CFE FD Model Solutions
Fall 2017

1. Learning Objectives:

2. The candidate will understand how an enterprise's structure and policies allow its management to prioritize and select among projects or business activities that are competing for scarce capital resources especially when opposing factors are key decision criteria.

Learning Outcomes:

(2b) Recommend an optimal capital structure and how to implement it for a given business strategy.

(2d) Assess the impact of behavioral factors in capital budgeting methods and capital structure policies.

Sources:

Creating Value Through Best-In-Class Capital Allocation, JPMorgan
Handbook of Economics of Finance, Chapter 5
Case Study pages 68-74

Commentary on Question:

The goal of this question was to gauge the candidates' understanding of risk, performance metrics, and decision-making in the context of the case study.

Solution:

(a) Identify two pros and two cons of RAROC as compared to total stock return.

Commentary on Question:

Most candidates included one correct pro and con, typically noting that RAROC is adjusted for risk although it is more difficult to calculate and/or communicate. Full credit answers also included statements regarding the measurement/allocation of capital or the impact of macroeconomic factors.

Pros

- As the name implies, RAROC is adjusted to reflect the risk(s) associated within a particular business or investment, which helps to identify what decisions do (or do not) truly drive value creation.

- RAROC can be broken down by division or line of business, providing a more granular view of risk relative to return. This is useful when considering capital allocation strategies.

1. Continued

Cons

- RAROC can be difficult to calculate and, ultimately, communicate to stakeholders. Total stock return is relatively straightforward.

- RAROC is highly dependent on the measurement of capital. This makes comparing returns against external benchmarks or peers difficult.

(b) Identify two pros and two cons of RAROC as compared to IRR.

Commentary on Question:
Most candidates included one correct pro and con, typically noting that RAROC is adjusted for risk although it is more difficult to calculate or communicate. Few candidates considered the time horizon or line of business implications.

Pros

- As outlined above, RAROC is adjusted to reflect the risk(s) associated within a particular business or investment, which helps to identify what decisions do (or do not) truly drive value creation.

- RAROC can be more easily broken down by division or line of business than IRR. Such breakdowns are useful when considering capital allocation strategies.

Cons

- RAROC may have a shorter-term focus than IRR, despite the long-term nature of many businesses and investments that employ both measures.

- RAROC may be cumbersome to calculate and, moreover, to actually use in decision making. IRR is widely understood and accepted already as a basic decision-making metric.

(c) Recommend three improvements to Darwin's GAAP projections in order for the data to be appropriate for calculating RAROC.

Commentary on Question:
Most candidates only discussed the process of risk-adjusting cash flows and did not consider other potential improvements.

Darwin's GAAP projection includes only five years of cash flows. Given the longer-term nature of many of the liabilities, the projection horizon should be extended considerably to more appropriately capture additional risks.

1. Continued

Darwin's GAAP projection is more of base case and not a best estimate. A best estimate could be derived using probability-weighted scenario analysis, where scenarios include key risks emerging in different ways and at different times.

Currently, Darwin does not allocate debt to the specific lines of its business. Doing so will facilitate calculating RAROC at a line of business level.

(d) Recommend whether Darwin should invest in the ULSG product based on CRS' analysis. Support your recommendation.

Commentary on Question:
Most candidates made a clear recommendation and supported it logically. Full credit could be earned regardless of the recommendation, as there is merit in both arguments.

Recommendation: Invest in the ULSG product

The RAROC (11.5%) is greater than the cost of capital (10.8%), so this investment will create value. Additionally, for a ULSG product, the margins assumed by CRS are conservative. Although quantifying the net impact of these margins would be useful, it is not unreasonable to expect that the RAROC without these margins would also increase to a level above the company's hurdle rate of 12%.

(e) Describe how behavioral factors could impact management's decision to invest in the ULSG product.

Commentary on Question:
Many candidates only discussed policyholder behavior factors and therefore received only partial credit. Full credit answers included a discussion of possible management behavioral factors.

Darwin has historically based its product decisions on IRR. This acts as a reference point / anchoring mechanism. Since Darwin has not yet adopted the RAROC methodology, managers may simply base their decision entirely on IRR.

Darwin may feel that the assumptions used by CRS are too pessimistic. Exhibiting their optimism bias, managers might propose alternative assumptions until the RAROC was above the hurdle rate as well. Overconfidence can lead to excessive risk-taking.

2. Learning Objectives:

4. The candidate will understand how to identify and recommend appropriate model risk assessment and vetting techniques for risk management models.

Learning Outcomes:

(4a) Assess methods and processes for quantifying and managing model risk within any business enterprise.

(4b) Design and evaluate stress-testing and back-testing processes.

(4c) Interpret stress-testing and back-testing results.

Sources:

Monte Carlo Methods and Models in Finance and Insurance, Korn - Chapter 5
How to Measure Anything, Hubbard - Chapter 7
Model Validation for Insurance Enterprise Risk and Capital Models, SOA
A Risk Management Tool for Long Liabilities: The Static Control Model
Corporate Finance, Berk & Demarzo – Chapter 8
Corporate Finance, Berk & Demarzo – Chapter 18

Commentary on Question:

Commentary listed underneath question component.

Solution:

(a)

(i) Sketch the critical path regarding the order of model risk validation.

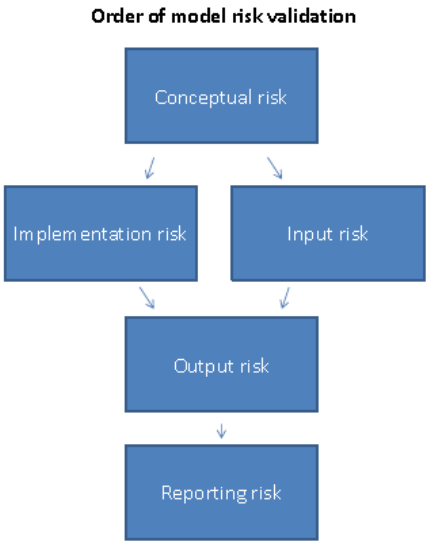
(ii) Justify the order of the critical path in part (i).

Commentary on Question:

Many candidates did well on part (i), correctly recalling the diagram from the note "Model Validation for Insurance Enterprise Risk and Capital Models." Candidates who failed to recall the diagram correctly generally attempted to rank the four CEO expectations, but those are goals/expectations, not how one would validate a model. Candidates generally did poorly on part (ii), demonstrating that you had to at least had to have a concept of a model prior to building one, but did not demonstrate comprehension of why this order is so crucial to model risk management.

2. Continued

(i)



(ii) Conceptual risk must come first and foremost because you cannot validate that a model serves a purpose without first knowing what you are trying to do.

Input risk secedes conceptual risk because choosing what the inputs are, validating their appropriateness, and setting them up requires having a fully developed concept.

Similarly, implementation risk requires that a model be developed and the calculations vetted/benchmarked back to the concept as well; you cannot verify the model code works as intended without knowing what it was intended to do.

You do not need fully set assumptions to implement a model, nor do you need a fully built model to set assumptions, this is why implementation and inputs are independent of each other. In fact, using simplified assumptions during implementation is often preferable due to the simplicity of setting up benchmarks to stress test where the implementation may fail.

Output risk follows implementation and input risk because the actual output of your concept, defined by the assumptions and algorithm, now need to be validated that they work together correctly to produce the right output.

2. Continued

Finally, reporting risk is last because this is the risk that the output may not meet management's needs, or be used in an inappropriate manner – beyond the scope of the concept.

(b) Propose a method to manage model risk with respect to expectations I and II.

Commentary on Question:
Most candidates performed poorly on part (b). The keyword here was "propose," but most candidates answered as a recall question and failed to tie their response back to the case study.

I – RPPC only requires model owners to document their validation process, this means each owner could use different standards creating inconsistencies between models when using the same inputs, and more importantly when rolled up and aggregated. An independent team could be used to ensure consistency across models; a prescribed benchmarking of inputs and outputs would accomplish the same thing.

