CFE FD Model Solutions
Fall 2024

1. **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.

(1c) Assess the impact of business strategies including acquisitions, divestitures, and/or restructurings.

Sources:
F-160-F23: Why private equity sees life and annuities as an enticing form of permanent capital

F-158-F23: Hurdle Rate Definition

Commentary on Question:
The goal is for candidates to understand that different types of businesses can look at the same opportunity differently. We expect the candidate to be able to perform a discounted cashflows profitability analysis.

In general, candidates did well on part a, which is to compare the minimum required rate and the hurdle rate (WACC).

Part b, some candidates did not use XNPV function. Therefore they missed the first year cash flow. Also, some used 8% as the discount rate.

Part c, most candidates were able to recognize the IRR > hurdle rate. A small number of candidates mentioned the NPV was a small positive number so it may not be worth to pursue the project. The graders felt such statement was a reasonable assessment; and gave credits for such answer as well.

Part d, this part was asking for the potential scaling and expense savings for a PE company. Some candidates failed to recognize from a PE's perspective.

Part e, most candidates did well on this part.

1. **Continued**

Solution:
(a)   Describe how a hurdle rate is used to evaluate an investment.

The minimum required rate of return or target rate that investors are expecting to receive on an investment.

Before accepting and implementing a certain investment project, its internal rate of return (IRR) should be equal to or greater than the hurdle rate. The hurdle rate is often set to the weighted average cost of capital (WACC), also known as the benchmark or cut-off rate.

(b)   Calculate the following metrics, using the assumptions given in the Excel file. Include time zero cash flows. Show your work.

(i)   NPV

(ii)   IRR

Part (i)
If they use this ""=XNPV(8%,C31:M31,C16:M16)"" they should get $0.37M
If they were to use the NPV function in excel, they would need to add in the time 0 outside of the function, otherwise it will be off in discounting.
"=NPV(8%,D31:M31)+C31"

Part (ii)
They can either use the IRR function, XIRR, or use goal seek to get an NPV of 0. If they use one of the methods listed above and get the correct result of 9.68%

(c)   Explain whether ANC's product offering is a good addition to ABC, using the results of your calculation in (b).

Before accepting and implementing a certain investment project, its internal rate of return (IRR) should be equal to or greater than the hurdle rate. The IRR of 9.68% exceeds the 8% hurdle rate so it is a good investment"

If the resulting Net Present Value (NPV) is greater than zero, the project exceeds the hurdle rate, and if the NPV is negative it does not meet it. The NPV is greater than 0 using the 8% hurdle rate so it is a good investment.

(d)   Describe two specific benefits that draw private equity companies to life and annuity business.

1. Continued

The cost of servicing the liabilities is significantly lower than the potential investment return. The spread represents an attractive margin.

Second, investing these assets provides a stable base for GPs to rapidly build their alternative credit capabilities.

They can also talk about permanent capital, or quickly reaching scale in alternative credit capabilities.
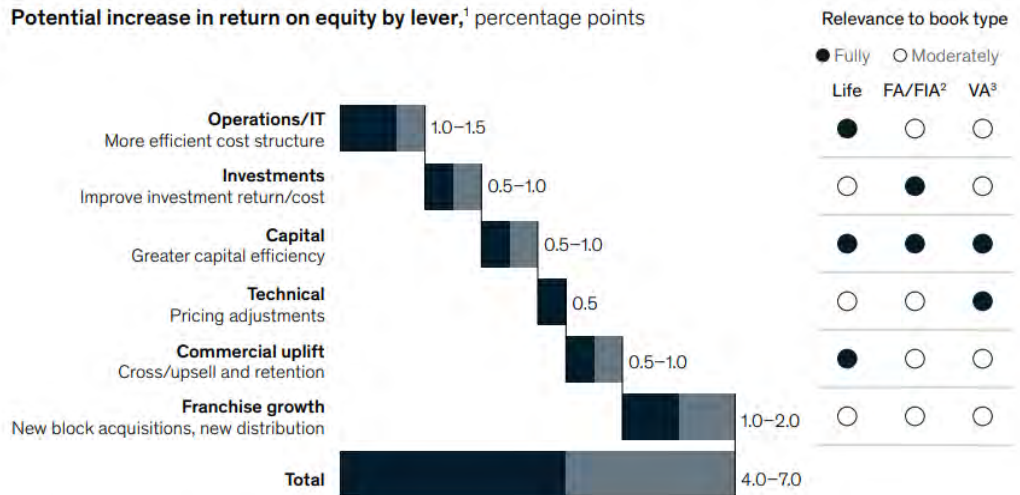
(e)

    (i)   Explain how two of the assumptions provided in the Excel spreadsheet might be different for a private equity firm.

    (ii)   Analyze the impact to the IRR (Excel tab 1_e-ii) after adjusting the two assumptions in part (i) to reflect what the private equity firm might reasonably assume. Show your work.

Part (i)

Exhibit

The value-creation playbook can lift return on equity by four to seven percentage points.

