convenient approach is to separate the cash flows by currency.' ... the reading continues with an example of how to split free cash flows and adjust using the forward exchange rate, before discounting at the WACC.

- (g) Calculate the impact to Frenz's 2020 current ratio and debt-to-assets ratio from incorporating Ishmael into its financials. Show your work.

Commentary on Question:

Candidates are expected to 1)Adjust inflation 2)Apply the exchange rate and then do the ratios calculation to receive full credit. Most candidates adjusted exchange rate but very few candidates include the inflation adjustment in the calculation. Most candidates scored partial marks from correctly calculating the current ratio and D/E ratio for Frenz before incorporating Ishmael, some candidates received more credit from including fx in the after incorporating Ishmael calculation.

4. Continued

High Inflationary Translation Method

<i>Mobucks in thousands</i>	Dec. 31, 2020	Restatement Factor	Inflation Adjusted	Exchange Rate	Euros
Cash	1,000	1	1000	0.5	500
Inventory	500	1.5=150/100	750	0.5	375
Property	5,000	2.25=225/100	11250	0.5	5625
Accounts Payable	800	1	800	0.5	400

	General Price Index	Euro per Mobucks
12/31/2019	100	1
Average	150	0.7
12/31/2020	225	0.5

Frenz Current Ratio:

Current Assets = 33,888
 Current Liabilities = 18,500
 Current Ratio = 1.83180

Incorporating Ishmael Roasters:

Current Assets = 34,763
 Current Liabilities = 19,300
 Current Ratio = 1.801

Current Ratio Impact: -0.031

Frenz Debt-to-Assets Ratio:

Total Assets = 311,803
 Total Liabilities = 152,900
 Debt-to-Assets Ratio = 0.490

Incorporating Ishmael Roasters:

Total Assets = 318,303
 Total Liabilities = 153,300
 Debt-to-Assets Ratio = 0.482

Debt-to-Assets Impact: -0.009

5. Learning Objectives:

2. The candidate will understand how to gauge a company's performance through an evaluation of its financial reports.

Learning Outcomes:

- (2b) Identify and analyze the impact of unusual accounting practices on the quality of earnings and assets of a corporation, including analyzing the signs of questionable accounting.
- (2c) Analyze the impact of tax accounting and policies, local regulations, and foreign exchange rates.

Sources:

Robinson et al., International Financial Statement Analysis 4th Ed, Ch. 9 Income Taxes

Robinson et al., International Financial Statement Analysis 4th Ed, Ch. 11 Financial Reporting Quality

Commentary on Question:

Most candidates received limited credit on the calculation aspects of the question, but did well making a recommendation.

Solution:

- (a) Define the following tax related concepts:
 - (i) Deferred Tax Asset (DTA)
 - (ii) Income Tax Payable
 - (iii) Tax Expense
 - (iv) Tax Base

Commentary on Question:

Many candidates received partial credit. Most commonly, not enough detail was provided to distinguish between the income tax payable and the income tax expense.

- **Deferred Tax Asset (DTA):** an amount on the balance sheet arising when an excess amount is paid for income taxes and the company expects to recover the difference
- **Income Tax Payable:** a balance sheet items representing taxable income times the company's current tax rate

5. Continued

- **Tax Expense:** an income statement item that aggregates income tax payable and includes changes to DTA/DTL
- **Tax Base:** the amount at which an asset or liability is valued under accounting principles

(b)

- (i) Critique the consultant's comment.
- (ii) Calculate the change in DTA/DTL related to this project from 12/31/2021 to 12/31/2022 assuming the tax rate will change from 21% to 28% on 1/1/2022. Show your work.

Commentary on Question:

Most candidates critiqued some aspects of the consultant's comment but did not include enough detail to receive full credit.

Some candidates correctly calculated the DTA/DTL under a 21% tax rate but most did not appropriately account for both the change in tax rate and the change in time period.

(i) There was a temporary difference created instead of a permanent difference, and the difference is a tax and reporting expense, not revenue item. In addition, the carrying amount is higher than the tax base, which should create a DTA instead of a DTL. Finally, without a permanent difference, there should be no impact on the effective tax rate.

(ii) The reporting depreciation schedule is \$100M/year but the taxable depreciation is \$1750M/25 years = \$70M/year. A DTA is created.

	1/1/2021	12/31/2021	12/31/2022
Carrying Amount	\$1750M	\$1650M	\$1550M
Tax Base	\$1750M	\$1680M	\$1610M

On 12/31/2021, the DTA is $\$6.3\text{M} = 21\% * (\$1680\text{M} - \$1650\text{M})$

On 12/31/2022, the DTA is $\$16.8\text{M} = 28\% * (\$1610\text{M} - \$1550\text{M})$

So, the change in DTA is $\$16.8 - \$6.3\text{M} = \$10.5\text{M}$.

5. Continued

- (c) Determine how this estimation will impact the DTA/DTL under both IFRS and USGAAP. Show your work.

Commentary on Question:

Many candidates did not answer this part. Those that did often made a general comment about US GAAP that received limited credit.

Based on the difference between the depreciation schedule, taxable income must exceed \$30M/year to fully recognize the DTA.