II – RPPC contains several business units that have exposure to common risks, especially with respect to economics. RPPC uses an economic capital model at the corporate level, but also permits the business units to have their own model for the same purpose. There is no reference of reconciliation between models with overlapping purposes. Benchmarking the models against one another at a minimum, or requiring the consolidation of the economic models to the corporate level with all business units using or integrating the RPPC economic models into theirs would go a long way to ensuring internal consistency.

(c)

(i) Evaluate two key model risks specific to Blue Ocean P&C's reserving model (Case Study, Section 5.2.4).

(ii) Propose an approach to mitigate each model risk identified in part (i).

Commentary on Question:
Most candidates performed well on part (c).

(i) Calculation engine based on travel insurance reserving model, this is an implementation risk as it may not be appropriate for a renewable energy model.

Assumptions largely derived from wind farm data, this is an input risk as wind may be poorly correlated with solar both generally and regionally.

2. Continued

(ii) Only Jay was involved in modifying the travelers reserving model for renewable energy. Seeing as it was quickly developed by one Actuary, a peer review and involvement of others would assist in identifying any issues regarding the appropriateness of the model.

Secondary sources and industry data, as available, should be used to back-test and calibrate the wind assumptions for solar energy forecasting. Credibility and conservatism should be used to ensure that experience deviations do not give rise to adverse experience that may cause liquidity or solvency concerns.

(d) Recommend potential improvements to the interest rate hedging model used by Blue Jay Air (Case Study, Section 2.5.3) with respect to expectation III.

Commentary on Question:
Candidates generally answered part (d) in a fashion more appropriate for a recall level question, the keyword here was "recommend." Few candidates supported their answer strongly enough to receive full credit.

1) Modeling Commodity and Interest Risk in One Model/Method. Interest rates and commodities should be modeled separately for many reasons, even if the algorithm is the same, because:
    a. Commodity and interest rate volatility are independent
    b. Term structures and maturities are very different
    c. Interest rates tend to be mean reverting
    d. the underlying processes are unrelated, they should be modeled differently
2) Black-Scholes is an inappropriate model for interest rates because of mean reversion and volatility differences, should use a model such as:
    a. Short-rate
    b. Forward-rate
    c. Market-Model
    d. Static Control Model

(e)

(i) Recommend four improvements to RPPC's model risk management (Case Study, Section 1.3.10) to achieve expectation IV.

(ii) Identify the type of model risk that each of these improvements mitigates.

2. Continued

Commentary on Question:
Candidates did very well on part (e). With regards to part (i), candidates were able to successfully identify a wide range of issues that needed improvement. For part (ii), a fair number of candidates failed to fully comprehend the boundaries between conceptual, input, implementation, output, and reporting risks which led to the misidentification of the scope in which the recommendations should be addressed.

(i)

1) Define frequency to review and update inputs
2) Document intended purpose and scope for the model
3) Change log, version archiving and controls
4) Prescribed benchmarks to test outputs against

(ii)

1) Input risk
2) Conceptual risk
3) Implementation risk
4) Output risk

3. Learning Objectives:

1. The candidate will understand how a business funds its activities with considerations for its business model, and the cost and constraints on the sources of capital, including other market frictions.

2. The candidate will understand how an enterprise's structure and policies allow its management to prioritize and select among projects or business activities that are competing for scarce capital resources especially when opposing factors are key decision criteria.

Learning Outcomes:

(1a) Identify and critique the available funding sources at different stages of a business's development.

(1b) Evaluate capital budgeting approaches and structure policy for insurance and non-insurance organizations.

(2a) Evaluate how the legal form of an organization, corporate governance, compensation dynamics and other market frictions impact business decisions.

Sources:

Corporate Finance, Berk & Demarzo – Chapter 22
Raising Capital, Sherman – Chapter 1
Raising Capital, Sherman – Chapter 2
Securitization, Insurance, and Reinsurance, Trainer & Cummins
Creating Value Through Best-In-Class Capital Allocation, JP Morgan
Is the Company Using Its Capital Wisely? KPMG

Commentary on Question:

Commentary listed underneath question component.

Solution:

(a) Explain why Blue Ocean is able to raise debt through a bond offering instead of resorting to notes or debentures.

Commentary on Question:

Candidates generally did well on part (a), providing either asset redundancy or strong credit rating as one of the rationales. Only some papers addressed both perspectives to receive full marks.

Blue Ocean has plenty of assets on which to secure a bond, whereas growing companies usually do not and therefore must rely on debentures and notes. Moreover, Blue Ocean's strong credit rating (A rating by AM Best) will enable it to secure its loan in affordable terms.

3. Continued

(b) Evaluate whether reinsurance or securitization is more appropriate for capital requirement reduction and risk transfer for each line of business:

(i) Marine Insurance

(ii) Pet Insurance

(iii) Travel Insurance

Commentary on Question:
Candidates generally did well on part (b). Most candidates correctly identified the proper risk transfer instrument for each line of business. Some candidates failed to describe the reinsurer expertise in providing pricing and underwriting advice when arguing for reinsurance as the appropriate instrument. Moreover, only a few candidates referenced the capital definition of the case study and properly related it to describe the loss distribution in each type of insurance to receive full marks.

(i) Marine Insurance

Loss distributions in 5.1.8 show extreme skew, which does not provide for good risk transfer through reinsurance. Marine losses likely have high covariance (since Blue Ocean is focused solely on the Atlantic Ocean region) and are subject to catastrophe risk.

Reinsurance works best when risks are statistically independent and maximum probable losses are small. Neither of these describe the Marine line (per two previous points). Therefore, reinsurance will not transfer risk well. The reinsurance premium demanded from reinsurers will be very high and make any risk transfer not very efficient.

Blue Ocean is a big company, so it would likely have the resources to securitize. It could also use Big Ben's expertise throughout the process. Investors can diversify their portfolios better than reinsurers, so including Marine insurance securities as part of a diversified portfolio can be done at a more affordable rate vs reinsurance.

3. Continued

Reinsurance and securitization both can provide capital reduction. And as long as they are correctly taken into account when solvency margin requirements are calculated, they will lead to a proportionate reduction in the solvency margin requirements set by regulation or by the insurance rating agency. VaR(99) - VaR(95) is defined as capital requirement from table 5.1.8, because the Marine line's VAR is so skewed in the tail and the absolute value is large, any reduction of difference between VAR(99) and Var(95) will provide significant capital reduction.

Therefore, I recommend securitization due to the ability to transfer risk efficiently at potential lower cost and provide capital reduction.

(ii) Pet Insurance

Loss distributions in 5.1.8 are not as skewed, so reinsurance provides better risk transfer than for Marine. Pet insurance may have some covariance due to catastrophe risk, it's likely not as extreme as Marine. Since pet insurance is relatively new, there likely isn't a market for pet insurance securities so it would be an inefficient way to transfer risk.

Blue Ocean can benefit from the reinsurer's economies of scale at a more affordable rate, making it cheaper and thus freeing up more capital. Blue Ocean can also benefit from the reinsurer's expertise since it is new to pet insurance. The reinsurer can provide underwriting and pricing advice, which in turn can lower the product's risk.

Reinsurance and securitization both can provide capital reduction. However, due to the small size of VAR in the tail and the fact that the result is not skewed, any capital reduction provided will be insignificant

As a result, I recommend reinsurance due to more efficient risk transfer.

(iii) Travel Insurance

Loss distributions in 5.1.8 are not as skewed, so reinsurance provides better risk transfer than for Marine. Travel insurance may have some covariance due to catastrophe risk, it's likely not as extreme as Marine. Since travel insurance is relatively new, there likely isn't a market for travel insurance securities so it would be an inefficient way to transfer risk.

3. Continued

Blue Ocean can benefit from the reinsurer's economies of scale at a more affordable rate, making it cheaper and thus freeing up more capital. The Company can benefit from the reinsurer's expertise since it is new to travel insurance. The reinsurer can provide underwriting and pricing advice, which in turn can lower the product's risk.