Potential increase in return on equity by lever,[1] percentage points — Relevance to book type (● Fully, ○ Moderately)

Lever	Increase	Life	FA/FIA[2]	VA[3]
Operations/IT — More efficient cost structure	1.0–1.5	●	○	○
Investments — Improve investment return/cost	0.5–1.0	○	●	○
Capital — Greater capital efficiency	0.5–1.0	●	●	●
Technical — Pricing adjustments	0.5	○	○	●
Commercial uplift — Cross/upsell and retention	0.5–1.0	●	○	○
Franchise growth — New block acquisitions, new distribution	1.0–2.0	○	○	○
Total	4.0–7.0			

[1] If carrier matches best-in-class benchmark.
[2] Fixed annuity/fixed indexed annuity.
[3] Variable annuity.

Part (ii)

For example, if they say that the investment returns would be triple for the PE firm, that is much higher than the article indicated and would lead to an IRR of 250%. That would show a lack of understanding of the article.

1. Continued

If there is an error in part (b) calculating the IRR and NPV, do not penalize them for that.

Example of reasonable answers:
Higher Investment Return -> 7% increased to 7.25% increases the IRR from ~10% to 15%.
More efficient cost structure -> Could lower the expenses for maintenance from 1% to .5% , increases the IRR from ~10% to ~11%.
Increased retention -> Could decrease the lapse assumption or lapse growth, small increases to IRR.
Increased Cross sell -> Could decrease acquisition expense, drop from 6% to 5% would increase IRR from ~10% to ~14%.

2. Learning Objectives:

3.   The candidate will understand how managerial accounting, ERM and operational processes impact performance evaluation and decision making.

4.   The candidate will understand the application methods and techniques to business problems for an organization.

Learning Outcomes:

(3a)   Assess how managerial accounting can drive decision making, behavior and performance evaluation.

(3c)   Evaluate ERM risk measurement, modeling, and management of financial and non-financial risks that impact performance.

(4a)   Assess and apply methods and processes for quantifying and managing hedgeable and non-hedgeable risks and technologies.

(4b)   Evaluate model risks and processes
      (i)   Assess model tradeoffs among usefulness, resource constraints, timeliness, fidelity, and accuracy
      (ii)   Assess processes for vetting models

Sources:

Zimmerman, Accounting for Decision Making and Control 10th Ed, Ch 5: Responsibility Accounting and Transfer Pricing

Lam, Implementing Enterprise Risk Management from Methods to Applications, Ch 17: Integration of KPIs and KRIs

F-164-F23: Operational Risk Management, 2nd Ed, Ch. 18 Case Studies (JP Morgan Whale and Credit Suisse Archegos Scandal sections only)

Kelleher, Mac Namee, and D'Arcy, Fundamentals of Machine Learning for Predictive Analytics 2nd Ed, Ch. 12 Case Study: Customer Churn

SOA: Peer-to-Peer Insurance: Blockchain Implications

SOA Research Institute: Decentralized Insurance Alternatives: Market Landscape, Opportunities and Challenges

Commentary on Question:
Most candidates did well on this question. Overall, to earn full credit on each sub question, candidates needed to explain the underlying concept as well as relate their answer to the context of the case study and SIT.

2. **Continued**

Solution:
(a)   Explain why Karen may want to consider Economic-Value-Added as a performance measure using two reasons specific to SIT.

Commentary on Question:
Only a few candidates noted that EVA can be used as a performance incentive metric for managers.

Economic Value Added (EVA) is a good performance metric for SIT to use for two reasons:
1) Start-ups with growth mindset have lots of early, upfront costs needed to grow with profits not being realized until later years, assuming execution goes to plan. EVA considers this by amortizing these upfront costs. Accounting profits might be negative, but EVA will let you know when value has been added to the company.
2) SIT has many risks associated with its current and future expanded business. Capital will be a major consideration for SIT, for both internal and external reasons. SIT needs to consider economic capital for internal decision making. EVA considers economic capital and adjusts the value for the risks associated with generating profits.

(b)   Recommend two key risk indicators to monitor SIT's operational risk. Justify your recommendations.

Commentary on Question:
To receive full credit on this question, candidates needed to provide KRIs that specifically addressed operational risks and provide an answer relating to the context of the case study. KRIs not addressing operational risks did not receive credit.

(1) % of fraud detected. This KRI ties to a key business objective, reducing fraud losses, is quantifiable, and is simple without being too simplistic. As mentioned in the case study, "SIT is looking to improve the performance of its underwriting and fraud detection capabilities" & "However, an audit has indicated that there are at least another 5% of fraud cases that are being missed"
(2) Number of cyber attacks. This KRI ties to a key business objective, is measurable, relevant, and critical to the success of SIT. As mentioned in the case study, "Cyber risk is high in a heavily digitalized InsurTech with high dependence on consumer data."

2. Continued

(c) Describe two lessons learned from the Credit Suisse Archegos Scandal that SIT should consider.

Commentary on Question:
Many valid answers were accepted. To receive full credit, candidates needed to accurately describe a lesson learned from the Argos scandal and relate it to the context of the case study.

(1) There were inadequate internal controls that were not followed, exacerbating credit Suisse's losses via taking more exposure to Archegos than their risk limits should've allowed. SIT can learn from this, and impose internal risk limits and controls on the amount of Insuracoin that they expose themselves to, thereby sitting a limit on the amount they can lose due to the volatile and unregulated nature of the cryptocurrency.
(2) Insufficient training/resources dedicated to risk management. It is noted that staffers in charge of risk management at credit Suisse were too inexperienced and too few in number, leading to insufficient management. SIT can learn from this by dedicating sufficient resources and experienced personnel to the risk management and oversight of Insuracoin on SIT's digital platform.

