

CFE SDM Model Solutions

Spring 2023

1. Learning Objectives:

2. The candidate will understand how sustainable growth and value can be created through strategic budgeting. The candidate will also understand measures of an organization's value and their uses in decision making.

Sources:

Handbook of Budgeting – Ch. 30 Zero-Based Budgeting

Handbook of Budgeting – Ch. 2 Balanced Scorecard-based Budgeting & Performance Management

Commentary on Question:

In general candidates performed well on this question. This question tests candidates' mastery of ZBB. To perform well on this question, candidates need to demonstrate how to apply the ZBB to help BJA achieve their objectives.

Solution:

- (a)
 - (i) Identify a leading measure on the balanced score card. Justify your answer.
 - (ii) Identify a lagging measure on the balanced score card. Justify your answer.
 - (iii) Identify an efficiency measure on the balanced score card. Justify your answer.
 - (iv) Identify an effectiveness measure on the balanced score card. Justify your answer.

Commentary on Question:

Candidates in general did well on this question. To receive full marks, candidates need to identify a measurement and provide valid reasonings. Some candidates failed to consider the corresponding objective when assessing the property of the measure.

1. Continued

Leading Measure:

Leading measures are often referred to as early-warning measures. These indicators are generally more prevalent in the operations and learning and growth perspectives of your BSC to provide a month or quarter heads-up to activities or events that will manifest themselves later in the financial results measures. However, leading measures can occasionally be financial as well.

From BJA's scorecard:

- Website visits for objective increase direct online sale
- Higher tangible assets for objective asset utilization
- Number of participants for objective enhancing loyalty program

Lagging Measure:

Lagging measures, or rearview-mirror-based measures, such as Free Cash Flow, record history of what took place last month, last quarter, or last year. While these measures provide a historical perspective, they are not always reliable predictors of future performance.

From BJA's scorecard:

- Total revenue for objective revenue growth
- Business class load factor for frequent business travels
- Total operating expense for expense reduction

Efficiency Measure:

Efficiency (process) measures provide visibility into how well a given process or set of processes is functioning. Fundamentally, BSC should be tracking key attributes of processes or an index of several processes. Examples of process measures include productivity measures such as process cost per unit of output (economic), turnaround time (cycle time), and process reliability and repeatability.

From BJA's scorecard:

- On time departure for objective turnaround
- Decrease staff expenses for labor efficiencies

1. Continued

Effectiveness Measure:

Effectiveness (output) measures complement efficiency measures and provide instruction on the quality of process outputs. In quality terms, these are your customer-facing deliverables, or so-called Ys. Examples include percent defective items, number of errors, and invoicing accuracy.

From BJA's scorecard:

- Industry safety index rank for objective safety
- Employee satisfaction for objective labor relationship management
- Utilization of internet and mobile app for objective booking system enhancements

(b)

- (i) State the two questions that the ZBB Ranking Process answers.
- (ii) Define "decision package" as it relates to the ZBB Ranking Process.
- (iii) Explain how management would use the ZBB Ranking Process to compare different initiatives.

Commentary on Question:

Candidates performed well for part i) and part ii). To receive full mark for this question, candidates need to provide the definition in terms of how it works in the ZBB ranking process. They should also understand the key differences between ZBB and the traditional budgeting process for part iii).

- (i) The ranking in ZBB process attempts to provide management with a technique for allocating its limited resources by answering two questions:
 - (1) What objectives should we attempt to achieve based on companies' core values?
 - (2) How much should we spend on this attempt?
- (ii) A "decision package" provides a description and evaluation of each decision unit for management review and decision making. The decision package is designed to produce an evaluation of each decision unit that will describe the:

1. Continued

- (1) Purpose or objective
- (2) Description of actions
- (3) Costs and benefits
- (4) Workload and performance measures
- (5) Alternative means of accomplishing objectives
- (6) Various level of efforts

(iii)

- Management takes decision packages identified and ranks them in order of decreasing benefit to the organization
 - ZBB allows management to have the option to fund all packages, no packages, or any number of packages, and can ensure both current and new packages are considered when making the budgeting decisions
 - Management uses the rankings to analyze the trade-offs among different initiatives, and compares the marginal benefits of funding additional decision packages against the organization's profit needs
- (c) Recommend a relevant decision unit to use during the ZBB Ranking process for each initiative (A – D). Justify your answers.