Reinsurance and securitization both can provide capital reduction. However, due to the small size of VAR in the tail and the fact that the result is not skewed, any capital reduction provided will be insignificant

Therefore, I recommend reinsurance due to more efficient risk transfer.

(c) Describe the functions of an advisory board.

Commentary on Question:
Candidates generally did well on part (c), adequately describing the functions of an advisory board, although there were only a few candidates who addressed the non-fiduciary nature of an advisory board.

Advisory Board is a group that is set up to provide reviews, advice, etc. for a specific purpose or series of purposes. Advisory Boards are more informal regarding meetings and agendas than the Board of Directors. Advisory Boards do not owe the same levels of fiduciary duties to shareholders.

(d) Explain the benefits to Blue Ocean of creating an advisory board as opposed to appointing additional members to its Board of Directors.

Commentary on Question:
Overall, candidates generally did very well on part (d), adequately describing the advantages of creating an advisory board as opposed to appointing additional board members. There were some candidates who described the function of an advisory board but failed to discuss why it is better than appointing additional members to the Board from Blue Ocean's standpoint.

An advisory board can be used in the capital formation process to demonstrate that the company has access to credible and objective sources of advice and contacts without using Board of Director seats. Since securitization is only a part of Blue Ocean's business, it probably does not make sense to use a Board of Director seat on a securitization expert.

To add credibility to an advisory board, companies can seek a variety of members that add to the advisory board's credibility. In this case, Blue Ocean can include securitization experts from other RPPC subsidiaries, such as Big Ben.

3. Continued

(e) Describe how Blue Ocean can use real options to decide if it should incur the initial securitization costs today.

Commentary on Question:
Candidates performed poorly on part (e). While most candidates correctly described the nature of the real option in this context, few went on to provide a way to evaluate this option or describe a decision rule to determine whether the Company should incur the securitization cost today.

Real options will allow Blue Ocean to determine at the start of the project if further investment is worthwhile, essentially purchasing a call option on the right to continue the project. The development cost is essentially the price of the call option.

Blue Ocean will need to find the NPV of the project under both scenarios:

1. Legislation does not pass
2. Legislation passes

Using the probability of the legislation passing, calculate a weighted average NPV. If the NPV is positive, then it is worth spending the upfront costs of securitizing now.

To calculate NPV for each scenario, Blue Ocean can make the following assumptions:

If the legislation does not pass, then Blue Ocean can continue the project assuming it is still positive NPV.

If the legislation eventually passes, Blue Ocean will stop the project and avoid spending further capital. NPV for this scenario will be calculated under these assumptions.

3. Continued

(f) Blue Ocean's management team is deciding how to allocate the remaining available capital to grow its three current lines of business. Tan makes the following comments:

I. *Just because Marine Insurance contributes the most profit to Blue Ocean does not mean it should receive the most capital next year.*
II. *We need to allocate capital to the lines of business with the greatest growth potential, with particular focus on near-term profit.*
III. *Stress tests can help us understand each line of business' downside risk, so there's no need to include these risks in the expected cash flow projection.*

Critique each of Tan's comments.

Commentary on Question:
Candidates scored well on part (f), adequately critiquing each comment. Most candidates understood the elements of Statements I and II. A few candidates inaccurately suggested Tan was correct in that stress test results should not be included in the cash flow projection in Statement III.

I. Tan is correct.
Prior year allocations should not anchor future capital allocation decisions. Absolute dollars are not the best measure to look at as it doesn't take into account the return on capital. Consequently, capital allocation should be forward thinking!

II. Tan is not correct.
Tan should not emphasize next year's earnings as most important. Capital allocation should be linked to longer-term strategic goals. If the firm wants to grow a line of business that currently does not generate much profit then that should be considered in the capital allocation process more than profitability.

III. Tan is not correct.
Blue Ocean's profit projections should include the possibility of downside scenarios, otherwise the projections may be upward-biased and could overstate the company's expected future earnings.

4. Learning Objectives:

2. The candidate will understand how an enterprise's structure and policies allow its management to prioritize and select among projects or business activities that are competing for scarce capital resources especially when opposing factors are key decision criteria.

Learning Outcomes:

(2b) Recommend an optimal capital structure and how to implement it for a given business strategy.

(2c) Design a risk management plan to optimize the risk reward trade off of employed capital.

Sources:

An International Comparison of Capital Structure and Debt Maturity Choices, Fan, Titman & Twite
How Do CFOs Make Capital Budgeting and Capital Structure Decisions?, Graham & Harvey
Case Study Blue Jay Air- Exhibit 4

Commentary on Question:

Commentary listed underneath question component.

Solution:

(a) List four factors of a country's institutional environment that can influence a company's capital structure and debt maturity choices.

Commentary on Question:

In general candidates did well and most got full credit. Some answered vaguely without tying the response back to something more institutional or systemic in the country.

Possible answers include:

- A country's legal system
- A country's tax system
- A country's level of corruption
- A country's explicit bankruptcy code
- A country's deposit insurance
- The size of government bond market
- More extensive defined benefit or defined contribution plans
- Allowable bond holdings of pension funds

4. Continued

(b) Explain why equity financing is not an option for BJA.

Commentary on Question:
Key here was for candidates to have reviewed and understood the Case Study. The fact that Blue Jay Air has negative equity is critical to evaluating a host of possible decisions and approaches to risk for that organization.

BJA has negative equity. Given this, it would be difficult to attract equity investors with the poor financials and negative equity.

(c) BJA is making its decision on the fleet expansion based on NPV analysis using RPPC's weighted average cost of capital (Case Study, Section 2.6 – Exhibit 4). If BJA purchases the fleet, assume the fleet is sold at the end of five years at a salvage value of $1B.

(i) Evaluate the lease option using NPV analysis.

(ii) Evaluate the buy option using NPV analysis.

(iii) Calculate the tax shield advantage of the buy option.

(iv) Calculate a purchase price that would make BJA indifferent between leasing or buying the fleet.

Commentary on Question:
Most candidates did the WACC calculation correctly. The concept of a "tax shield" was more difficult. Many candidates received credit for the purchase and lease option analysis for answers that differed from those below if they demonstrated sound logic and conclusions on incorrect data. Stronger candidates approached this question in a more organized manner (e.g. drawing out a table of years & cashflow components) that lead to greater success.

The WACC is 10.48%, with a debt ratio of 40%, cost of debt at 8%, and cost of equity financing at 14% and a tax rate of 35%.

10.48% = 40% * 8% * (1 – 35%) + 60% * 14%

Upfront lease costs are 500 (or 100 per year), with annual costs of 60 and revenue of 270 (net 210). NPV on a pre-tax basis is 286, discounted at WACC.

Some candidates also calculated on a post-tax basis or varied the assumed timing of cashflows (beginning versus end of period), which were acceptable answers.

4. Continued

For the purchase option, initial expenditure is 1,750 with annual costs of 62 and revenue of 270. Due to depreciation, there is also a tax advantage of 35 each year to the cashflows. Finally, there is a tax credit in year 5 given the company sells the equipment at a price lower than purchase price less depreciation, which is worth 87.5.

	Initial	1	2	3	4	5
Purchase Price	-1,750.00					
Salvage Value						1,000.00
Depreciation		-100.00	-100.00	-100.00	-100.00	-100.00
Capital Gain / Loss						-250.00
Revenue		270.00	270.00	270.00	270.00	270.00
Maintenance Cost		-2.00	-2.00	-2.00	-2.00	-2.00
Annual Expense		-60.00	-60.00	-60.00	-60.00	-60.00
Income before tax		108.00	108.00	108.00	108.00	-142.00
Taxes		-37.80	-37.80	-37.80	-37.80	49.70
Net Income		70.20	70.20	70.20	70.20	-92.30
Free Cash Flow (add depreciation)	-1,750.00	170.20	170.20	170.20	170.20	1,007.70
NPV (at 10.48% WACC)	-604.00					

The tax shield advantage is worth 35 per year, which was an acceptable answer. Some candidates also included a final amount of 87.5 due to the realized capital loss from the salvage value. Some candidates calculated the deductibility of debt financing costs based on the initial purchase price, which was also an acceptable answer.