(d) Describe potential risks to SIT from the proposed Faslite arrangement in regards to:

(i) A p2p platform claim process.

(ii) Financial considerations.

Commentary on Question:
Many valid answers were accepted with justification; however to receive full credit on this question, candidates needed relate their response to the context of the case study.

Most candidates noted Faslite's high loss ratio as a key financial consideration for SIT on (d)(ii).

P2p platform:
SIT as the reinsurer for higher losses, once the mutual pool is exhausted, needs to cover claims. The claim process is potentially highly automated by smart contracts, and automatic payments can be done and non-reversible. Therefore, this process is highly prone to smart contract risks (cyber security, coding, etc.). Errors in smart contracts can lead to financial losses for SIT. Vulnerabilities in those smart contracts can also attract hacker's attacks.

2.   Continued

Financial:
Faslite has a very high loss ratio, most recently 125%, which poses significant counterparty risk to SIT. Since SIT would be acting as Faslite's reinsurer in this arrangement, SIT needs to be very careful about what terms they set on reinsuring excess losses, since it is very likely given their recent history that Faslite will have losses in excess of 100% of premiums collected, which could create significant reinsurance claims for SIT.

(e)   Recommend actions SIT could take to mitigate the potential risks discussed in part (d). Justify your recommendation.

Commentary on Question:
Below are some sample answers. Valid answers were accepted with justification.

To mitigate the first risk, SIT can facilitate smart contract audit to validate the smart contracts before put into use. Additionally, they can potentially purchase insurance coverages for smart contracts if needed to mitigate the effects of hacker attacks.

To mitigate the second risk, SIT can only reinsure the better performing rental insurance and refuse to reinsure the home insurance block. As per the case study, most of the better profitability outlook is coming from the rental insurance, and home insurance profitability has not been improving.

3. **Learning Objectives:**
4.   The candidate will understand the application methods and techniques to business problems for an organization.

Learning Outcomes:
(4b)   Evaluate model risks and processes
    (i)   Assess model tradeoffs among usefulness, resource constraints, timeliness, fidelity, and accuracy
    (ii) Assess processes for vetting models

(4c)   Evaluate results of deterministic, stress-testing, stochastic and simulation methods and models.

Sources:
Dowd, Measuring Market Risk 2nd ed, Ch 15 Back Testing Market Risk Models

Commentary on Question:
This question tests the candidate's ability to construct and interpret backtests, transformations, and their results. To perform well, candidates needed to not only know the various methods, but also their purpose and how to interpret their results. Candidates generally did poorly on this question.

There was a defect found in the graph to be interpreted in part c(iii). Individual results were reviewed. Candidates were given full credit for that part of the question so that no candidate was penalized for the issue on the exam. For purposes of training, sample answers are included below to assist in future exam study.

Solution:
(a)
    (i)   Describe the two bases for statistical backtests that can be used to assess the adequacy of the risk models.

    (ii) Identify an advantage, in addition to ease of application, and a disadvantage for each basis in part (i).

    Commentary on Question:
    Many candidates were familiar with one basis for statistical backtests, but few were familiar with two. For full marks for part (ii), candidates only needed to name one advantage and disadvantage for each basis, but multiple correct answers are included below for reference.

    (i)   Statistical backtests can be:
        • Based on the frequency of exceedances
        • Based on the distribution of exceedances or P/L

3. **Continued**

Statistical backtests based on frequency of exceedances focuses on the probability of the first exceedance happening in time T, or on the probability that the # of observed frequency of tail losses ties with the expected # in the model.

Statistical backtests based on distribution of exceedances or P/L focuses on the distribution of the observations making a good fit (based on tests of distribution of equality) with the assumed distribution of the exceedances or P/L of the model.

(ii) For statistical backtests based on frequency of exceedances:
- Advantages
  - Only need limited information both in terms of data volume and parameters
  - Useful when long runs of data are not available
  - Intuitive, easy to explain
- Disadvantages
  - Throws away information on temporal pattern of exceedances which would have allowed tests for iid (independently and identically distributed). This is important for applicability of tests.
  - Throws away information on size of exceedances, which could lead to accepting "bad" models because the frequency is low even though the forecasts of size of losses are very poor.
  - Does not provide context for model failure, such as abnormal situations (e.g., natural disaster or market crash)

For statistical backtests based on distribution of exceedances or P/L:
- Advantages
  - Allows comparison of P/L observations to forecasts that are parametric and/or change every day.
  - Allows the application of statistical tools to identify possible sources of model failure.
- Disadvantages
  - Need larger volume of data or leads to unreliable results
  - Need to apply a number of tests to ensure reliability of results even under plausible circumstances.
  - Often assumes normal distribution which does not capture fatter tails of financial risks

3. **Continued**

(b)

    (i)   Construct a backtesting chart based on the Excel data.

    (ii)   Interpret the results in the context of Darwin's VA hedging program.

Commentary on Question:
Some candidates did not know which components to include in the backtesting chart. Many candidates did not know how to interpret the results.

    (i)   See solution in Excel.

    (ii)   There is a relatively large # of negative exceedances (10) as compared to 5 positive exceedances (double), and these negative exceedances are a lot greater in size than those of the positive exceedances. This could signify where (what market conditions) the model issues are.

              There are also some sharp movements in the observations which could suggest changes in volatility in the market risks and/or convexity in the liability are not captured by the hedging program.