Commentary on Question:

Overall, candidates performed poorly on this question. Most candidates failed to demonstrate the correct understanding the decision unit concept. For example, many candidates listed different measurements (such as number of years in IT expertise) or the actual decisions to be made (such as how many IT staffs should be hired) as decision units. No mark is awarded if decision units are not correctly identified. Some candidates were able to correctly identify decision units but failed to justify the relevancy to the initiatives and only received partial marks.

Decision units are meaningful elements of each organization must be defined that can be isolated for analysis and decision making. For those organizations with a detailed cost center structure, the decision unit may correspond to the cost center. In some case the cost center manager may wish to identify separately different functions or operations within the cost center if they are significant in size and require separate analysis.

1. Continued

A – Expand the current IT team and acquire employees with mobile app development expertise

Relevant decision unit: The IT team at BJA. Cost required to acquire mobile app development expertise (e.g. salary range of an app developer) should be analyzed by the IT department

B – Update employee training courses and increase the frequency of employee training

Relevant decision unit: The human resources department at BJA. The HR team's operational expenses include expenses to develop new training.

C – Renovate and improve amenities in business lounges in major hubs

Relevant decision unit: Lounge renovation project team. Since this is a niche initiative and it's outside of BJA's core operations, there should be a project team dedicated to this objective. They will be responsible to analyze required costs and expected outcomes of lounge improvement for management's decision making

D – Reduce staff working hours and staffing for short domestic flights

Relevant decision unit: The human resources department at BJA. The HR department is responsible for staff working assignments and need to ensure a minimum level of staffing required for each flight. They can also reallocate staff with higher experience level to flights with low staffing to ensure service quality

(d) Recommend a ranking for the initiatives (A – D). Justify your answer.

Commentary on Question:

Overall, candidates performed poorly on this question. Most of the candidates were able to tie the initiatives ranking to BJA values and received partial points. However, candidates struggled to apply the concept of ZBB when recommending the ranking.

1. Continued

Multiple rankings of the initiatives are acceptable as long as they are consistent with BJA priorities.

Example:

- C – Renovate the business lounges
 - This initiative should rank highest since it fits into BJA’s ‘new strategic vision to become the most customer-oriented airline company in the world’ with ‘comfort, punctuality and safety’ as the three important virtues that the company has adopted. Additionally, business professionals are over half (55%) of BJA’s customers, so this initiative will not only fit their new strategic vision, but will also cater to their customer base
 - This initiative should be either fully funded or funded at a higher level. The lounges renovation projects team should assess whether increased funding levels will significantly increase business professionals as a proportion of their customer base, which will in turn boost BJA objective of increased frequency of business traveling

- B - Update employee training courses
 - This initiative should rank second highest. Alongside comfort and punctuality, safety is one of BJA. With the recent cut back on training programs, BJA needs to review its training courses to ensure comprehensiveness (i.e. no reduction in employees performance quality despise cut back on program)
 - This initiative should be fully funded, given cost is likely low. BJA HR department should assess correlation between employee training quality and industry safety index ranking to better predict if increased funding level could lead to BJA’s higher ranking on the index

1. Continued

- A - Expand the current IT team and acquire employees with mobile app expertise
 - This initiative should rank third. This initiative is a good fit to their goal of becoming the most customer-oriented airline – which is important for strategic growth even though it's not directly in scope of BJA's core value. A new booking app will appeal to demographics that prefer to book flights through online portal (e.g. leisure travelers), which will in turn increase direct online sales.
 - The initiative should be fully funded, or partially funded if budget constraint exists at this point. BJA IT department should assess whether a reduced version of the app (developed with fewer resources) will still have value added in term of increased website visits

- D- Reduce staff working hours and staffing for short domestic flights
 - This initiative should be ranked last. Reduced hours might negatively impact employee satisfaction, even though it might fit into BJA objectives of reduced staff expenses. Short domestic flights are popular among business travelers, and decreasing employee morale will most likely result in service quality decline, which directly goes against BJA's values
 - This initiative should not be funded. HR department should seek alternatives to reduce staff expense without reducing staffing and working hours

2. Learning Objectives:

1. The candidate will understand and apply strategic management concepts and frameworks to develop an organization's financial and ERM Solutions.
2. The candidate will understand how sustainable growth and value can be created through strategic budgeting. The candidate will also understand measures of an organization's value and their uses in decision making.