	Scenario 1	Scenario 2	Scenario 3
Revenue	305	270	235
Annual Maintenance Cost	-2	-2	-2
Additional Annual Expenses	-60	-60	-60
Depreciation	-100	-100	-100
Interest Expense	-65	-65	-65
Taxable Income	78	43	8

Under IFRS, the carrying amount should be reduced because sufficient taxable profit is no longer probably to recognize the full amount of the DTA, but the reduction can be reversed if subsequent taxable profit becomes probable.

Under US GAAP, a valuation allowance should be set-up to reduce the DTA because it is more likely that the taxable income will not be sufficient to realize all the DTA.

- (d) Evaluate if the following options will achieve managements' objectives. Explain your answer.
- (i) Adopt an accelerating depreciation method so that the aircraft depreciation will be \$35m more for the year of 2021
 - (ii) Invest \$35m in the Luxury Lounges
 - (iii) Purchase \$35m of additional fuel
 - (iv) Invest \$35m to enhance data analytic capabilities
 - (v) Pay out \$35m in restricted stock units (RSU) with 1/4 vesting each year starting on 12/31/2022

5. Continued

Commentary on Question:

Many candidates did well on this part. To receive full credit, candidates must include a statement about each of the three management's objectives on all five options. Other answers received credit as long as they were well-reasoned.

1. Accelerating depreciation

- **Objective A:** achieves objective because it increases depreciation cost in the current year, lowering earnings
- **Objective B:** does not achieve objective because the accounting choice is not consistent with prior periods
- **Objective C:** achieves objective because accelerated depreciation this year will result in lower depreciation in future years and thus higher earnings in future years.

2. Luxury Loungers

- **Objective A:** does not achieve objective because the expense would be capitalized and not impact this year's earnings
- **Objective B:** achieves objective because financial reporting quality is not changed
- **Objective C:** achieves objective because additional revenue will be gained in future years due to the investment in the loungers

3. Purchase additional fuel

- **Objective A:** does not achieve objective because air fuel expense is the cost of fuel consumed
- **Objective B:** achieves objective because financial reporting quality is not changed
- **Objective C:** achieves objective because future expense on air fuel will be decreased

4. Invest \$35m to enhance data analytic capabilities

- **Objective A:** achieves objective if the enhancement is implemented this year because the expense would be recognized
- **Objective B:** achieves objective because financial reporting quality is not changed
- **Objective C:** achieves objective because future earnings could be improved by better analytics on marketing and pricing

5. Continued

5. Pay out RSU

- **Objective A:** achieves objective because the three-year vesting period will partially reduce 2022 income.
- **Objective B:** achieves objective because financial reporting quality is not changed
- **Objective C:** achieves objective because RSU aligns the interests of the employees with BJA which should increase future productivity and earning levels

- (e) Recommend which option from part (d) BJA should choose. Justify your recommendation.

Commentary on Question:

Most candidates received full credit on this part. Multiple answers were accepted as long as the answer was well-reasoned and consistent with the candidate's response from part (d).

Option iv is recommended because it meets all three objectives. Furthermore, the increase in earnings due to better pricing and route planning could significantly outweigh the \$4M from the Luxury Loungers.

6. Learning Objectives:

5. The candidate will understand the application of quantitative methods and techniques with a risk management focus to business problems for financial and non-financial companies.

Learning Outcomes:

- (5b) Evaluate model risks and processes
 - (i) Assess model tradeoffs among usefulness, resource constraints, timeliness, fidelity, and accuracy
 - (ii) Assess processes for vetting models
- (5d) Assess techniques to measure risks given limited information

Sources:

ASOP 56: Modeling, Dec 2019 (excl appendices)

F-131-16 Heavy Models, Light Models, and Proxy Models, sections 1-5, 7 (excl appendices)

F-147-20 Bolle-Reddat, Bernard (et al.), Modeling in Life Insurance - A Management Perspective, Chapter 11

Commentary on Question:

Candidates should explain and relate answers to the case study to receive the full points. The spreadsheet part of the question does not need to be explained if done correctly but will help in getting partial credits.

Solution:

- (a) Describe the following parameters.
 - (i) β_k
 - (ii) $X_k()$
 - (iii) $y(s)$
 - (iv) $r_N(s)$

Commentary on Question:

Successful candidates should be able to dissect and explain the meaning of the function

6. Continued

- (i) β_k - the k th parameter of the proxy model to be estimated
 - (ii) $X_k()$ - element of features to be included for the k th parameter
 - (iii) y - result produced by the heavy model. In this case this is the reserve calculated.
 - (iv) $r_N(s)$ - the value of the N th risk driver for the s th observation
- (b) Explain the following considerations behind developing the proxy model for Snappy:
- (i) Formula structure
 - (ii) Data selection

Commentary on Question:

For full credit, the answer should relate to the case study.

Formula Structure:

The key consideration for the formula structure is to construct a model that can adequately reproduce the behavior of a more complex model when subjected to variation in a number of different risk parameters. In this case, Snappy needs to create a model that can estimate reserves under stress scenarios, but faster than the current model.

Data Selection:

The key consideration for the data selection is that the sample used for calibration should be representative of the data. It should be enough to cover all cases, but not too much that it defeats the purpose of proxy modeling. Because the model needs to estimate reserves for the whole block, and the population will not change between the reserve run and the sensitivity runs, all Whole Life policies should be included to train the model.