              These likely point to inadequacy of Darwin hedging only Delta and half rho, which are not hedging the volatility of the market and capturing the convexity of the liability profile at the tails. This is made worse by the basis risk from many of Darwin's more popular funds that are likely moving faster than the market.

(c)

    (i)   Explain the Transformations, their purpose, and application.

    (ii)   Transform the data to populate the two charts provided in the Excel tab 3_c.

    (iii)   Interpret the results of the Transformations for Darwin Life.

Commentary on Question:
For full marks on part (i), candidates needed to explain the purpose and application of the Rosenblatt and Berkowitz transformations as opposed to transformations in general. For part (ii), candidates generally performed well. For part (iii), candidates needed to recall that the Rosenblatt transformation should show a uniform distribution and the Berkowitz transformation should show a normal distribution, but, more importantly, be able to analyze what it means if they do not show a uniform/normal distribution and why.

3. Continued

(i) The Rosenblatt Transformation transforms the observed data into their forecast cumulative probability values. In doing so, it is essentially comparing the observed data to forecasts based on the risk model. It is used to check whether the forecast P/L distribution conforms to the distribution of actual observed values. This would then indicate whether the risk model distribution fits the observed data or the model needs to be changed.

Since Darwin's risk model assumes that P/L is normally distributed, the transformation is into normal cdf (cumulative distribution function) values. Under the assumption of normal distribution, these cdf values should be distributed as standard uniform.

The Berkowitz Transformation transforms the Rosenblatt Transformed data into standard normal. This allows the use of statistical tools, such as t-tests, variance analysis correlations, etc. to identify the source of model failure.

(ii) See solution in Excel.

(iii) The resulting Rosenblatt transformation chart does not show a uniform distribution and has a heavy preponderance in the lowest percentile. This would be consistent with a distribution that has much fatter tails than a normal distribution.

This could imply that Darwin's risk models need to reflect market conditions more in the tail that can happen more often (i.e., risk condition distribution itself should have fatter tails). Or, it could imply that the forecast P/L is not adequately capturing the effect on P/L of market conditions already reflected in the tails, i.e. that the hedging is inadequate.

Since the Rosenblatt transformation is already showing non-normality, the Berkowitz transformation becomes unnecessary for this iteration. If Darwin changes its model to reflect the fatter tails, and the resulting Rosenblatt transformation shows a uniform distribution, then this next transformation can be very useful.

The Berkowitz Transformation chart does support the finding under the Rosenblatt transformation of non-normality in the observations. It has a negative skew and a positive kurtosis, longer and heavier on the negative side.

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

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.

(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 Multiinternational Operations, Pages 3 – 9, and 18 – 24.

Case study – Frenz

Commentary on Question:
The purpose of this question is to assess the candidates knowledge on how foreign currency transactions and foreign subsidiaries effect a parent company's financial statements.
- *Which currency translation method to use*
- *The impact to the equity when there is net asset or liability balance sheet exposure*
- *Methods can be used to mitigate balance volatility.*

Solution:
(a)
(i) Recommend the appropriate foreign exchange translation method for the parent company, Frenz, to use when translating the financial statements of its new Japanese subsidiary into its presentation currency, Euros. Justify your recommendation.

(ii) Translate the 2023 year-end income statement and balance sheet of the Japanese subsidiary in terms of Euros using the appropriate translation method. (Excel tab 4_a-ii). Show your work.

(iii) Assess the following statement from Kitty Dunn regarding the foreign currency risk of establishing the Japanese subsidiary whose functional currency is the Japanese yen:

"The establishment of a Japanese subsidiary will result in a net liability balance sheet exposure. This means that if the Japanese yen weakens relative to the euro, the value of stockholders' equity on the parent company's balance sheet will increase due to an increase of the foreign currency translation adjustment."

4. **Continued**

Commentary on Question:
The goals of this question are to examine candidates' ability to
- *Recommend currency translation method – current method vs. temporal method*
- *To assess the statement, the candidate should determine if the statement is valid or not based on the result from the translation of asset and liability items.*

(i) Current Rate Method is recommended because foreign entity operates in its local currency (yen) which varies from the parent company's presentation currency (euro).

(ii)

INCOME STATEMENT (¥)   Conversion method

Yen in thousands	2023	¥/€	Conversion Rate
Sales	4,620,000	160	Average Full Year 2023
Cost of Sales	462,000	160	Average Full Year 2023
Store Operating Expenses	2,079,000	160	Average Full Year 2023
Depreciation	207,900	160	Average Full Year 2023
General and Administrative Expenses	600,600	160	Average Full Year 2023
Total Operating Expenses	**3,349,500**	160	Average Full Year 2023
Operating Income	**1,270,500**	160	Average Full Year 2023
Interest Expense	**92,400**	160	Average Full Year 2023
Income Tax Expense	**294,525**	160	Average Full Year 2023
Net Income	**883,575**	160	Average Full Year 2023

BALANCE SHEET (¥)

Yen in thousands	Dec. 31, 2023	¥/€	Conversion Rate
Current Assets:			
Cash	202,421	165	December 31st, 2023
Accounts Receivable	68,284	165	December 31st, 2023
Inventory	134,616	165	December 31st, 2023
Total Current Assets	**405,321**	165	December 31st, 2023
Long-term Assets:			
Long Term Investments	2,975,743	165	December 31st, 2023
TOTAL ASSETS	**3,381,064**	165	December 31st, 2023
Current Liabilities:			