Learning Outcomes:

- (1a) Evaluate and apply strategic management concepts, recognizing factors that affect development and implementation of strategies:
 - Analyze the firm's external environment and the internal organization.
 - Describe and apply strategic management models, including Porter's five forces and value chain analysis.
 - Define types of business-level strategies and recommend an appropriate business-level strategy for a given situation.
 - Explain the impact of competitive dynamics on strategic management.
- (1b) Evaluate commonly used business growth strategies and their application under different economic risk and business environments:
 - Critique and evaluate internal/organic and external/inorganic growth strategies.
 - Assess and recommend growth strategies under different business situations and market opportunities, utilizing the applicable strategic management models.
- (2d) Evaluate and recommend appropriate value measures for an organization.
- (2e) Assess the impact of performance measures and incentives on key business decisions and stakeholder value.

Sources:

Understanding Michael Porter.

Strategic Management - Chapter 6

Damodaran on Valuation:

- Chapter 9 Value Multiples
- Chapter 13 Value of Control
- Chapter 14 Value of Liquidity
- Chapter 15 Value of Synergy

2. Continued

Commentary on Question:

The goal of this question is to test candidates on Damodaran Valuation. Candidates are expected to:

- *Understand ways to add firm value*
- *Apply valuation models to calculate firm value*
- *Understand how liquidity changes firm value*
- *Understand the difference between value of control vs. value of synergy*
- *Make an informed decision on bidding of acquisition target*

In general, candidates performed well on some parts of the question, but very poorly on other parts: specifically (c), (d), (h), (l).

Solution:

- (a) Identify the best target (I – III) based on each of the following criteria. Justify your answer.
- (i) Growth potential
 - (ii) Volatility
 - (iii) Value

Commentary on Question:

Candidates did very well on (i) and (ii), but many struggled with (iii). Either qualitative or quantitative justifications are accepted for full credits.

- (i) Growth: Yolo has the highest investment rate and return on equity
 - (ii) Volatility: ABC has the lowest beta/volatility
 - (iii) Value: XYZ has the lowest price to book ratio
- (b) Explain how the valuation of Snappy may differ from I – III due to it being privately owned.

Commentary on Question:

Many candidates were unable to point out the illiquidity in Snappy's assets as privately owned entity.

Snappy is privately owned and therefore is less liquid than public firms – should be valued with an illiquidity discount.

2. Continued

- (c)
- (i) Define “strategy” according to Porter.
 - (ii) Critique Frank’s statement.

Commentary on Question:

Candidates struggled with recalling Porter’s definition for strategy from the syllabus which led to less focused answers for part (ii).

- (i) Strategy explains how an organization, faced with competition, will achieve superior performance.
- (ii) “Competition to be the best” is not a strategy, because it doesn’t explain how an organization, faced with competition will achieve superior performance.
When all rivals compete on the same dimension, no one gains a competitive advantage. This would lead to competitive convergence, where over time, all rivals would look alike and can only compete on price.
The descent into price competition would lead to drop in industry profitability and lead to industry consolidation, with a few players dominating the market.

- (d)
- (i) Define economies of scope.
 - (ii) Define corporate-level core competency.
 - (iii) Identify the value-creating diversification strategy Darwin is pursuing by acquiring Snappy. Justify your answer.

Commentary on Question:

Candidates did poorly on this question, especially part (iii). Many confused economies of scale with economies of scope. Very few could identify the value-creating diversification strategy from the reading. Partial credits were given for recognizing that Darwin and Snappy would share/transfer core competencies.

- (i) Define economies of scope.
Cost savings that a firm creates by successfully sharing resources and capabilities or transferring one or more corporate level core competencies that were developed in one of its businesses to another of its businesses.

2. Continued

- (ii) Define Corporate-level core Competency.
These are complex sets of resources and capabilities that link different businesses primarily through managerial and technological knowledge, experience, and expertise.
- (iii) Identify the value-creating diversification strategy is Darwin pursuing by acquiring Snappy. Justify your answer.

Either (1) or (2) below.

(1) Related Linked Diversification

- (a) This is when operational relatedness (sharing activities between businesses) is low.
 - (i) For the most part the activity functions between Darwin and Snappy are the different in practice:
 1. Snappy's Distribution is more digital.
 2. Snappy's UW and admin are more modern and automated, while Darwin's are manual.
- (b) and Corporate relatedness (transferring Core Competencies into businesses) is high.
 - (i) Darwin and Snappy are selling the same products: Term Life and Whole life.