- (c) Calibrate the parameters of the proxy model using the unweighted Least Squares method. Show your work.

Commentary on Question:

This is answered in the spreadsheet. This question does not need to be explained if done all steps correctly, but commentary will help in getting partial credits.

See Excel

6. Continued

- (d)
- (i) Explain four shortcomings of using this proxy model approach for required sensitivities.
 - (ii) Recommend two changes to your modeling process to improve its robustness. Justify your response.

Commentary on Question:

Response should surround additional work required to incorporate the proxy model into production environment. Since ABC is currently using Excel, moving valuation to a better platform should generally be a cost-effective and efficient solution.

- (i) The four shortcomings of using proxy model approach to calculate sensitivities are
 - a. With proxy model another model is ultimately created, which brings in additional model risk. Model due diligence needs to be performed, including reviewing its design, data, assumption, intended use, results and limitation.
 - b. If the model is used for reporting purpose, it likely will go through vigorous balance and check, validation, consistency checks process. Principles and methods need to set out to withstand audit queries.
 - c. The proxy model is going to be less accurate than the full model and may need to justify and explain the difference.
 - d. This proxy model uses features that are directly observed from policy data and hence has limited use on sensitivity testing. One obvious shortcoming of this proxy model is the inability to test mortality and interest rate. Since the result using the heavy model relies on various assumptions coming from policyholder features, the proxy model built using the risk parameter relationships or calibration may not work if using a different set of data.
- (ii) Two recommended changes to improve the robustness of the model are
 - a. In order for the model to be useful, it needs to be maintained and calibrated regularly. Guideline needs to be created on how to maintain and calibrate the model, including data selection process for meaningful calibration and avoid under-/over-fitting.
 - b. The proxy model should be used to back test with heavy model's calculation to see how accurately it would've predicted changes in reserves.

7. Learning Objectives:

5. The candidate will understand the application of quantitative methods and techniques with a risk management focus to business problems for financial and non-financial companies.

Learning Outcomes:

- (5a) Assess and apply methods and processes for quantifying and managing hedgeable and non-hedgeable risks within any business enterprise
- (5b) Evaluate model risks and processes
 - (i) Assess model tradeoffs among usefulness, resource constraints, timeliness, fidelity, and accuracy
 - (ii) Assess processes for vetting models
- (5c) Evaluate results of deterministic, stress-testing, stochastic and simulation methods and models
- (5d) Assess techniques to measure risks given limited information

Sources:

Kelleher, Mac Namee, and D'Arcy, Fundamentals of Machine Learning for Predictive Analytics 2nd Ed, Ch. 9 Evaluations

Commentary on Question:

Candidates should understand the basic techniques for evaluating a machine learning model, create metrics (e.g. confusion matrix) to compare model candidates as well schemes to prevent concept drift after deployment. Most candidates did well on the retrieval part of the question; and scored well on the confusion matrix.

- *Quite some candidates performed poorly on the question b.2 which was asking for the precision and recall rates. The graders felt that candidates were confused about the definitions; and did precision something else instead of $TP/(TP+FP)$; similar mistake was for the recall rate.*
- *For c.2, half candidates misunderstood the question; and failed to recognize the question was intended to test the hypothesis based on the provided data in a false positive and false negative fashion.*

For d3, this question was to test the concept drift in real application. And the model did suffer a great bias due to the underlying data changes. Many candidates failed to recognize the shift in patterns; and did not realize the number of target and predicted claims that are low, and in the new dataset, the number of target low-probability transaction have stayed about the same whereas the number of predicted low-probability transactions have increased.

7. Continued

Solution:

(a)

- (i) Describe each approach I - III.
- (ii) Evaluate whether each of I - III is appropriate for the data science team to use. Justify your response.

Part i

Hold-out sampling

Hold out some of the data from the training set as a test set to see if the model, as developed from the training set, works for the test set of data. Can also have a third data set as the validation set to tune particular aspects of a model.

There are no fixed recommendations for how large the different datasets should be when hold-out sampling is used, although training validation: test splits of 50:20:30 or 40:20:20 are common.

k-fold cross validation

When k-fold cross validation is used, the available data is divided into k equal-sized folds, and k separate evaluation experiments are performed.

Bootstrapping

Bootstrapping is preferred when the datasets are small. Similar to k-fold cross validation, bootstrap iteratively performs multiple evaluation experiments using slightly different training and test sets each time to evaluate the expected performance of a model. To generate these partitions for an iteration of the bootstrap, a random selection of m instances is taken from the full dataset to generate a test set, and the remaining instances are used as the training set.

Part ii

Since we have 10,000 samples in the dataset which is sufficiently large. Hold-out sampling is most appropriate when we have very large datasets and since the data science team is given 10,000 data samples, this is an appropriate approach. This ensures that the training, validation and test set are sufficiently large to train an accurate model and fully evaluate the performance of that model.

K-fold cross validation may be better than hold-out sampling as we are supplied with sufficiently large dataset and it could avoid the 'lucky split' phenomenon which could exist using hold-out sampling.

7. Continued

Bootstrapping would be not an appropriate approach here since we have a large dataset.