Accounts Payable	85,354	165	December 31st, 2023
Current Borrowing	75,075	165	December 31st, 2023
Total Current Liabilities	**160,429**	165	December 31st, 2023
Long-term Debt	**1,924,560**	165	December 31st, 2023
Total Liabilities	**2,084,989**	165	December 31st, 2023
Equity			
Paid-in Capital	412,500	140	Average Historical
Retained Earnings, accumulated	883,575	Equal to Net Income	
		Equal to Total Equity - Paid-in Capital - Retained Earnings	
Total Equity	**1,296,075**	Equal to TOTAL ASSETS - Total Liabilities	
TOTAL LIABILITIES AND EQUITY	**3,381,064**	165	December 31st, 2023

Statements in Euro

INCOME STATEMENT (€)

Yen in thousands	**2023**
Sales	28,875
Cost of Sales	2,888
Store Operating Expenses	12,994
Depreciation	1,299
General and Administrative Expenses	3,754
Total Operating Expenses	20,934
Operating Income	7,941
Interest Expense	578
Income Tax Expense	1,841
Net Income	5,522

BALANCE SHEET (€)

Yen in thousands	**Dec. 31, 2023**
Current Assets:	
Cash	1,227
Accounts Receivable	414
Inventory	816
Total Current Assets	**2,456**
Long-term Assets:	
Long Term Investments	18,035
TOTAL ASSETS	**20,491**

Current Liabilities:	
Accounts Payable	517
Current Borrowing	455
Total Current Liabilities	**972**
Long-term Debt	**11,664**
Total Liabilities	**12,636**
Equity	
Paid-in Capital	2,500
Retained Earnings, accumulated	5,522
Cumulative Currency Adjustments	**(167)**
Total Equity	**7,855**
TOTAL LIABILITIES AND EQUITY	**20,491**

      (iii)   Kitty's statement is incorrect. The establishment of a Japanese subsidiary results in a net asset balance sheet exposure because Total Assets are greater than Total Liabilities. This means that if the Japanese yen weakens relative to the euro, the value of Total Equity will decrease due to a decrease of the cumulative foreign currency translation adjustment.

Frenz makes the decision to expand its super premium coffee product line. To do so, it decides to import coffee beans from Costa Rica. Frenz finds a Costa Rican coffee bean supplier and agrees to purchase coffee beans under the following terms:

- The Costa Rican Colón(₡) will be the currency used for the transaction.
- The transaction is made on November 15, 2023 with credit terms that allow for payment within 60 days.
- The transaction is settled on January 15, 2024.

(b)   Describe how this foreign currency transaction will be reflected on the quarterly balance sheet and income statement at both December 31, 2023 and March 31, 2024.

Commentary on Question:
The objectives of this question are to assess candidates' ability to:
- *Identify what should be recorded on November 15, 2023.*
- *Analyze the impact of the exchange rate change on the balance sheet and income statement as of December 31, 2023.*
- *Analyze the effects of the exchange rate on January 15, 2024, when the transaction is settled, and identify the affected accounting items on the balance sheet and income statement for the quarter end reporting.*

Note: The sale of coffee beans is not discussed. Therefore, candidates should provide a straightforward explanation of the transaction without analyzing what might happened to Cost of Good Sold. At November 15, 2023, a debit of Inventory with a credit of Account Payable should be recorded.

4. Continued

At December 31, 2023, the financial statement impact is as follows:
For foreign currency transactions whose settlement dates fall in a different accounting period than the transaction itself, both GAAP and IFRS accounting require adjustments to reflect intervening changes in currency exchange rates. Thus, Frenz needs to calculate the value of the coffee beans in euros using the exchange rate at the time of purchase less the value of the coffee beans in euros using the exchange rate at December 31, 2023. This difference is than booked as a (unrealized) foreign currency transaction gain/loss on the income statement.

At March 31, 2024, the financial statement impact is as follows:
Any change in the exchange rate between the colon and the euro between December 31, 2023 and January 15, 2024 (the settlement date) will also result in a foreign currency transaction gain or loss on the March 31, 2024 financial statements. In this case the gain/loss is calculated as the value of the coffee beans in euros using the exchange rate at December 31, 2023 less the value of the coffee beans in euros using the exchange rate at January 15, 2024. This gain/loss is booked as a foreign currency transaction gain/loss on the March 31, 2024 income statement.

(c)

(i) Recommend a method which Frenz can use to reduce any potential volatility on the balance sheets and income statements related to the transaction in part (b). Justify your recommendation.

(ii) Describe one drawback of the method recommended in part (i).

Commentary on Question:
Most of the candidates did well in answering this question. There are more than one solution. Reasonable answers with clear recommendations were accepted.

Frenz could use derivative instruments such as forward contracts which would reduce the effect of unfavorable short-term fluctuations in the colon/euro exchange rate.

Shortening the credit terms will reduce the period over which FX accounting volatility can occur but doesn't directly address any FX changes that do occur over the shorter time span. Frenz could also just pay in Euros also. Considerations should be given for counterparty risk in derivative instruments are used.

5.   **Learning Objectives:**

3.   The candidate will understand how managerial accounting, ERM and operational processes impact performance evaluation and decision making.