(2) Both Operational and Corporate relatedness

- (a) This is when operational relatedness is high.
 - (i) For the most part the activity functions between Darwin and Snappy are the same: Distribution, admin, and underwriting.
 - (b) and Corporate relatedness is high.
 - (i) Darwin and Snappy are selling the same products: Term Life and Whole life.
- (e) Propose one way Darwin's acquisition of Snappy could increase the value of the combined firm through value of control. Justify your answer.

Commentary on Question:

Candidates did well on this part. There are many ways to change Snappy's operation and thereby add value. Below are some examples that received full marks.

2. Continued

Value of control - change the way Snappy is operated

- Make the executive team more balanced by adding more technical staff as the current team only has sales and marketing background
 - De-risk the pricing process by lessening influence from marketing
 - De-risk the underwriting process by giving more control the automated underwriting (depending on regulatory impacts)
 - Redeploy investment from bonds (majority of Snappy's assets) into higher yield assets
- (f) Propose one way Darwin's acquisition of Snappy could increase the value of the combined firm by creating an operating synergy. Justify your answer.

Commentary on Question:

Candidates did well on this part. Either economies of scale or economies of scope with justifications from the case study are accepted.

- Economies of scale
 - Same lines of business (whole life, level term)
 - Aligns with Darwin's cost reduction program
 - Economies of scope / Combination of different functional strengths (transfer of corporate level core competencies)
 - Snappy's digital distribution platform and modernized systems will help implement Darwin's digital distribution plan and improve underdeveloped manual admin system
 - Snappy's combination of AI and Simplified Underwriting is a competitive advantage that can enhance overall sales
 - Lack of capital is a limiting factor for Snappy. The combined entity would allow for higher sales capacity
 - Darwin's well established and experienced actuarial team will complement Snappy's lack of expertise in modeling and financial projections
 - Darwin has a formal risk management function and will help improve Snappy's risk mitigation strategies
- (g) Propose one way Darwin's acquisition of Snappy could increase the value of the combined firm by creating a financial synergy. Justify your answer.

Commentary on Question:

Candidates did well on this part. Either cash slack or debt capacity with justifications from the case study are accepted.

2. Continued

- Cash slack - combination of a firm with excess cash and a firm with high growth
 - Darwin has \$210m cash and Snappy is capital strained
 - Darwin is a larger established insurer and Snappy is new and growing fast
 - Debt capacity increases compared to individual firms
 - Snappy's earnings have been very volatile in the last 4 years.
 - The combined firm will have steadier and more predictable cash flows.
- (h) Snappy is planning to begin selling variable annuities. The estimated NPV for the project is \$10 million. Gabriela Martinez says, "If we acquire Snappy today, the value of synergy will be \$10 million on this project alone, in addition to other aspects of the acquisition."

Critique Gabriela's statement.

Commentary on Question:

Candidates struggled with this part. Some understood that the \$10 shouldn't be considered value of synergy. But few recognized that the loss of PV in waiting to undertake the project would be the value of synergy.

The CFO assumes the \$10m NPV will be lost forever, if the acquisition doesn't happen. Snappy might be able to find another way to finance the project without the acquisition happening, in which case it would simply be value added to standalone Snappy instead of value of synergy. If Snappy cannot fund the project now on its own because of capital constraints, the value of synergy should be the loss in PV in waiting to undertake this investment rather than invest the entire \$10m today.

- (i)
- (i) Recommend which model (A or B) is appropriate for valuing Darwin prior to the acquisition. Justify your answer.
 - (ii) Recommend which model (A or B) is appropriate for valuing Snappy prior to the acquisition. Justify your answer.
 - (iii) Describe the model for valuing the combined firm once the acquisition is complete. Justify your answer.

Commentary on Question:

Candidates did poorly on this part. Partial credits were given for part (iii) for answering two-stage model due to potential synergies and high growth post-acquisition.

2. Continued

(i) Darwin pre-acquisition
Stable-growth model – Darwin is established/slow-growing

(ii) Snappy pre-acquisition

Two-stage model – Snappy is new/fast-growing

(iii) The combined firm post-acquisition

Hybrid – The combined firm will be somewhere in between, closer to the stable-growth model since Snappy is much smaller than Darwin

(j) Calculate the value of control. Show your work.

Commentary on Question:

Candidates generally did well on this part. Most understood to use the new cost of capital to calculate the value of control. A common mistake was failing to recalculate the reinvestment rate after change of cost of capital. Credits were given whether the stable-growth model or the two-stage model was used, as long as it was consistent with the answers provided in part (i).