(b) Based on the model results of 100 data samples provided in the Excel spreadsheet:

- (i) Create a confusion matrix. Show your work.
- (ii) Calculate the model's precision and recall. Show your work.
- (iii) Evaluate the model based on your results.

Part i

		Prediction	
		Fraudulent	Legitimate
Target	Fraudulent	25	13
	Legitimate	46	16

Part ii

Precision is defined as $TP/(TP+FP)$ 35.21%
Recall is defined as $TP/(TP+FN)$ 65.79%

Part iii

This model is not good at all based on the confusion matrix, precision, and recall. It has very low precision and its recall isn't very high. Improvement is required.

- (c)
- (i) Describe how the confusion matrix from part b) would change under these new categorizations.
 - (ii) Assess the thresholds given in the new sample dataset provided in the Excel spreadsheet. Justify your assessment.

7. Continued

Part i

This enhancement will require the data science team to build a multinomial prediction model whereby three classification exists:

- (1) High
- (2) Medium
- (3) Low

The updated confusion matrix will be as follows:

		Prediction		
		High	Medium	Low
Target	High			
	Medium			
	Low			

Part ii

The team can only handle 25% of claims investigation. That is, for 100 claims, they can only handle up to 25 claims.

Based on the sample dataset, we see that 35% of the claims require claim handling, therefore we need to adjust either threshold so that the total 'Maybe Fraudulent' claims predicted reduces

Total Transaction	100
Medium	36
% claims required to be handled	36%

(d)

- (i) Define concept drift.
- (ii) Recommend one ongoing model validation scheme that could prevent concept drift.
- (iii) Assess whether you observe concept drift in the 100 new data points (provided in the Excel spreadsheet). Justify your assessment.

Part i

Concept Drift

Predictive models are based on the assumption that the patterns learned in the training data will be relevant to unseen instances that are presented to the model in the future. Data, however, like everything else, is not constant. Concept drift means that almost all the predictive models that we build will at some point go stale, and the relationships that they have learned between descriptive features and target features will no longer apply.

7. Continued

Part ii

To monitor the ongoing performance of a model, we need a signal that indicates that something has changed.

There are three sources from which we can extract such a signal:

- (1) The performance of the model measured using appropriate performance measures
- (2) The distributions of the outputs of a model
- (3) The distributions of the descriptive features in query instances presented to the model

The simplest way to get a signal that concept drift has occurred is to repeatedly evaluate models with the same performance measures used to evaluate them before deployment.

We can calculate performance measures for a deployed model and compare these to the performance achieved in evaluations before the model was deployed.

If the performance changes significantly, this is a strong indication that concept drift has occurred and that the model has gone stale.

For example, if we used precision/recall and misclassification rate on a hold-out sampling set to evaluate the performance of model FDM v1.0 before deployment, we could collect all the query instances presented to the model for a period after deployment and calculate the performance measures.

A large change in the performance measures would flag that the model has gone stale.

Part iii

By comparing the number of target and predicted claims that are low, we notice in the new dataset, the number of target low-probability transactions have stayed about the same whereas the number of predicted low-probability transactions have increased. This is a sign that our model is suffering from concept drift.

	Target_Low	Prediction_Low
Old dataset	41	59
New dataset	39	73

7. Continued

Original Confusion Matrix

		Prediction			Total
		High	Medium	Low	
Target	High	4	12	0	16
	Medium	1	23	19	43
	Low	0	1	40	41
Total		5	36	59	100

Other Metrics

	<u>High</u>	<u>Medium</u>	<u>Low</u>
Recall	25%	53%	98%
Precision	80%	64%	68%
Overall Accuracy		67%	
Average Class Accuracy		44%	

New Confusion Matrix

		Prediction			Total
		High	Medium	Low	
Target	High	3	13	1	17
	Medium	0	10	34	44
	Low	0	1	38	39
Total		3	24	73	100

Other Metrics

	<u>High</u>	<u>Medium</u>	<u>Low</u>
Recall	18%	23%	97%
Precision	100%	42%	52%
Overall Accuracy		51%	
Average Class Accuracy		27%	

8. Learning Objectives:

2. The candidate will understand how to gauge a company's performance through an evaluation of its financial reports.
3. The candidate will understand how managerial accounting impacts performance evaluation and decision making.

Learning Outcomes:

- (2a) Analyze the interrelationships between the income statement, cash flow statement, and balance sheet, in order to measure a corporation's financial performance.
- (3a) Assess how managerial accounting can impact decision making and organizational architecture.
- (3b) Assess and recommend methods a company may use to allocate its costs and how these methods impact the perceived performance of a company or its component lines of business..
- (3c) Assess how managerial accounting can impact behavior and performance evaluation in organizations.

Sources:

Zimmerman, Accounting for Decision Making and Control 10th Ed, Ch 10: Criticisms of Absorption Cost Systems: Incentive to Overproduce

Zimmerman, Accounting for Decision Making and Control 10th Ed Ch 12: Standard Costs: Direct Labor and Materials

Robinson et al., International Financial Statement Analysis 4th Ed, Ch. 11 Financial Reporting Quality

Commentary on Question:

Commentary listed underneath question component.

Solution:

- (a)
 - (i) Explain why one would question BJT's 2020 financials.
 - (ii) Describe how a dysfunctional incentive created by absorption cost systems may lead to the problem discussed in i).