Learning Outcomes:

(3a)   Assess how managerial accounting can drive decision making, behavior and performance evaluation.

(3b)   Assess and recommend methods used to allocate costs and how these methods impact perceived performance.

Sources:

Implementing Enterprise Risk Management from Methods to Applications, Chapters 18 and 19; Managing Business Process Flows, Chapter 2

Commentary on Question:

While candidates generally understood the topic being tested, additional credit would have been received if candidates were familiar with the case study, and better informed on the verb list detailed in "Guide to Written Exams" published by the SOA. Maximum credit was granted to students who were able to connect their recommendations to Big Ben.

Solution:

(a)   Analyze the effectiveness of the feedback loop implemented by the operations team in explaining changes in customer satisfaction with regards to:

      I.   Complaints by phone

      II.   Cumulative website downtime

      III.   Customer rating of service received

      IV.   Overall % customer satisfaction

Justify your answer.

Commentary on Question:

While many candidates were able to provide an analysis of the detailed results of the feedback loop, well-prepared candidates also provided a high-level analysis and posed questions about the results.

5. **Continued**

The complaints by phone metric improved, but not as much as the goal. The impact was consistent with the change. That is, the target was to reduce the number of calls by 3 per month (from 5 to 2), with an expected impact on %CS of 0.5% per call per month (for a total target of 1.5%). The actual improvement was 2 fewer calls per month and a 1.0% improvement, so the metric improved and the level of improvement was consistent with expectations.

The website downtime metric wasn't tracked properly. A survey of website users was available and indicated a target level of satisfaction.

Customer service staff rating increases exceeded the goal, but the overall impact on %CS was less than expected. This might be indicative of a metric that isn't as important as management thought. May not be worth the time or money to continue pursuing further improvements until other metrics are improved.

The overall measured impact was 2.0%, but the increase in %CS was only 1.0%. This implies the impact from other sources was -1.0%.

(b) Recommend two improvements to the feedback loop based on the analysis in part (a). Justify your answer.

Commentary on Question:
Candidates generally did well on this question, recognizing the need to improve the connection of the risk metric to objectives and making them financially quantifiable; however, few recognized the large unexplained error.

1. Conduct a root cause analysis. Because the overall measured impact was 2.0%, but the increase in %CS was only 1.0%, a root cause analysis should be done to understand what is driving the -1.0% unexplained impact.

2. Reevaluate the CS staff ratings metric. This was overshot, but did not improve the %CS as much as expected. Could those funds be diverted to another area/metric (e.g., one that comes out of the root cause analysis)?

(c) Recommend two additions to the feedback loop based on other important elements of Big Ben's business model, such as products and services. Justify your answer.

Commentary on Question:
Candidates generally did not receive full points on this question. While candidates made general recommendations about additions to the feedback loop, many struggled to connect those recommendations to Big Ben's business model. Recommendations that were not specific to the case study, or that are applicable to most companies and not Big Ben specifically, did not receive full credit.

5. **Continued**

1. Big Ben could set up nested feedback loops within high-risk areas like credit and liquidity management, allowing for targeted improvements at a granular level. This would help Big Ben identify specific sources of risk variation within broader categories, enhancing their capacity to address issues at their root cause.

2. There should be independent assessments within feedback loops. Big Ben should strengthen its three lines of defense by ensuring robust oversight from risk managers and involving audit committees to independently assess risk processes and outcomes.

6.   **Learning Objectives:**

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

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.

(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. 6 Financial Analysis Techniques

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

Commentary on Question:

The candidate should understand how to analyze income statements and balance sheets (with a focus on ROE and its component parts) as well as being able to take the information, analyze statement items that impact ROE and make recommendations to company management to improve ROE. The candidate should demonstrate a basic understanding of deferred taxes, as well.

Solution:

(a)

(i)   Calculate the components of the Dupont analysis. Show your work.

(ii)   Analyze the drivers of Darwin Life's ROE (Excel tab 6_a) for three of the Dupont components in part (i).

Commentary on Question:

Candidates generally did well in part (i). Full credit granted for calculating ROE, Leverage, Tax Burden, Interest Burden, EBIT Margin and Asset Turnover. Other combinations of ratios are acceptable as well. For example, if EBIT Margin is decomposed further but EBIT margin is not explicitly identified, that is acceptable. Candidates used average assets over full year for Return on Assets (or similar calculations) was also given credit.

Candidates are expected to analyze three Dupont components to receive full credit. Candidates who didn't calculate the first part correctly but did reasonable analysis based on values calculated in (i) also received credit. Candidates did well in this part too.