Improved Snappy – Current Snappy = \$8m (rounded)

(k) Calculate the value of synergy. Show your work.

Commentary on Question:

Candidates did well on this part. Most understood to use the cost savings to calculate the value of synergy of the combined firm. Credit was given whether the stable-growth model or the two-stage model was used, as long as it was consistent with the answers provided in part (i).

Combined firm with synergy - Combined firm without synergy = \$11m

(l) Evaluate the decision with respect to the answers in parts i, j, and k.

Commentary on Question:

Candidates did poorly on this part. Most only compared the \$60m to value of Snappy + value of control + value of synergy but failed to further analyze how much of each value should be paid.

- Darwin is paying the sum of value of Snappy, the value of control and the value of synergy. This is an overpayment with 100% of control value and 100% of synergy value.

2. Continued

- Per the textbook, “we may be willing to pay close to 100 percent of the control value (arguing that the target firm could have made the changes on its own) but only a portion of synergy value (since synergy could not have been created without the acquiring firm).” In Snappy’s case, Darwin should pay only a small portion of value of control, since it’s unlikely to change on its own due to its current management. On the other hand, Darwin may be willing to pay a good amount for value of synergy, since Darwin will be utilizing Snappy’s automation technology to improve its own operation and save cost along the way.
- Also, both the stable-growth model and the two-stage growth model use EBIT from the income statements. Darwin’s earnings are relatively stable over time, whereas Snappy’s are very volatile, which makes the valuations potentially unreliable and risky.

3. Learning Objectives:

3. The candidate will understand how to apply decision making models to general managerial decisions within specified business constraints.
4. The candidate will be able to analyze and model dynamic systems and evaluate the risks and sustainability of these complex systems.

Learning Outcomes:

- (3c) Evaluate business situations and describe how quantitative and statistical methods.
- (4a) Identify and model the dynamic processes within a complex system:
 - Develop and apply causal loop diagrams that model the feedback structure of complex systems
 - Apply stocks and flows to dynamic modeling
 - Apply dynamic modeling to business decisions
- (4b) Explain the underlying factors that drive the sustainability and stability of a dynamic system:
 - Evaluate the structure and behavior of dynamic systems
 - Identify the factors that contribute to risk and instability in dynamic systems

Sources:

Business Dynamics Sterman: Chapter 4 Structure and Behavior of Dynamic Systems

Business Dynamics Sterman: Chapter 5 Causal Loop Diagrams

Understanding Michael Porter – Ch. 3

Commentary on Question:

Commentary listed underneath question component.

Solution:

- (a) Critique the consultant's model.

Commentary on Question:

Most candidates were able to list a number of considerations. Points were also awarded for answers that correspond to the syllabus.

The model has a number of shortcomings:

- This model fails to consider whether employees recover (or die) from this illness. Eventually, all employees become infected at the same time.
- Population changes (e.g., employee turn-over) are ignored, so the total population is assumed to be static.

3. Continued

- The employees interact not only with other employees, but also with the broader population of customers within the community.
- This model assumes homogeneous behavior of employees, meaning they do not change their behavior by staying home while sick or social distancing when they become infected.
- Since the stores are geographically spread out into different regions in independent locations, it is not appropriate to combine all employees into one single model.

- (b) Recommend three improvements to the SI model based on your critique in part (a).

Commentary on Question:

Most candidates were able to provide reasonable improvements. In order to receive full points, recommendation had to be valid based on the syllabus and correspond to an issue in part (a).

1. Consider expanding this to a SIR model. Including recovered population is reasonable based on prior pandemics and represents a more accurate representation of the SIR flows during a pandemic. Additionally, recovered population might flow back into the susceptible population.
 2. Additional causal relationships could split the contact influence between the employee population (a positive loop to the infection rate) and the general population of customers (a positive external influence on the infection rate). Each could have a different infectivity rate.
 3. Each store should be modeled separately. Because the stores are independent, the model for one store will be the same for all the other stores.
- (c) Calculate how many days it is expected to take for a Frenz store with no infected employees to reach ten symptomatic employees. Show your work.

It will take 6 days to reach 10 infected employees, so stores are expected to close on the 7th day.

Please see the solution in attached Excel workbook.

- (d) Calculate the impact of each policy (A – C) on the number of days it is expected to take for a Frenz store to close. Show your work.