Commentary on Question:

Candidates should always seek to tie their answers back to the Case Study when answering. The best candidates were also able to specifically call out impacts to the income statement and balance sheet.

8. Continued

- (i) Explain why one would question BJT's 2020 financials.

BJT's Total Gross Sales and Total Costs of Sales move in the same direction in all years except 2020.

Pay attention to revenues: Look at revenue relationships; examine trends for unusual changes and seek an explanation if they exist;

BJT's Inventory increases in 2020.

Pay attention to signals from inventories. Look at inventory relationships. Because revenues involve items sold from inventory, the kind of examination one should perform on inventory is similar to that for revenues.

Cost of Raw Materials has declined, due to volume discounts from the rubber supplier;

Production Costs, which include overhead costs, have leveled off; Inventory has increased.

- (ii) Describe how a dysfunctional incentive created by absorption cost systems may lead to the problem discussed in i).

Absorption cost systems create incentives for managers to produce more than they sell (incentive to overproduce).

Absorption cost systems spread all manufacturing costs (including fixed costs) against all units produced.

When more units are produced than sold, some fixed costs are inventoried on the Balance Sheet.

Increasing the number of units in inventory increases the fraction of fixed costs in inventory. With more fixed costs in inventory, less fixed costs are transferred to the income statement.

Increasing production while holding sales constant causes average unit costs to fall and profit per unit sold to increase.

8. Continued

- (b) Describe how a company may use Standard Costs for:
- (i) Decision making.
 - (ii) Control.

Decision Making

Firms use standard costs to convey information about alternative uses of scarce resources.

Standard costs are useful in making decisions on product pricing, outsourcing, and resource allocation.

Standard costs are used in contract bidding and assessing alternative production technologies.

Control

Managers can gauge performance by comparing actual costs against standard costs.

Variances provide useful information in determining whether the production system is operating as expected.

Variances alert senior managers that something is amiss.

Variances provide information for performance evaluation.

- (c)
- (i) Calculate the total materials variance in terms of price variance and quantity variance. Show your work.
 - (ii) Calculate the total labor variance in terms of wage variance and efficiency variance. Show your work.
 - (iii) Interpret the results in (i) and (ii).

Commentary on Question:

While the calculation was important, the interpretation is also important. Sample interpretations are included below.

8. Continued

(i)

Total Materials Variance = Price Variance + Quantity Variance

Price Variance = (Actual Price - Standard Price) x Actual Quantity = $(23 - 25) \times 2826 = -5652$

Quantity Variance = (Actual Quantity - Standard Quantity) x Standard Price = $(2826 - 2300) \times 25 = 13150$

Total Materials Variance = $-5652 + 13150 = 7498$

(ii)

Total Labor Variance = Wage Variance + Efficiency Variance

Wage Variance = (Actual Wage - Standard Wage) x Actual Hours = $(15 - 20) \times 3500 = -17500$

Efficiency Variance = (Actual Hours - Standard Hours) x Standard Wage = $(3500 - 3000) \times 20 = 10000$

Total Labor Variance = $-17500 + 10000 = -7500$

(iii)

The unfavorable Total Materials Variance was due to the unfavorable Quantity Variance, partially offset by the favorable Price Variance.

Quantity Variance was unfavorable because Actual Quantity exceeded Standard Quantity; Price Variance was favorable because Actual Price was less than Standard Price.

The favorable Total Labor Variance was due to the favorable Wage Variance, partially offset by the unfavorable Efficiency Variance.

Wage Variance was favorable because Actual Wage was less than Standard Wage; Efficiency Variance was unfavorable because Actual Hours exceeded Standard Hours.

8. Continued

- (d) Explain why BJT should be concerned about favorable variances, providing two reasons based on its risk profile.

Commentary on Question:

Similar answers for favorable materials quantity variance were acceptable (e.g. skimping on the quantity of inputs may lead to the production of lower quality tires)

Favorable materials price variance.

Favorable materials price variance could mean that lower quality materials were used in production, resulting in lower quality tires

BJT must constantly assure that its products are of the highest quality because one of its primary strengths is its brand name. The risk of a tire recall or litigation and the resulting damage to BJT's brand, reputation, and financials are not worth the price savings of using lower quality materials.

Lower quality materials will result in lower quality tires and increased claims under the warranty program that BJT introduced which provides free tire replacement for five years from the purchase date of every tire. Using low quality materials will significantly increase the cost of the warranty program and will not be worth the input price savings.

Favorable wage (or labor efficiency) variance.

Favorable wage variances can indicate that less-skilled, lower-paid employees were used.

BJT should be concerned about the cost of a unionized labor force which could lead to contentious labor issues. A favorable wage variance is likely not worth the increased labor cost or potential disruption in the workforce at BJT plants that could accompany unionization.

Favorable wage variance or favorable wage efficiency variance can also compromise product quality.

All variances must be analyzed as an integrated whole. A favorable materials price variance and a resulting unfavorable materials quantity variance can cause unfavorable wage or labor efficiency variances if extra material and labor are used due to the substandard materials.

9. Learning Objectives:

3. The candidate will understand how managerial accounting impacts performance evaluation and decision making.

Learning Outcomes:

- (3a) Assess how managerial accounting can impact decision making and organizational architecture.
- (3b) Assess and recommend methods a company may use to allocate its costs and how these methods impact the perceived performance of a company or its component lines of business..
- (3c) Assess how managerial accounting can impact behavior and performance evaluation in organizations.