To be indifferent between the two options, the purchase price would need to be set such that the present value of the lease option is equal to the present value of the purchase option, or reduce the purchase price by the difference of the two options:

Buy Option	-604.00
Lease option	286.00
Difference	890.00
New Purchase Price (for indifference)	860.00

5. Learning Objectives:

5. The candidate will understand how and when to apply various advanced techniques to evaluate non-hedgeable risk or uncertainty in any business enterprise, especially non-insurance organizations.

Learning Outcomes:

(5c) Assess the appropriateness of Applied Information Economics (AIE) concepts for risk management.

Sources:

How to Measure Anything, Hubbard – Chapter 7
How to Measure Anything, Hubbard – Chapter 10
How to Measure Anything, Hubbard – Chapter 14
Monte Carlo Methods and Models in Finance and Insurance - Chapter 5
Corporate Finance, Berk & Demarzo – Chapter 8
Corporate Finance, Berk & Demarzo – Chapter 18

Commentary on Question:

This question focuses on the Applied Information Economics framework. Candidates were fairly split on this question, with some being well versed in AIE and others responding in a way that tied to neither AIE nor to the Case Study situation.

Solution:

(a)

(i) Explain why Tan's question is not suitable for measurement within the Applied Information Economics (AIE) framework.

(ii) Propose an alternative question to be answered that is suitable under the AIE framework.

Commentary on Question:

The most common mistake for part (a) was focusing on the return measure and coming up with a more specific definition for return, instead of considering the AIE framework and a question that would support a decision relevant to the situation.

(i) The AIE framework is used to support a decision, Tan's question does not make it clear what decision this would support. There is too much uncertainty to come up with a point metric, a range would be more suitable.

(ii) In what range would the expected ROI fall with 90% confidence?

5. Continued

(b) Describe the process to quantify weather as a risk factor under an AIE framework.

Commentary on Question:
The specific steps were not as important as the types of activities that one would go through in quantifying the risk. Many candidates provided generic risk responses rather than explicitly relating to weather as a risk factor.

Phase 0: Project Preparation
- Initial research on nature of the problem, already happened since weather risk has been determined to be a risk factor

Phase 1: Decision Modeling
- Define the problem and the relevant uncertainties, in this case weather related costs on the new insurance program
- Calibrate initial estimates, for example estimate number of rainy days

Phase 2: Optimal Measurements
- Decompose weather risk further and determine value of information for each piece

Phase 3: Decision Optimization and Final Recommendation
- Final report and presentation outlining strategies on mitigating weather risk

(c) Calculate the maximum premium Blue Ocean should pay, based on information given above. Show your work.

Commentary on Question:
Most candidates realized that there were no losses for a 15 cent decrease; however, a common mistake was to take the expected value of the decreases (15 cents and 30 cents) and then complete the loss calculation using that value, this is not a correct approach. Another common mistake was forgetting to multiply by the number of homes and the kWh/home.

Reinsurance is only pays off if the decrease is 30 cents. In that situation, the loss would be 10 cents in that situation for all years.

For each year, the total loss is:
(# homes insured) * (kWh/home) * (loss of 10 cents)

The total losses for each year where there is a decrease of 30 cents then need to be discounted back to the beginning of 2017 and summed:
(4,200 * 20,250 * .10) / (1.1) + (6,000 * 30,375 * .10)/(1.1^2) + (8,000 * 45,563 * .10)/(1.1^3)

5. Continued

At 30 cents the total loss = 50.18M
At 15 cents the total loss = 0

Expected Value of Perfect Information = probability * loss for each situation
= 50% * 0 + 50% * 50.18M
= 25.09M

Therefore, Blue Ocean should pay a maximum premium of $25.09M to the reinsurer.

6. Learning Objectives:

1. The candidate will understand how a business funds its activities with considerations for its business model, and the cost and constraints on the sources of capital, including other market frictions.

2. The candidate will understand how an enterprise's structure and policies allow its management to prioritize and select among projects or business activities that are competing for scarce capital resources especially when opposing factors are key decision criteria.

Learning Outcomes:

(1a) Identify and critique the available funding sources at different stages of a business's development.

(1b) Evaluate capital budgeting approaches and structure policy for insurance and non-insurance organizations.

(2d) Assess the impact of behavioral factors in capital budgeting methods and capital structure policies.

Sources:

Raising Capital – Sherman – Chapter 4
Raising Capital – Sherman – Chapter 7
Raising Capital – Sherman – Chapter 9
Creating Value Through Capital Allocation – JP Morgan
Cross Section of Hurdle Rates for Capital Budgeting
Case Study - Section 4.1.3 & 4.2

Commentary on Question:

The goal for this question was for candidates to demonstrate an understanding of capital funding sources for various stages of a business' development cycle and to apply real options in an appropriate context.

Solution:

(a)

(i) Assess each of the options I-III listed above as possible funding sources for Frenz.

(ii) Recommend the best funding source for Frenz. Justify your recommendation.

Commentary on Question:

A straightforward question but very few (if any) candidates mentioned the amount of funding each source typically provides. Better candidates tied their responses to the Case Study. Frenz is public, very large and needs lots of funding.

6. Continued

Part (i)
I. Venture capital typically provides $0.5-3m in a company's growth stage for a i) company's expansion of physical facilities or ii) a significant increase in sales and marketing efforts.
I. Based on Frenz's expansion and marketing strategies, it is planning to do those things but it will likely need way more than $3m. So venture capital is not the best option.

II. Commercial loans typically provide $1-5m in the mezzanine / bridge stage of growth to small, growing companies (for large companies, regional banks usually handle M&A.)
II. Although Frenz is growing, it is not a small company so a commercial loan isn't a viable option.

III. Franchising is a financing source (or exit strategy) which typically provides $2-20m in the harvest stage of growth.
III. Frenz is in the right growth stage for franchising to be a good option.

Part (ii)
Recommend Franchising/licensing for Frenz due to its growth stage and inapplicability of the other options

(b) Critique each statement using the lessons learned from JP Morgan's, "Best-in-Class Capital Allocation" paper.

Commentary on Question:
Most candidates did not quote the JPM BICCA strategy directly but successful candidates paraphrased the relevant ideas/concepts from the paper. Another key was to provide the "critique" requested in the question. One sided responses received only partial credit.

The part of Pirot's statement which says "We currently have a lot cash on hand" is correct according to the case study but…
...the part of Pirot's statement which says "...and we can afford to invest in Asia or any project we like, as long as we can earn more than what do now." is incorrect. It contradicts BICCAS #5 because Pirot is only focused on how much cash Frenz has available to invest, not on the risks related to any particular project.

6. Continued

The part of Kaplan's statement which says "We should evaluate the Asian expansion and all projects based on risk." is correct based on either:

a) BICCAS #1 which says "1. Firms should allocate capital based on the economic value of each investment opportunity, accounting for risk-adjusted returns that reflect value creation." or

b) BICCAS #8 which says "8. To create shareholder value, decision makers should focus on returns relative to risk, not the return on capital (ROIC.)"

However, the part of Kaplan's statement which says "By investing and expanding in the Asia market, we are 100% diversifying our portfolio and can effectively mitigate risk." is incorrect due to…

BICCAS #2 which says "When allocating capital, firms should take into account that diversification can be limited during crises, especially global crises." Frenz (or any firm) cannot ever be 100% diversified. While investing in Asia could allow Frenz to earn revenue from Asian markets if revenue from non-Asian markets decline, a crisis could affect both sets of markets and result in an overall loss of earnings.

(c) Describe Frenz's decision making process with respect to each of the following:

(i) Timing of this investment

(ii) Frenz's cost of capital for the Vietombia proposal

Commentary on Question:
Part (i)
Many candidates thought this question was "is now a good time to invest?" and focused on Vietombia's political and other risks, investing now to beat the competition, etc. The real idea behind the question was the key understanding of real options and the concept that the option to wait is valuable.