3. Continued

Commentary on Question:

Candidates generally did poorly on this question. Successful candidates leveraged the model from part c.

Please see the solution in attached Excel workbook.

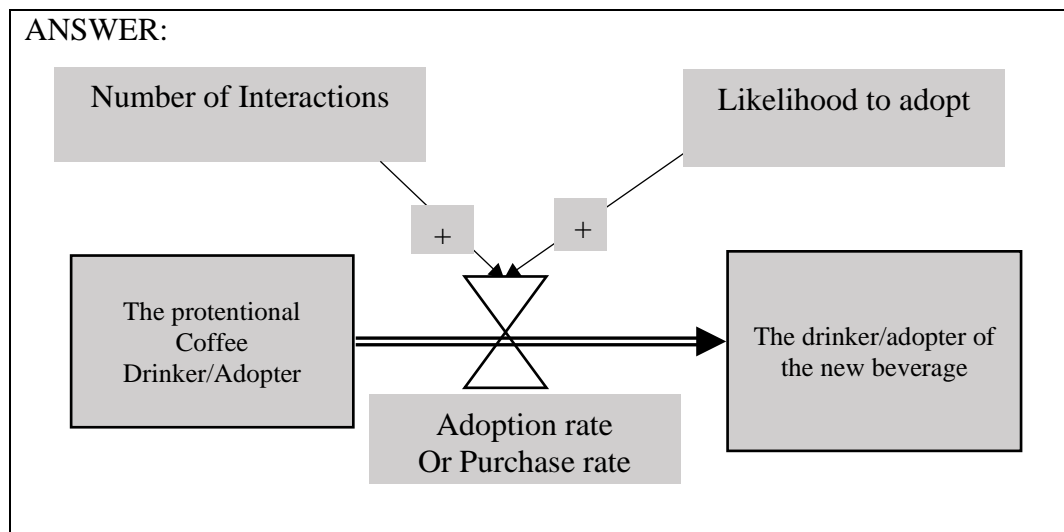
Isolating employees will not solve the problem. This is actually the worst case for Frenz because it guarantees that their workforce gets sick as quickly as possible. Without the isolation, some of the employees working on a given day are already sick, so they cannot get sick and a healthy employee is not exposed.

- (e) Recommend one of the three policies (A – C) for Frenz to adopt. Justify your answer.

Commentary on Question:

Candidates generally did poorly on this question. Partial credit was awarded for options that kept the store open for longer with supporting rationale.

- Both options B and C will result in stores staying open. The reason to recommend option B however, is because basic instant coffee goes against Frenz’s marketing strategy of “Maintain a high Customer Taste Index (CTI) score. The CTI is based on customer feedback and reflects their satisfaction with various coffee beans. “
- (f) Update the labels of the original model in the shaded boxes below.



3. Continued

Commentary on Question:

Candidates generally performed well on this part.

The following changes should be made to use the SI model as a basic diffusion of innovation model:

- The stock of Health Frenz Employees would become the Potential Drinkers (or Adopters, or the like) of the new beverage.
- The stock of Infected Frenz Employees would become the Drinkers (or Adopters or the like) of the new beverage.
- The flow labeled Infection Rate would become the Adoption Rate (or purchase rate or the like).
- The positive modifier labeled Number of Interactions would remain the Number of Interactions. In this context the interactions are between those who have adopted (become drinkers) and those who have not.
- The positive modifier labeled Likelihood of Spread would become Likelihood to Adopt (become a drinker) and would reflect the probability of adoption given an interaction with a Drinker.

- (g) Critique the use of the pandemic SI model for this application.

Commentary on Question:

Most candidates touched on one or several of the following limitations listed. Credit was also given if candidates brought up relevant limitations that are not listed below. To get full marks, justification was required.

The SI model limitations/drawbacks/simplifying assumptions (general):

- Population changes (e.g., growth or decline in the coffee/tea drinking population) are ignored, so the total population is assumed to be static.
- The adoption rate is solely based on word of mouth, so spread of the beverage requires an initial drinker (like a patient zero). No other forms of spread are considered.
- The flow of adopters only goes one-way, so once someone is a Drinker, they are always a Drinker.

Issues specific to Frenz's situation:

- Frenz has existing customers that could become exposed by seeing the new drinks in the store. These customers would likely have a different adoption rate than the general population.
- Frenz would likely use advertising to spread the word about the new drink, reaching their existing customers as well as people in the broader population who are not currently customers.