6. Continued

(i)

	2021	2022	2023	2024	2025	2026
ROE		0.1951	0.1874	0.1988	0.1962	0.2120
Return on Assets		0.0101	0.0094	0.0096	0.0088	0.0085
Leverage		19.2696	19.8671	20.7247	22.4164	24.9212
Net Profit Margin		0.0703	0.0610	0.0582	0.0493	0.0430
Total Asset Turnover		0.1440	0.1546	0.1647	0.1774	0.1977
Tax Burden		0.6502	0.6500	0.6501	0.6499	0.6500
Interest Burden		0.9159	0.9140	0.9202	0.9191	0.9672
EBIT Margin		0.1180	0.1027	0.0973	0.0826	0.0684

RoE= Net Income/Statutory Equity
Return on Assets = Net Income/ Total Assets
Leverage = Total Assets/Statutory Equity
Net Profit Margin = Total Revenues/Net Income
Total Asset Turnover= Total Revenues/Total Assets
Tax Burden = Net Income/(EBIT – Interest)
Interest Burden = (EBIT – Interest)/EBIT
EBIT Margin = EBIT/Total Revenus

(ii)
1. ROE relatively stable over the period.
2. Leverage increases partially offset decline in return on assets
3. Return on assets decline due to decrease in net profit margin, as asset turnover is improving.
4. Net profit margin is declining is because EBIT margin is declining. Tax and interest burden are relatively stable.
5. Net income decline reflected in decline of EBIT margin. EBIT Margin is the cause of Net profit margin declining.
6. Tax burden and interest burden relatively stable.
7. EBIT Margin is declining because earnings are declining then increasing while revenues rising, i.e. sales are good but income is not because of expenses and spread compression.
8. ROE improvement in 2024-2026 is speculative.
9. ROE improves in the projection period due to greater leverage, while ROA decreases. This is not good because it may imply that Darwin's borrowing costs exceed the marginal rate it can earn on investing in the business.
10. Part of statement is actual and part is projection.
11. Increasing leverage with a declining ROA is a riskier and less successful path for Darwin.

6. Continued

(b) Recommend how to improve Darwin's ROE using the following. Justify your recommendations.

    (i)   Operations

    (ii)   Improving the balance sheet.

Commentary on Question:
Candidates were expected to recommend one from operations perspective and one from improving balance sheet perspective to receive full credit. Overall candidates scored well in this part of question, some candidates only recommended from operations perspective and received partial credit.

(i)
- Limit expense growth. Expenses at Darwin have or are expected to grow by 0-5%/year more than revenues over the 2021-2026 period (See Darwin Life tab).

- Improving risk adjusted investment performance, as Net Investment Income hasn't been growing as fast as reserves.

(ii)
- Undertake a review of product profitability. Take advantage of market spaces, such as IVA, where competitors aren't. Re-price products as necessary to meet IRR/ROE targets.

- Evaluate opportunities to reduce Darwin's tax burden, which is more than 30% of EBIT, or increase timing efficiency.

- Balance use of leverage to a consistent target, which has been in the 30%+ range but is expected to drop to about 10%.

(c) Darwin has also just purchased new office furniture for the whole company. Darwin's regular accounting method depreciates the furniture over 10 years while the taxing authority depreciates the furniture over 20 years, both using the straight-line method.

Analyze qualitatively Darwin's deferred taxes related to this purchase.

Commentary on Question:
Candidates are expected to address on the DTA may only be recognized to the extent that there is a reasonable expectation of future profits to receive full credit. Most candidates only explained DTA and were granted partial credit.

6. Continued

1. The carrying amount of the asset is less than the tax base as the carrying amount decreases by 10%/year while the tax base decreases by 5% per year, resulting in a deferred tax asset.

2. A deferred tax asset occurs in this situation because the depreciation expense is lower for tax purposes compared to the accounting method, resulting in an overpayment of taxes.

3. This results in a deductible temporary difference as the temporary difference results in the deduction of taxable income in a future period as the asset is recovered or settled. The DTA may only be recognized to the extent that there is a reasonable expectation of future profits against which the asset can be recovered or settled.

4. Based on Darwin's ROE pattern, there is currently a reasonable expectation, although this should be watched.

7. **Learning Objectives:**

4. The candidate will understand the application methods and techniques to business problems for an organization.

Learning Outcomes:

(4b) Evaluate model risks and processes
  (i) Assess model tradeoffs among usefulness, resource constraints, timeliness, fidelity, and accuracy
  (ii) Assess processes for vetting models

(4c) Evaluate results of deterministic, stress-testing, stochastic and simulation methods and models.

Sources:

Kelleher, Mac Namee, and D'Arcy, Fundamentals of Machine Learning for Predictive Analytics 2nd Ed, Ch. 12 Case Study: Customer Churn

SOA Research Institute: Decentralized Finance for Actuaries

SOA: Peer-to-Peer Insurance: Blockchain Implications

SOA Research Institute: Decentralized Insurance Alternatives: Market Landscape, Opportunities and Challenges

Commentary on Question:
Most candidates did well on this question. They can demonstrate their understandings of blockchain technology and its application in insurance industry, also can connect to the case study and provide the answers related to SIT's situation. Some candidates only finished the first part of questions, or leave this question empty, which might be caused by running out of time.

Solution:
(a)
  (i) Compare and contrast the public blockchain and private blockchain.

  (ii) Recommend which blockchain, public or private, SIT should use, based on SIT's strategic initiative to increase sales. Justify your recommendation.

  Commentary on Question:
  Most candidates did well on this question. For part (i), to get full credit, candidates need to provide the similarities of public and private chains, and also the differences between public and private chains. The key difference needs to be included which is that public can be accessed by everyone while private cannot. For part (ii), candidates would receive full credit by recommending either public or private, but they need to fully justify their recommendations.

7. **Continued**

      (i)   Both public and private chains are decentralized, transparency of transactions, and immutable.
Public chain can be accessed by everyone, it's permissionless.
Private chain is not open to everyone, only the authorized users can have access.