Part (ii)
Most candidates recognized that the cost of capital for this project was higher than the normal CoC for Frenz and RPPC. However, some candidates didn't know how to move on from there, and some even did a WACC or CoC or NPV calculation to say whether Frenz should pursue the deal or not.

Part (i) - Timing of this investment:
Investing in a project now is an irreversible decision while choosing to wait is a reversible decision. Frenz needs to consider the project's current NPV when making this decision (NPV for Vietombia is negative)

6. Continued

This option to wait is valuable to growth firms since it may enable them to take on future projects that possibly have higher NPVs than the (positive) NPV projects they have in the current period. Frenz is expanding product lines and potentially has other projects they can invest in.

Some growth firms may behave in this manner (i.e., exercise the option to wait) due to managerial and other human capital constraints in the current period. Frenz is a high growth company and it is having some managerial conflicts between the Marketing VP and the CRO, both of whom seem to have different risk appetites. This is an argument for Frenz to wait.

If a firm considers a specific project to be strategic, then it believes that such a project has the potential to generate additional future cash flows that are currently not incorporated in the valuation of the project – e.g., an investment in a foreign country may pave the way for future, positive NPV projects. Frenz considers its expansion and marketing plans to be strategic and critical to its future. While it has franchising and M&A opportunities available to expand its market share and revenue, it does not have any other projects like this deal – direct ownership of the coffee source - on the table right now. Therefore, the Vietombia deal is an essential part of its strategic plans and Frenz should pursue the project now.

Part (ii) - Frenz's cost of capital for the Vietombia proposal.
Firms in a growth stage tend to use higher hurdle rates even if they have a lower cost of capital. They would want to put in a premium in addition to WACC to represent the option to wait. Frenz is expanding and has a lot different directions they can go, future projects may bring higher return than the Vietombia project, so it is reasonable for them to have a higher COC for this project.

In the real world, a specific project could be different than the average investment made by the company and have a different risk profile. The return on invested capital should always be benchmarked against the risk associated with that investment. Vietombia project faces a lot uncertainty and risks (unstable country, weak laws, corrupt officials, weak banking system, new currency peg, etc..), it is reasonable to use a higher COC to reflect the risks inherent in this project.

(d) Explain why Frenz might proceed with the Vietombia project.

Commentary on Question:
Most candidates stated that Frenz should not proceed with the deal while a few suggested that Frenz should pursue the deal now. Either response was acceptable as long as it was supported. Stronger candidates mentioned how this decision did or did not fit with Frenz's strategy which is key for a company's long-term planning.

6. Continued

Frenz should pursue this specific deal now because:
Frenz has the capital to invest in the deal with little or no need of outside financing, Even though the project's current NPV is negative, Frenz believes this project is central to its strategic goals and the future growth option can make this project still worthwhile
Overconfidence by management could drive Frenz's decision to proceed

7. Learning Objectives:

3. The candidate will understand how and when to apply various stochastic techniques to situations which have uncertain financial outcomes.

Learning Outcomes:

(3a) Assess the appropriateness of a given stochastic technique to quantify market and non-market risk exposures.

(3c) Assess the results of a given application of stochastic modelling and calibration processes.

(3e) Explain what risk exposures are or are not identified with a given risk metric, assess the implications, and recommend further action.

Sources:

Interest Rate Swaps – an exposure analysis, Ferrera and Nezzamoddini

Commentary on Question:

The goal of this question was for the candidate to demonstrate an understanding of interest rate swap arrangements and the obligations of swap parties. Candidates should also be able to identify limitations of a swap arrangement and where it might be appropriate for various purposes.

Solution:

(a) Identify advantages and disadvantages of entering into a swap arrangement.

Commentary on Question:

Most candidates received full marks for part (a).

Advantages:

- Offer added flexibility and diversity…split a single loan into both fixed and floating rate tranches.
- Ability to lock-in a fixed rate today for funding that will occur later.
- Take advantage of a favorable current rate environment even before you're prepared to take out the actual loan.

Disadvantages:

- Additional accounting and regulatory hurdles to cross with swaps.
- May be required to post collateral - tie up assets
- May have credit triggers from the firm's credit agency
- Could introduce volatility in the firm's balance sheet

7. Continued

(b) Consider option II.

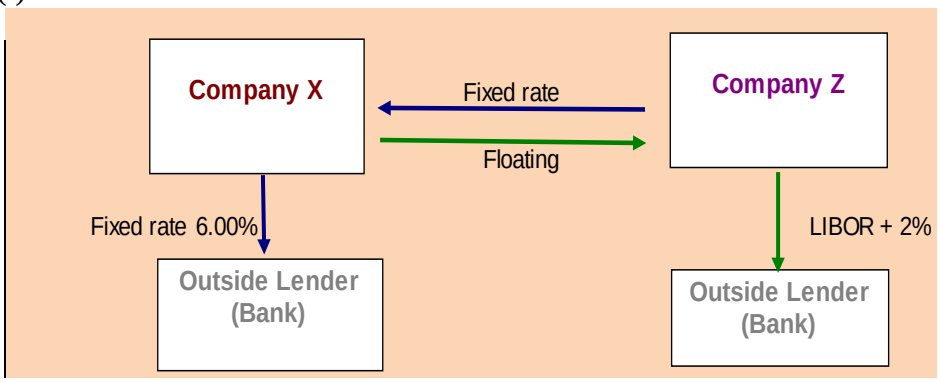
(i) Draw the diagram of transactions for option II.

(ii) Determine the combined reduction in funding costs for the two companies as compared to option I.

(iii) Calculate the fixed and floating rates of the swap.

Commentary on Question:
For (i), some candidates had difficulty identifying the right parties in the swap transaction. For example, they did not recognize that an outside party/bank is normally part of a swap transaction. For (ii), most candidates received full credit for identifying the combined savings through the swap. In (iii), many candidates failed to recognize the savings from the swap; or failed to come up with the total cost of Libor + 6%.

(i)



(ii).
With the SWAP
Company X pays 6% on fixed to outside lenders
Company Z pays LIBOR + 2% to outside lenders

Company X gets 9% from Company Z but only pays out 6% to lenders….it nets +3%
Company Z gets LIBOR + 1% from Company X but pays out LIBOR + 2% to lenders….it nets -1%

Therefore the combined net for the swap is (+3% - 1% = 2%) which Company X and Company Z share equally

7. Continued

(iii).
Assume the even slitting of profit between X and Z as stated in the question
Company X should pay LIBOR to Company Z
Company Z should pay 6% to Company X
Both receive 1% net profit from entering into the transaction.

(c)

(i) Calculate X's semi-annual net payment flows under its expectations.

(ii) Calculate Z's semi-annual net payment flows under its expectations.

Commentary on Question:
Many candidates failed to recognize the appropriate cash flows. This should have been a fairly straight forward question. Candidates would have benefited from approaching this part in an organized manner.

(i) Company X

Outside Lender – pay – 6% fixed
Counter Party – pay – LIBOR (expected)
Counter Party – receive – 8% fixed

Outside Lender	pay	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Counter Party	pay	2.50%	2.25%	2.50%	2.00%	1.90%	2.00%
Counter Party	receive	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%
	net	1.50%	1.25%	1.50%	1.00%	0.90%	1.00%
interest	$	1.50	1.25	1.50	1.00	0.90	1.00
repayment							100.00
total		1.50	1.25	1.50	1.00	0.90	101.00

(ii) Company Z

Outside Lender – pay – LIBOR (expected) + 2%
Counter Party – pay – 8% fixed
Counter Party – receive – LIBOR (expected)

7. Continued

Outside Lender	pay	4.50%	4.75%	5.80%	5.90%	6.00%	6.90%
Counter Party	pay	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%
Counter Party	receive	3.50%	3.75%	4.80%	4.90%	5.00%	5.90%
	net	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
interest	$	5.00	5.00	5.00	5.00	5.00	5.00
repayment							100.00
total		5.00	5.00	5.00	5.00	5.00	105.00

(d) Calculate the semi-annual net payment flows for X and Z under:

(i) Option I

(ii) Option II

Commentary on Question:
Part d is the continuation of part c, and candidates were expected to understand the difference between option I and II. Most candidates failed to recognize the different options.