Sources:

Zimmerman, Accounting for Decision Making and Control, 10th Edition, Chapter 7: Cost Allocation: Theory

F-155-21 Product Costing in Service Organizations

Case Study

Commentary on Question:

Candidates generally did not perform well on this question. This question was testing candidates' understanding of how overhead allocation affects performance from both an accounting view, and from the incentive impact accounting views have on managers. Candidates who did well were able to demonstrate an understanding that the "best" accounting method varies as an individual moves through a company.

Solution:

- (a)
 - (i) Calculate the overhead rate for Frenz from 2016 through 2020. Show your work.
 - (ii) Critique Kitty's statement to Jeff (Case Study Section 4.5, Exhibit B) regarding the success of the current allocation method.

Commentary on Question:

Common mistakes made by candidates in part (i) were including cost of sales in the total indirect costs and including depreciation in the total indirect costs. Including depreciation in the indirect costs was considered an acceptable answer, but not preferred.

On part (ii), many candidates critiqued the current allocation method rather than Kitty's statement.

9. Continued

(i)

<i>Euros in thousands</i>	2020	2019	2018	2017	2016
Sales	453,044	431,483	411,049	391,681	373,321
Cost of Sales	46,906	56,395	37,700	34,148	30,896
Store Operating Expenses	226,166	216,716	207,662	198,985	190,671
Depreciation	25,822	23,359	20,856	18,290	15,643
General and Administrative Expenses	54,483	53,189	51,963	50,801	49,699
Impairment of Goodwill	0	0	0	10,385	0
Total Operating Expenses	353,376	349,660	318,180	312,610	286,909
Total Indirect Costs	280,649	269,905	259,625	249,786	240,370
Overhead Rate	61.95%	62.55%	63.16%	63.77%	64.39%

- (ii) Kitty's observation that the overhead rate is decreasing every year is correct. By Kitty's standards, the current allocation method is successful.
- (b) Explain why Jeff believes that Frenz is allocating overhead in a way that punishes the most successful store managers.

Commentary on Question:

Candidates generally did very poorly on this question. While many candidates identified the increase on costs allocated to store managers with higher sales, very few candidates provided additional information on cost allocations aligning with Jeff's concerns.

Since Operating Expenses are included in Indirect Costs to be allocated across all stores, managers who successfully manage costs are punished because they are covering costs of other stores that may not be as well-managed.

Store managers with the highest sales have the most costs allocated to them as a tax for increased revenue.

Overhead allocation ratio has been decreasing almost every year. When overhead allocation ratios are decreasing, it means that more overhead is being allocated than marginal cost incurred from sales.

- (c) Explain how Jeff benefits from:
- (i) The existing allocation method.
- (ii) His suggested allocation method.

9. Continued

Commentary on Question:

Candidates generally did poorly on this question. Many candidates described a general benefit of the allocation methods to the store owners, and did not describe the benefit to Jeff, who is the Division Head of Non-Coffee Product Marketing, not a store owner.

(i) The existing allocation method is non-insulting. Allocated costs depend on the coffee line's sales, not just the non-coffee line sales. This benefits Jeff because the variability of his performance measures will decrease, causing Jeff's bonuses to be more regular.

(ii) Jeff's suggested allocation method is to allocate total overhead by store. With this approach, the profitability of the non-coffee products is unaffected by coffee sales in the short term. This benefits Jeff because store managers can be encouraged to market and sell more non-coffee items without the additional overhead in the short term, which would increase Jeff's bonus.

- (d) Explain one reason why Frenz should not use allocated costs to price its products.

Commentary on Question:

Many candidates were able to identify a reason to not use allocated costs when pricing products. However, a common mistake made by candidates was not tying their answer to Frenz specifically, and those candidates did not receive full credit.

Allocated costs result in a joint-product-costing problem for Frenz. There are a high level of fixed costs that produce the range of Frenz products. Attempts to allocate involve an arbitrary allocation of costs, which can lead to inappropriate product pricing.

- (e)
- (i) Describe three considerations that Jade needs to address in the strategy to allocate marketing costs.
 - (ii) Recommend an allocation strategy that would meet Jade's marketing strategy goals. Justify your answer using each of the considerations in (i).

Commentary on Question:

Candidates generally did poorly on this question. While many candidates were able to successfully describe three considerations that Jade needs to address, many candidates did not address those considerations in their justification of an allocation strategy that would meet Jade's goals. Very few candidates identified Jade's goals.

9. Continued

(i) Cost: Volatility of branch profitability: Jade needs to consider if different Frenz stores can have significant variance in profitability.

Subsidization: Jade needs to consider if the allocation method should subsidize under-performing departments or stores

Cost: Jade needs to consider if the cost of a more detailed allocation method is justifiable

(ii) Jade's first priority is to expand into the fast-growing Asian market.

I recommend pooling total corporate overhead costs, then allocating them by store based on total sales in USD.

Allocating based on total sales is a non-insulating allocation method, which ties profits to other stores' results. This is needed to reduce variance in branch profits as Frenz expands into new geographic areas.