      (ii)   Since one of SIT's strategic initiatives is to increase sales, I would recommend going with public chain. Since public chain can be accessed by everyone, it would be much easier to attract future potential customers and would make it possible for SIT to have access to the much larger customer pool.

(b)   Describe how SIT could effectively use:

      (i)   Tokens

      (ii)   Oracles

Commentary on Question:
For both (i) and (ii), to get full credit, candidates needed to define what tokens and oracles are, and provide explanation about how they would help improve the efficiencies on the chain.

      (i)   Token is a digital asset that represents a specific value within a blockchain ecosystem. It can be used as premiums to be paid by the policyholders, also as claims to be received by policyholders. It can make the payments seamlessly so to improve the efficiency of the transactions on the chain.

      (ii)   Oracle can allow the smart contracts to access the external data from the real world. For example, retrieving the weather information, market information, real-time events, etc. It can help automate certain process within the smart contracts and improve the overall efficiencies.

(c)   Describe how this approach would help SIT achieve each of its strategic initiatives (Case Study section 9.4).

Commentary on Question:
To get full credit, candidates need to provide answers for all 3 SIT's strategic initiatives based on the case study, with details on how it would help to achieve the goals.

7.   Continued

For the 3 strategic initiatives:
Increase sales: entering the decentralized exchanges would provide a brand-new platform for SIT. This would allow SIT to have access to a new marketplace where it contains a large number of potential customers. This would help achieve the goal of increasing sales and be consistent with SIT's strategic initiatives.

Increase margin: by entering the decentralized exchanges, the traditional processes can be automated and replaced by the blockchain technology. It would significantly reduce the operational and administrative expenses, which can help improve the margin, and that's consistent with SIT's strategic initiatives.

Increase performance of digital assets: by entering the decentralized exchanges, SIT can take the advantage from its expertise in modern technologies. As a tech-insure, SIT has experience with those modern technologies and can benefit from the early transition. The opportunities on the decentralized exchanges can be utilized by SIT easily and this would be a nature fit for SIT to improve the performance of their digital assets.

8. **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.

(1c)   Assess the impact of business strategies including acquisitions, divestitures, and/or restructurings.

Sources:
Koller, Goedhart, and Wessels, Valuation: Measuring and Managing the Value of Companies, Seventh Edition, Ch 31: Mergers and Acquisitions

F-157-23: CFO Forum: Market Consistent Embedded Value Basis for Conclusions

Commentary on Question:
This question tests the Candidate's ability to strategically consider acquisitions using the MCEV framework and evaluate the impact such acquisitions may have on all companies involved. Candidates generally did well on this question.

Solution:
(a)   Explain how each of the following value-creating opportunities would apply to the acquisition of SIT.

        I.   Improve the performance of the target company.

        II.   Create market access for SIT's products.

        III.   Acquire skills or technologies more quickly or at a lower cost than building in-house expertise at Darwin.

        Commentary on Question:
        Although candidates generally did well on this question, few gave enough detail on the value-creating opportunities themselves and most failed to note that the first opportunity may not well apply because SIT is already highly automated and has cost-effective operations.

8. Continued

   1. Improve the Performance of the Target Company
      a. This strategy refers to improving the acquired company's performance using opportunities such as reducing costs or increasing revenue. This strategy may not well apply to this acquisition as SIT already has highly automated and cost effective operations. In addition, SIT products are commodity like in a very competitive market. Therefore, it is not clear how Darwin could help drive higher margins for SIT products by increasing prices, distribution relationships, or brand.
   2. Create market access for SIT's products
      a. This strategy can apply when smaller companies have difficulty gain the full market exposure to their products, and the acquiring company can accelerate this access. As Darwin has increased recent growth through developing distribution relationships and product service, this strategy could apply if Darwin can leverage their distribution relationships to drive higher market access for SIT.
   3. Acquire skills or technologies more quickly or at a lower cost than building in-house at Darwin
      a. This strategy can apply when the acquiring company can benefit from skills or technologies already in place in the target company. Darwin is in need of technology that can improve and reduce costs in back office systems and will likely be able to leverage the staff and technology that built a highly automated back office at SIT.

(b) Describe what reference interest rates should be used for this MCEV analysis.

Commentary on Question:
Candidates generally did well on this question, being able to identify swap rates as the ideal reference rate for MCEV analysis, but few mentioned the CFO Forum's involvement and guidance or provided background on reference rates in general.

Reference rates are a proxy for true risk-free rates used in valuation. The CFO Forum guidance for reference rates is that market swap rates should be used because it is believed that swap markets are more liquid and consistent with market traded options. Although the CFO Forum recognizes that swap rates have limitation in some markets for long durations, they are still the best reference rates available.

(c) Describe how the MCEV valuation methodology could be used in Darwin's evaluation of the SIT acquisition.

8. **Continued**

Commentary on Question:
Candidates were generally able to describe the MCEV approach and how it could be used by Darwin to evaluate the acquisition. Partial credit was also given to candidates who provided the MCEV formulas and discussed computational aspects of the formula components that are applicable to Darwin.

The MCEV approach should be used to estimate the economic value added, the value of performance improvements that Darwin could achieve from acquiring Star. Additionally, the MCEV approach would best measure the entity specific value for Darwin.

It's important to note that MCEV is not the actual transaction price that Star would accept for the acquisition, especially if other companies were also bidding to acquire Star, and that the price paid is an important factor regarding the economics of the transaction.