3. Continued

- Some buyers of the new drink will not be repeat buyers, so the simple SI model will need to be adapted to deplete the Drinker population by these one-and-done customers.
- (h) Recommend two changes to the model based on your critique in part (g). Justify your answer.

Commentary on Question:

Candidates generally did well on this question.

Answers could include but not limited to:

- Separate adoption rates for current customers vs the general population
- A separate flow out of the drinkers stock for customers who are not going to repeat their purchase
- Reference to the Bass Diffusion model, which adds a positive feedback loop that influence the adoption rate for advertising

A full credit answer would include a recommendation and a justification.

- If critique around initial adoption was raised in part g): I recommend adding an advertising component to the adoption rate as this would explain how the initial adopters started drinking and reflects that people can choose their drinks based on advertising and not just word of mouth
 - If critique around recovered population was raised in part g): I recommend adding a third stock of ‘former adopters’ since it is possible that people will move on to other drinks/may not be a forever drinker
- (i)
- (i) Identify the elements in your model that affect the tipping point. Justify your answer.
 - (ii) Explain how each strategy (I – III) might affect the tipping point for the new drink.

Commentary on Question:

Candidates did well on this part. Partial credit was given for listing out the formula and describing different components of the formula. Description of different variables within context of the model and how they affect the drinker stock are required for full credit.

3. Continued

- (i) Candidates did well on this part. Partial credit was given for listing out the formula and describing different components of the formula. Description of different variables within context of the model and how they affect the drinker stock are required for full credit.

The tipping point is when the adoption rate is greater than the rate of people abandoning the drink. The elements that affect this are:

- Number of potential adopters
 - Number of total customers (adopters + potential adopters + former adopters)
 - Number of interactions per adopter
 - Likelihood of adoption given an interaction
 - Strength of advertising
 - Rate of people abandoning the drink

- (ii) Full credit if an explanation was included for each strategy and credit was awarded for overall reasonableness of the explanation if they were consistent with the critique, recommendation and models in previous sections. Example answers could include:
 - I: Nurturing the relationships may expose more people to the new beverage and also have the opportunity to buy the beverage outside of a traditional Frenz coffee shop. This would positively impact the adoption from both advertising and word of mouth, both of which that would increase the flow of adopters
 - II: Assuming that the smart phone app is mostly used by existing customers, the app could be used to inform customers about the new beverage, impacting advertising, as well as provide incentives to initial and repeat purchases. This would impact the effectiveness from advertising and reduce flow out of drinker population by encouraging repeat purchases
 - III: Might increase the effectiveness of advertising and the stock of potential drinkers by expanding advertising into additional countries

- (j)
- (i) Explain any flaws in each of Lotte's statements (X – Z).
 - (ii) Describe the use of return on invested capital (ROIC) according to Porter.
 - (iii) Calculate Frenz's ROIC for current year and prior year. Show your work.
 - (iv) Evaluate Frenz's ROIC results assuming the industry average is 40% over the same period. Justify your answer.

3. Continued

Commentary on Question:

Candidates did well on this part demonstrating a logical reasoning in their explanations in part (i). Partial marks were awarded in (ii) for only stating the formula. Full marks were given for (iv) as long as they were consistent with answers in (iii).

- (i) X: In the short run, the differentiation of having a new drink may have led to a higher relative price but given that competitors can imitate easily, this is likely not sustainable and wouldn't be considered a competitive advantage

Y: Relative costs have increased (note: calculations were not necessary) which indicates that costs would overtake sales in the long run even if current year profits have increased in absolute figures

Z: Market share increasing indicates that they have achieved some success; however, when gauging competitive advantage, returns must be measured relative to other companies. Also, competitive success needs to account for how effective resources are being used

- (ii) ROIC is a metric to measure competitive success that accounts for how effective resources are being used. It weighs the profit a company generates versus all the funds invested in it

- (iii) 55.6% in prior year and 48.4% in current year

- (iv) Answers could include but are not limited to commentary around:
- ROIC decreasing from 56% to 48%, trend of ROIC weakening over time but might be worth observing over a longer period
 - ROIC needs to be compared against other companies within the same industry who are facing similar challenges
 - ROIC should be measured over a longer period of time, particularly a period of time that is appropriate for the market cycle of the industry in question comparison with the industry average and concluding that Frenz is under 60% and would be underperforming

4. Learning Objectives:

3. The candidate will understand how to apply decision making models to general managerial decisions within specified business constraints.