(i) Option I

Company X

Outside Lender – pay – LIBOR + 1%

Outside Lender	pay	3.75%	3.40%	2.85%	3.40%	4.40%	4.10%
interest	$	3.75	3.40	2.85	3.40	4.40	4.10
repayment							100.00
total		3.75	3.40	2.85	3.40	4.40	104.10

Company Z

Outside Lender – pay – 9% fixed

7. Continued

Outside Lender	pay	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
interest	$	4.50	4.50	4.50	4.50	4.50	4.50
repayment							100.00
total		4.50	4.50	4.50	4.50	4.50	104.50

(ii) Option II

Company X

Outside Lender – pay – 6% fixed
Counter Party – pay – LIBOR (actual)
Counter Party – receive – 8% fixed

Outside Lender	pay	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
Counter Party	pay	3.25%	2.90%	2.35%	2.90%	3.90%	3.60%
Counter Party	receive	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%
	net	2.25%	1.90%	1.35%	1.90%	2.90%	2.60%
interest	$	2.25	1.90	1.35	1.90	2.90	2.60
repayment							100.00
total		2.25	1.90	1.35	1.90	2.90	102.60

Company Z

Outside Lender – pay – LIBOR (actual) + 2%
Counter Party – pay – 8% fixed
Counter Party – receive – LIBOR (actual)

7. Continued

Outside Lender	pay	4.25%	3.90%	3.35%	3.90%	4.90%	4.60%
Counter Party	pay	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%
Counter Party	receive	3.25%	2.90%	2.35%	2.90%	3.90%	3.60%
	net	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
interest	$	5.00	5.00	5.00	5.00	5.00	5.00
repayment							100.00
total		5.00	5.00	5.00	5.00	5.00	105.00

(e) Describe the risk management considerations when collateral is required for a swap.

Commentary on Question:
This is a straight-forward question and most candidates were able to recognize the risk implications of entering a swap transaction. The answer below is much more complete than was required for full credit.

There is additional cost associated to posting collateral: Capital must be invested in liquid assets versus other assets that could earn a higher yield. For OTC swaps, collateral merely earns an overnight rate because margining of collateral occurs daily.

The collateral requirement is sensitive to future interest rates and company credit ratings, which could be irrelevant to actual future payments even if the current rate does not change, a change in yield curve steepness could result in a dramatic change to the value of the swap, hence the collateral requirement.

Also, collateral often contains a credit trigger, which could be a systematic risk when credit downgrades occur across the industry.

Capital savings come from reducing counterparty risk by imposing collateral requirements, if the counterparty defaults or refuses to honor the swap payment, the collateral is used to clear the outstanding balance of the swap. Hence required to hold capital against the counterparty risk.

Reduced counterparty risk comes at a cost of increased liquidity risk and operational risk: CCP demands end-users of derivatives post variation and initial margin. This poses a liquidity issue for a company on adverse changes in future interest rates. A specific company function may need to be established for collateral management.

7. Continued

(f) Describe how a company's risk profile changes if swaps are cleared through a centralized counterparty.

Commentary on Question:
Candidates should have focused on the risk profile of the company, not just listed a generic change. For example, "increase transparency by providing information on prices" simplifies risk management and collateral management. Some candidates failed to relate their response to the impact on the risk profile.

Both parties are exposed to less credit risk by frequent (often daily) clearing.

Spreading risk among a large number of counterparties through novation also reduces risk.

CCP performs multilateral netting and acts as the central clearing for most swaps……so, both parties are exposed to less operational risk.

Liquidity risk may increase or decrease because of collateral requirements by the CCP, e.g. initial margin and variation margin.

Counterparty becomes the CCP instead of the bank.

8. Learning Objectives:

1. The candidate will understand how a business funds its activities with considerations for its business model, and the cost and constraints on the sources of capital, including other market frictions.

2. The candidate will understand how an enterprise's structure and policies allow its management to prioritize and select among projects or business activities that are competing for scarce capital resources especially when opposing factors are key decision criteria.

Learning Outcomes:

(1a) Identify and critique the available funding sources at different stages of a business's development.

(1b) Evaluate capital budgeting approaches and structure policy for insurance and non-insurance organizations.

(2a) Evaluate how the legal form of an organization, corporate governance, compensation dynamics and other market frictions impact business decisions.

Sources:

Corporate Finance, Berk - Chapter 18
Corporate Finance, Berk – Chapter 22
Raising Capital, Sherman - Chapter 1
How do CFOs make capital budgeting and capital structure decisions?
Is the company using its capital wisely? KPMG
The Modigliani-Miller Theorem, Villamil

Commentary on Question:

This question was intended to allow candidates to demonstrate their ability to analyze different approaches and identify short-comings or errors. Stronger candidates were able to provide this analysis while other candidates had merely memorized some relationships.

Solution:

(a) Calculate the NPV of the project using the WACC method. Show your work.

Commentary on Question:

This is a very straightforward and easy question. All candidates were able to make the calculations.

1) Debt (D) to Equity (E) ratio = 1, so D/(D+E) = E/(D+E) = 1/2

$$r_{WACC} = D/(D+E)* r_d * (1-t) + E/(D+E) * r_e$$

$$= (50\%*6\%*0.65 + 50\%*15\%) = 9.45\%$$

8. Continued

2) NPV = CF at end of the year/ $(1+r_{WACC})$ – Initial investment
= \$11,000,000 / 1.0945 - 9,500,000 = \$10,050,251 - \$9,500,000
= \$550,251

(b) Identify your co-worker's error(s). Justify your response.

Commentary on Question:
This is question intended to check the basic concept that to maintain a 50/50 D/E ratio, the firm's investment must be financed with debt equal to 50% of the market value instead of using initial investment. Some candidates picked apart the calculation provided in the question and commented with random thoughts. Candidates would have benefited from focusing on the question that was asked and providing the requested justification.

Many candidates did not show the tax shield calculation and "proof" that the corrected PV matches that from the WACC method.

To maintain a 50/50 D/E ratio, the firm's investment must be financed with debt equal to 50% of market value instead of using initial investment of 9,500,000. Debt shield is calculated based on the value of the project. Solve for the project value and debt capacity at the same time. Calculate present value using the WACC and APV should be the same as the PV calculated in part (a).

- 50% of \$11,000,000 / 1.0945 = 50% * \$10,050,251 = 5,025,125 (not 50% of the \$9,500,000 initial investment)
- Tax shield = (5,025,125*0.06*0.35 / 1.105) = 95,500
- Add tax shield back to 11,000,000/1.105 i.e.
  9,954,751 + 95,500 => \$11,000,000 / 1.0945 =\$10,050,251

(c) Evaluate each of the CFO's statements, I-III.

Commentary on Question:
The question asked candidates to 'evaluate' the statements not to determine if they are true or false. Many candidates simply stuck to the point that debt is always risky and applied that logic in responding all three statements. Better candidates considered each comment on its own merit and the financial theory that makes it possible. Some candidates did very well on this question of the theory behind capital structure.

I - This statement is based on Modigliani & Miller's capital-structure irrelevance hypothesis. It assumes no corporate taxes and no bankruptcy cost. If no corporate tax, then the WACC of the firm remains unchanged. It also, assumes that debt can always be borrowed at the risk-free rate of interest. Because of the assumptions, this is a hypothetical, not a real-world situation.

8. Continued

II – This statement makes sense in a world with corporate taxation.
The benefit from a tax shield equals the amount of debt times corporate marginal tax rate.
r_{wacc} =D/(D+E) r_d (1-t) + E/(D+E) r_e, So overall r_{wacc} will decline with increasing debt.

This may be true within a small range; however, the company must be able to increase leverage ratio without affecting cost of debt. Above a certain level, the cost of debt will increase and the cost of capital won't fall forever. So, it is true in a certain range but not outside of that range.

III – This is possible when an investment has risk-free cash flows. A firm can replace these cash flows with 100% debt and leave the overall risk unchanged.