Allocating based on total sales allocates more overhead to stores that are already operating profitably, which subsidizes new stores in the Asian market until they are able to ramp up sales.

Indirect costs for Frenz are a large portion of total operating expenses, and the cost of tracing and allocating costs further down the value chain is not justified since indirect costs like marketing aren't specific to any market, product, etc.

10. Learning Objectives:

4. The candidate will understand how to apply and recommend appropriate ERM frameworks, principles and strategies to manage, evaluate, analyze and mitigate risk exposures faced by an entity and to ensure operational excellence in any industry.

Learning Outcomes:

- (4a) Assess the potential impact of risks faced by an entity in any industry, including the extent to which risks are hedgeable or non-hedgeable.
- (4c) Develop and evaluate an appropriate risk mitigation or risk transfer strategy for any given situation.
- (4d) Design, analyze and develop ERM strategies for financial and non-financial companies.
- (4e) Recommend best practices in business and ERM processes to achieve operational excellence.

Sources:

Sweeting, Financial Enterprise Risk Management, Ch 19: Risk Frameworks

F-143-19 Vakharia and Yenipazarli, Managing Supply Chain Disruptions, sections 2-5

Case Study

Commentary on Question:

The goal of this question was to have the candidate analyze potential supply chain disruptions using a traditional enterprise risk management framework. To succeed on this question, candidates needed to demonstrate in part a) the different risks and responses posed by different supply chain threats. For part b) and c) they need to take the pandemic threat and proactively establish a risk management program for BJT to help mitigate the risk associated with future instances.

Candidates did fair on this question, but many candidates attempted to answer the question more generically, rather than follow the specific ERM frameworks that were identified within the question. More general answers that still tied to the case study got partial credit.

10. Continued

Solution:

(a)

- (i) Classify each scenario, I - III, above using the four categories of the “supply chain disruption” approach (Cause, Life Cycle, Type, Decision Focus). Justify your response for each categorization.
- (ii) Recommend one supply chain disruption risk mitigation or recovery strategy for BJT for each scenario, I - III. Justify your recommendation.

Commentary on Question:

Candidates who were familiar with the source material and the concept being tested here did well on part (a), but many candidates appeared to have skipped over the material. The goal of the question is to classify each event along all four dimensions, not assign each event into one of them. Some categorizations can have more than one correct classification. Candidates who justified their choice showing correct understanding of the classifications and use reasoning consistent with the case study were awarded full points.

(i)

Classification #1 - Cause:

- Tire Recall: This would be an "act of humans" given that it was a manufacturing defect.
- Pandemic: This could be classified both as an "act of humans" and an "act of nature." The disease itself is an "Act of nature," but the manner of the spread is an "act of humans."
- Political Upheaval: This would be classified as an "act of humans," as this would be citizens taking an explicit action.

Classification #2 - Supply Chain Life Cycle Stage:

Given that BJT has been operating in some form since 1946 and has been under Blue Jay Air for over a decade, this would be considered a mature life cycle. This response is the same for all three supply chain disruption events, as it is dependent on the company itself and not the nature of the disruption.

Classification #3 - Type:

- Tire Recall: A manufacturing defect would be a change in quality, due to the decrease in manufacturing / material quality.
- Pandemic: This would likely be a change in lead time and/or quantity, as it would take longer to manufacture the raw materials during a pandemic. There may also be less resources, or a reallocation of resources to more vital needs.
- Political Upheaval: This would likely be a change in lead time, as political disruptions could affect both the production and shipping of raw materials.

10. Continued

Classification #4 – Decision Focus:

- Tire Recall: Disruptions that are caused by product recalls are classified as a revision to "sourcing, operations, and distribution."
- Pandemic: This would likely require either a focus on "product allocation decision" or "operational response within a supply chain node." Because the pandemic is global, it is difficult to just switch to a different source, as most producers will be facing similar issues.
- Political Upheaval: The solution may be best handled via switching to a new source, then "sourcing, operations, and distribution" would be the right focus.

(ii)

- Tire Recall: A reactive approach would be to enhance real-time response and damage control systems, to limit the impact and scope of the recall (and potentially to detect defects earlier, thus preventing a recall at all)

- Pandemic: For a global pandemic, it is tough to shift the supply chain to another producer or node, so the biggest benefits here are in increasing visibility across the supply chain and potentially increasing slack to absorb future pandemics

- Political Upheaval: For political upheaval, a redesign of the supply chain may be optimal, to diversify the countries that provide materials for BJT

- (b) Explain why the ISO 31000 framework is a good framework to use to assess the impact of a pandemic on BJT, based on the framework's definition of risk.

Commentary on Question:

Candidates did rather poorly on this section, focusing more on why ERM frameworks are good to use in general, as opposed to why the ISO 31000 framework might be a preferred framework for evaluating these specific risk scenarios. Minor partial credit was still awarded for general responses about risk frameworks.

The ISO 31000 standard is a good standard to use for this analysis because it defines risk as the effect of uncertainty on objects. ISO31000 focuses on the effects of events on the company objectives rather than the events themselves. The effect may be positive, negative, or simply a deviation from the expected outcome.

This risk framework shifts the emphasis to the impact of the pandemic on BJT, and away from analyzing the possibility of a pandemic occurring. BJT needs to know how the already-occurring pandemic will potentially impact the company.