Learning Outcomes:

- (3a) Apply fundamental techniques and frameworks of management science to make informed business decisions:
 - Apply linear optimization models to managerial decisions.
 - Develop decision trees, scenario tests, and simulation models.
- (3b) Apply statistical and quantification methods to analyze managerial decisions with uncertain conditions:
 - Apply probability distributions to business situations with random variables.
 - Construct optimization models utilizing probability theories.
- (3c) Evaluate business situations and describe how quantitative and statistical methods.

Sources:

Data Models and Decisions - Ch. 5

Commentary on Question:

Many parts of the question allowed for alternate answers and candidates were not penalized if appropriate justification was provided. Most candidates did well on the excel portion of the question and received most of the allocated points even if there were formula errors but the set up was mostly correct.

Solution:

- (a) Critique the model in Section 4 Exhibit 2b. Justify your answer.

Commentary on Question:

Most candidates were able to provide some criticism, however, they only received full marks if their points were justified. The critique needed to be of the model shown in Section 4 Exhibit 2b, and not a critique of the potential agreement itself to receive points.

Among a few positive aspects, the current model is very simple. This makes the model easy to communicate among stakeholders and understand the outcomes. It compares the percentile risk measures between the two scenarios with or without the Vietombia agreement.

4. Continued

However, the current model may be overly simplified. It does not address an expected return on investment, and it fails to provide valuable information such as:

- Expected profit/loss or return on investment
- Loss distributions, variables, or potential outcomes in adverse scenarios events
- Informative tail risk statistics such as VaR or CTE
- Information on upside scenarios
- Consideration of foreign currency risk, especially given Vietombia's political and economic instability
- Details of any non-linearity in the model or the convolution of multiple random variables

The model also fails to incorporate intangible factors such as synergy issues or productivity measures that might be impacted by weather events. Evidently, it does not provide enough information to stakeholders to allow risk-adjusted decision making.

- (b)
- (i) Calculate the profit (loss) for each of the 10,000 simulations, with and without the Vietombia agreement in place. Show your work.
 - (ii) Calculate each of the relevant statistics identified in rows 29-40 of the Excel spreadsheet, with and without the Vietombia agreement in place. Show your work.

Commentary on Question:

There were common formula errors, but candidates received at least partial marks if the formulas were close to the correct ones. Many candidates were able to set up the formulas correctly to generate scenarios of profit and loss. A majority of candidates were able to formulate the risk measures in part (ii) and they received partial marks even if they failed to generate the correct set of scenarios in the first part.

Model solution can be found in the excel sheet attached.

- (c)
- (i) Evaluate the Vietombia agreement based solely on the model output and statistics calculated.
 - (ii) Recommend whether or not Frenz should enter into the Vietombia agreement. Justify your answer.

4. Continued

Commentary on Question:

Many candidates received most of the points if they correctly interpreted the outcome of the model and justified their answers based on their findings in part (b) even if they did not have the correct values in part (b).

The Vietombia deal has higher expected value as evidenced by the higher mean and median for similar and slightly lower standard deviation. Additionally, the deal has favorable 1-in-5 year VaR. However, the deal has much more severe VaR at 1-in-10 and beyond, as well as worse CTE from 1-in-5 and beyond, with the key caveat being CTE99 for the no deal case is worse. Additionally, the deal has higher probability of loss given the possibility of supply disruption preventing Frenz from recouping startup costs. Overall, the decision to proceed comes down to the company's risk appetite, and whether the risk of severe tail losses is worth the expected earnings expansion.

- (d)
- (i) Identify two limitations of the current model design.
 - (ii) Recommend how the model can be enhanced to address the limitations identified in part (i). Justify your answer.

Commentary on Question:

Almost all candidates were able to identify at least two limitations. Most candidates were successful in providing recommendations to address these limitations with justification.

- There may be supply chain issues which are not addressed by the model.
 - To address this the model can consider inventory and logistical factors in addition to demand. Another dimension to consider would be the external factors impacting the supply chain. These factors would have significant impact on the quality and quantity of sold product.
- Correlations between risk factors are ignored.
 - The model assumes that each variable is independent. However, there may be some dependencies between risk factors. For instance, political issues in Vietombia may impact the demand or the price of coffee. It could affect the company image and skew the profit and loss in a systemic way. This can be addressed by incorporating interdependencies into the model such as co-variates.