(d)

(i) Discuss four rule of thumb criteria that Duvalt should meet before launching an IPO.

(ii) State two advantages and two disadvantages to Duvalt of going public.

Commentary on Question:
This a straightforward question and most candidates did well. For part (i) instead of stating criteria to make a company ready for an IPO some candidates focused on the effects of doing an IPO itself.

- Earnings before EBITA are at least $10M
- Revenues are at least $100M
- Both EBITA and Revenue are growing more than 25%/year and expected to continue for at least 3 years

- The underwriter of the IPO will also have a set of characteristics they want the firm to possess
- Strong management team and effective governance structure
- Impressive gross margin and profitability growth trends
- Large and growing target market with a strong forecast for the next 12-36 months
- Loyal and growing customer base with demand curve on the rise
- Genuine and demonstrable market niches protected by proprietary technologies or relationships
- Strong game plan for the post-IPO allocation of proceeds….organic growth and M&A

8. Continued

Advantages

- Significantly greater access to capital
- Increased liquidity for the shares
- Market prestige
- Enhancement of the firm's public image
- Flexibly for employee ownership and participation
- Improved opportunities for M&A and additional rounds of financing
- Immediate increase in wealth for firm's founders

Disadvantages

- Expenses (both $ and time) to pursue the IPO
- Required to go through public scrutiny
- Additional regulatory compliance (Sarbanes-Oxley)
- Risk of lawsuits for violating rules or disclosures of a public company

9. Learning Objectives:

3. The candidate will understand how and when to apply various stochastic techniques to situations which have uncertain financial outcomes.

Learning Outcomes:

(3a) Assess the appropriateness of a given stochastic technique to quantify market and non-market risk exposures.

(3b) Recommend the use of techniques that balance the reduction of computational demand versus model accuracy when applying stochastic methodology.

(3c) Assess the results of a given application of stochastic modelling and calibration processes.

(3e) Explain what risk exposures are or are not identified with a given risk metric, assess the implications, and recommend further action.

Sources:

How to Measure Anything, Hubbard – Chapter 6
Stochastic Modeling - Chapter 1
Stochastic Modeling - Chapter 2
Stochastic Modeling - Chapter 3

Commentary on Question:

This question tested the concept that sometimes the most complex model isn't the best model. Candidates who understood why this is true and what parameters of a situation called for a more or less complex model generally did well.

Solution:

(a)

(i) Critique the current foreign exchange rate model.

(ii) Explain why using a stochastic foreign exchange rate model with deterministic interest rates may be appropriate for BMC.

(iii) Explain how to calibrate the CRO's proposed exchange rate model.

(iv) Identify two considerations when using market data to calibrate the CRO's proposed exchange rate model.

9. Continued

(i) **Commentary:** *Better candidates focused on the "Critique" verb at the beginning of the question. Those candidates were able to say something positive and negative about the model.*

The current exchange rate model uses point estimates based on current market inputs. It does not provide information on balance sheet volatility. In addition, there is controversy related to the validity of interest rate parity. Nevertheless, for the purpose of hedging foreign exchange rate risk, this relationship is still widely used

(ii) **Commentary:** *The best candidates understood that stochastic models aren't always the solution to a problem. In a practical scenario, it often comes down to cost vs benefit.*

BMC does not have an interest rate model in place. Using a stochastic interest rate would increase the complexity without necessarily increasing the accuracy. Cost benefit is not justified for using a stochastic interest rate model.

Deterministic interest rate models are simpler, less error-prone, and demand less computation time. For such reasons, practitioners typically prefer using a deterministic interest rate model unless the stochastic interest rate model is already implemented for other reasons.

(iii) **Commentary:** *Many candidates understood that historical data was important to calibrate the model.*

Calibration using historical experience is typically used to set parameters for future scenarios. Choose an appropriate period of market USD/CAD exchange rate. Calculate the standard deviation (vol) of the exchange rate for the chosen period

(iv) **Commentary:** *Candidates gave many different responses for this section. Below are examples of some acceptable candidate answers. Full credit required only two responses and candidates were graded on their first* two *responses.*

Does the chosen experience and calibrated parameters (not the model) reasonably reflect expectations today?
How does increasing period of experience affect the calibrated parameters?
Does the period include any extreme events?
Do we want to include/exclude these events?
How are extreme events incorporated into the parameters?
Is there enough data?

9. Continued

(b)

(i) Compare and contrast the options for each of decisions I-III.

(ii) Justify each decision made by management.

Decision I - true random vs pseudo random number generator

(i) Both are random number generators
True random number generators make use of naturally occurring events as the source of inputs for randomness.
Pseudo random number generators are mathematical algorithms that produce sequences of numbers that only seem to be random

(ii) BMC management selected pseudo random
Justification:
- this is more efficient.
- BMC most likely does not have a random number generator in place
- BMC is not a heavy user of stochastic modeling. Pseudo random is sufficient for BMC's purpose to investigate the volatility of FX.

Decision II - VaR vs CTE

(i) CTE and VaR are both popular risk measures that provide a view of possible future loss.
VaR gives a percentile result of a loss while CTE is an average of losses in the tail. CTE is a coherent risk measure while VaR is not

(ii) BMC management selected VaR.
Justification:
- Although CTE is coherent risk measure, CTE requires more data at the tail to generate a stable result/reduce modeling error.
- Since the relationship between FX and earnings is linear, using VaR is justified.
- VaR is easier for management to understand.

Candidates could receive full credit for arguing that management should have selected CTE as long as candidates were able to justify it AND show how it makes sense for BMC. Better candidates understood that subadditivity wasn't important for BMC and were able to justify using the simpler VaR method.

9. Continued

Decision III - stratified sampling vs importance sampling

(i) Both methods reduce variance of the projections and both select a section to generate random numbers
Stratified sampling divides the distribution into a homogeneous subgroup and sample individually according to its probability
Importance sampling draws samples from the spaces with a larger weight (or the importance path).

(ii) BMC management selected Importance sampling.
Justification:

- Management wants to understand the impact of adverse FX rate movement. Importance sampling can then sample the adverse change in FX rates only.
- Stratified sampling does not work since the only variable in this model is FX rate (everything is homogeneous).

10. Learning Objectives:

3. The candidate will understand how and when to apply various stochastic techniques to situations which have uncertain financial outcomes.

5. The candidate will understand how and when to apply various advanced techniques to evaluate non-hedgeable risk or uncertainty in any business enterprise, especially non-insurance organizations.

Learning Outcomes:

(3a) Assess the appropriateness of a given stochastic technique to quantify market and non-market risk exposures.

(3e) Explain what risk exposures are or are not identified with a given risk metric, assess the implications, and recommend further action.

(5c) Assess the appropriateness of Applied Information Economics (AIE) concepts for risk management.

Sources:

How to Measure Anything, Hubbard - Chapters 4, 6, and 7

Commentary on Question:

This question tested the idea that one of the most important keys is to ask the right question. If you do that, you can measure confidence/risk and take steps to improve your decision making.

Solution:

(a) Co-worker A ranks the risk of program failure as HIGH, MEDIUM or LOW.

Co-worker B estimates the probability of success of the program.

Critique each of the co-worker's methods.

Commentary on Question:

This questions on part (a) and part (b) are testing the candidate's understanding of risk measurement techniques from a practical standpoint. To answer the question completely the candidate should link the key concern of the CEO with the proposed risk model outcomes.

The risk measurement technique proposed by co-worker A is not appropriate because

- The proposed measurement technique is subjective and fails to distinguish the outcomes quantitatively.
- The proposed technique doesn't provide enough information on costs and revenue to help the CEO decide one way or the other.

10. Continued

The risk measurement technique proposed by co-worker B is not appropriate because

- The proposed technique doesn't provide enough information on costs and revenue to help the CEO decide one way or the other.
- The proposed technique doesn't provide adequate information to calculate expected value of the project (profit) which is the ultimate decision-making criteria for the CEO.

(b) Justify the appropriateness of your measurement method.