10. Continued

- (c)
- (i) Identify four significant risks to BJT presented by a potential pandemic based on BJT's Risk Profile in Case study section 3.3.
 - (ii) Explain how each risk in (i) is impacted by the pandemic.
 - (iii) Explain the approach to evaluate these key risks under the ISO 31000 framework for BJT.
 - (iv) Describe how BJT should monitor, review, and communicate risks under the risk framework.

Commentary on Question:

Candidates generally did well on parts (i) and (ii), with full points being awarded for specifically tying back to the BJT case study as opposed to just presenting more generic pandemic-related impacts. For part (iii), most candidates answered with the steps of an entire ERM framework, which received no points. Evaluating the risk is one of the steps of the ISO 31000 risk management framework, and the question needed to identify/analyze how to evaluate these risks in this case. Candidates generally did better on part (iv), with full points again being awarded for more closely tying to BJT.

(i) and (ii)

BJT has an established Risk Profile and can analyze pandemic specific risks within each of these identified risk categories. E.g., four risk categories that could be impacted are:

- Commodity Risk - While BJT has identified commodity risk as an area that could be impacted by a natural disaster/pandemic, it only has enough extra to handle one month of lags. The pandemic could have longer effects on the supply of raw materials if employees up the supply chain are not able to generate materials on site.

- Labor Risk - BJT USA has a unionized labor force, which means they may have a greater ability to collectively bargain for specific work environment standards, COVID-19 testing, vaccination protocols, and more. BJT also has labor risk arising from the pandemic in that employees may have to miss long stretches due to quarantine/isolation rules resulting from COVID-19 exposure/infection.

- Distributor Risk - Given that BJT sells through distributors (as opposed to a more online driven model), the pandemic poses a risk if the distributors cannot sell in person, due to stay at home orders/quarantine situations/client's perceived risk of conducting in-person business.

10. Continued

- Economic Risk - This could be a positive or negative risk. A pandemic would affect travel in a number of ways, as people's travel habits change for both work and leisure.

(iii) Under the ISO 31000 framework, risk evaluation is mainly comparing the assessment of a risk (quantitative, semi-quantitative or qualitative) to the company's appetite for that risk.

Using labor risk as an example, BJT should compare the potential impact of a pandemic on its employees' ability to work and abilities for plants to stay open to the risk appetite statement of employees on average missing 5 or less unpaid days.

Similarly, for commodity risk, BJT should compare the potential impact of a pandemic on raw material prices to an annual increase in raw material prices of no greater than 10%.

(iv) BJT should have mechanisms in place to monitor and review leading KPIs that would help identify how they should respond to a pandemic. Unlike a natural disaster, which has an acute impact that ripples in over time, the effects of a pandemic slowly build and modulate throughout the life of the virus. Risk mitigation solutions that work in the first three months of a pandemic may not be appropriate twelve months into a pandemic, and a review process is needed to confirm risk mitigating actions are appropriate.

From a communication standpoint, BJT should be proactively communicating with suppliers to understand their individual approaches to managing pandemic risks, as well as where BJT falls in priority order in the event of a materials shortage. Downstream, BJT should be communicating with distributors to discuss how to handle changes in supply, demand, and ability to deliver goods at the final supply chain node. Communication with employees about safety in the workplace in regard to a pandemic would also need to occur. And management at both BJT and BJA (as parent company) should be made aware of these examples of communication as well as kept up to date on how the pandemic is affecting demand for BJT's products and the comparison of the pandemic impacts to BJT's risk tolerances.

- (d) Recommend an appropriate “risk treatment approach” for each of the risks identified in part (c)(i) under the ISO 31000 framework. Justify each recommendation.

Commentary on Question:

Candidates did fair on part (d). Full credit was awarded to answers that used the specific risk treatment approaches defined under ISO 31000 and tied those risk treatment approaches back to the case study specifically.

10. Continued

Risk Treatment Approach #1 - Changing the consequences of the event. BJT could take this approach for the Distribution Risk, by developing a more robust online distribution channel. This would limit the consequences of distributors being unable to sell from their local stores and could position BJT to succeed relative to peers without this capability.

Risk Treatment Approach #2 - Changing the likelihood of the event. BJT could take this approach for the Labor Risk related to being able to run the manufacturing process during a pandemic. This could be done in a number of ways, including proactively increasing the safety protocols of plants, automating additional aspects of the production process, and continuing to increase the geographical diversity of their plant locations as pandemics often hit different areas with different intensity (and with different political reactions).

Risk Treatment Approach #3 - Taking or increasing the risk in order to pursue an opportunity. BJT could take this approach for the Economic Risk, if BJT's Risk Analysis results in plausible scenarios where construction and agricultural demand remains high in the face of decreasing work commute traffic. This could be an opportunity / reason to pursue the possible product expansion.

Risk Treatment Approach #4 - Sharing the risk with another party or parties. This could be done with the Commodity Risk in a couple of ways. In the most traditional sense, BJT could purchase a pandemic insurance policy that is explicitly tied to the ability to acquire raw materials (and the cost of those materials). BJT could also work with suppliers to develop a mechanism that helps protect BJT from cost increases due to unexpected scarcity, in exchange for a portion of sales above a certain level.