My proposed risk measurement technique is appropriate because

- The proposed technique provides enough information to calculate expected loss objectively.
- The proposed technique provides adequate information to calculate expected value of the project (profit) which is the ultimate decision-making criteria for the CEO.

(c) Recommend whether to pay for the additional information. Support your recommendation.

Commentary on Question:
Stronger candidates understood the decision-making techniques and how to apply that to solve practical problems. Some candidates approached this backwards in that they looked for the EOL of not doing the program; that was not an appropriate response.

If the program is accepted, the expected opportunity loss (EOL) is \$5M (absolute value of expected loss) X 0.55 (probability of failure) = \$2.75M.

Therefore, in this case expected value of perfect information (EVPI) = EOL = \$2.75M

The cost of obtaining the information (\$3M is more than EVPI). Therefore, I do not recommend spending \$3M to obtain the information.

(d) Explain how the EOL of the rewards program might change if the decision is delayed for three months.

Commentary on Question:
This question tests the candidate's understanding of relationship between EOL and EVPI as well applying the concept of EVPI. Waiting is always valuable but is it more valuable than what you give up by waiting?

10. Continued

The expected value of perfect information (EVPI) reduces over time as there is less uncertainty on program outcomes. As expected opportunity loss (EOL) is equal to EVPI, the EOL is expected to reduce with time as well.
Therefore, EOL will reduce if the decision is delayed by three months.

(e) Identify two shortcomings of Co-worker C's approach.

Commentary on Question:
Most candidates were able to describe why Co-worker C's approach had some issues.

The key shortcomings of Co-worker C's approach are as follows:

- The model assumes a normal distribution, which is a symmetric distribution, for the ticket sales. In reality, the ticket sales are likely to be asymmetric.
- The assumption of normal distribution may generate values which are not reasonable (e.g. negative ticket sales).
- The ticket sales is a discrete variable which is being approximated by a continuous variable in this model. This approximation is likely to introduce some noise in the outcomes.

(f)

(i) Compare the program outcome probabilities between your approach and that of Co-worker C.

(ii) Recommend an improvement to make the model results more consistent between these two approaches.

Commentary on Question:
Candidates needed to understand the probability calculation under a normal distribution and should have realized that either model can work fine as long as they are calibrated correctly.

(i) Co-Worker C assumes a normal distribution for the ticket sales. Under this model,
90% CI upper bound = $\mu + 1.645 * \sigma$
90% CI lower bound = $\mu - 1.645 * \sigma$

the mean ticket sales (μ) = (90% CI upper bound+90% CI lower bound)/2
= (50,000+10,000)/2
= 30,000

10. Continued

the standard deviation (σ) = (90% CI upper bound - 90% CI lower bound)/ (2*1.645)
= (50,000-10,000)/(2*1.645)
= 12,158

The initial cost of the project is $5M and each ticket costs $250.
Therefore, the breakeven ticket sales = $5,000,000/$250 = 20,000.

The probability of 20000 ticket sales in this model is = Normdist [(20,000-μ)/σ]
= Normdist(-10,000/12,158)
= 0.2054

Therefore, the probability of success under co-worker C's model is 20.5% compared to 45% assumed in my model.

(ii) The two models are structurally different and due to the current calibration produce very different results. Both the models can produce useful results as long as they are calibrated correctly. Any bias in the parameter estimation should be removed by bias removal techniques such as repetition and feedback method, equivalent bet or others.

11. Learning Objectives:

4. The candidate will understand how to identify and recommend appropriate model risk assessment and vetting techniques for risk management models.

5. The candidate will understand how and when to apply various advanced techniques to evaluate non-hedgeable risk or uncertainty in any business enterprise, especially non-insurance organizations.

Learning Outcomes:

(4a) Assess methods and processes for quantifying and managing model risk within any business enterprise.

(4b) Design and evaluate stress-testing and back-testing processes.

(4c) Interpret stress-testing and back-testing results.

(5c) Assess the appropriateness of Applied Information Economics (AIE) concepts for risk management.

Sources:

How to Measure Anything, Hubbard - Chapter 7
Measuring Market Risk, Dowd - Chapter 15

Commentary on Question:

The first half of this question tested candidates' ability to apply Applied Information Economics to a business problem, through both calculations and higher-level evaluations. Candidates performed reasonably well on the explanation and critique sections, but many struggled with the calculation sections. The second half of the question asked candidates to evaluate back-testing approaches and apply an intuitive understanding of these approaches to interpret back-testing results. Many candidates did not correctly interpret the back-testing results.

Solution:

(a) Calculate the Expected Opportunity Loss of each option.

Commentary on Question:

Candidates performed moderately well on this question. Many candidates correctly stated the formula; however, many considered each option independently rather than evaluating the tradeoff between the two options. To earn full credit, candidates needed to recognize that the lost savings if the internal development option is successful is an opportunity loss for the vendor option.

11. Continued

The Expected Opportunity Loss (EOL) is equal to the loss if we are wrong times the probability that we are wrong.

EOL if Internal = Comparative costs of failure * Chance of failure

= ($12m + $5m - $10m) * 40% = $2.8 million

EOL if Vendor = Lost cost savings on success * Chance of success

= ($10m-$5m) * 60% = $3 million

(b) Explain how Expected Value of Information could assist in this decision-making process.

Commentary on Question:
Candidates performed moderately well on this section. Some candidates described the Expected Value of Information, but neither explained how it can help determine if it is worthwhile to make additional measurements nor evaluated how it could help in this particular situation.

The expected value of information (EVI) is the reduction in the expected opportunity loss (EVI = EOLafter - EOLbefore).

The EVI results from a reduction in uncertainty due to taking an additional measurement.

In this situation, the EOLs of the options are relatively equivalent, with each option potentially being the wrong decision.

By changing the uncertainty related to the internal development's chance of success, the risk of making the wrong decision could be reduced.

The expected value of information would help us make a decision about whether it's worthwhile to perform additional "measurements".

11. Continued

(c) Critique the CRO's statement within an Applied Information Economics (AIE) framework.

Commentary on Question:
Candidates generally performed well on this section. A full credit answer discussed both the flaws in the CRO's statement and noted that to reach certainty, the CRO's impressions of the cost are correct. In doing so, candidates would discuss the current quantity of information, the expected value and cost of information at that quantity, and how these values change as you approach certainty.

The CRO has only been in the role for a month, so his calibration for the probability of success for the internal development effort does not have much support. In other words, we have a low quantity of information.

With low information quantity, the EVI curve is steep, meaning small improvements in information quantity are valuable.

On the other hand, the cost of obtaining additional information when the information quantity is low is relatively cheap.

As we gain information, the incremental value decreases while the incremental cost increases.

While the CRO is right that the cost of getting to perfect information could be substantial, gaining some information at this stage would provide high value at a low cost.

(d) Determine whether to hire the consultant. Show your work.

Commentary on Question:
Candidates generally struggled with this section. Many candidates continued to look at the options in isolation. Also, many candidates weighted the probabilities of success too early, instead of calculating the EOL reductions under both the increased success rate and decreased success rate scenarios, and then calculating the average EOL reduction at the end.

Since the CRO will pursue the option with the lowest Expected Opportunity Loss, initial estimate's EOL would be $2.8 million, related to pursuing the internal development option.

We must calculate the EOL reduction in both the scenario that the probability of success increases and the probability of success decreases.

11. Continued

If the probability of success increases to 90%, the EOL calculations become:

EOL if Internal = Comparative costs of failure * chance of failure = ($10m + $2m - $5m) * 10% = $.7 million

EOL if Vendor = lost cost savings on success * chance of success = $5 million * 90% = $4.5 million

The CRO would pursue the internal, so our EOL reduction = $2.8m - $.7m = $2.1 million .

If the probability of success decreases to 30%, the EOL calculations become:

EOL if Internal = Comparative costs of failure * chance of failure = ($10m + $2m - $5m) * 70% = $4.9 million

EOL if Vendor = lost cost savings on success * chance of success = $5 million * 30% = $1.5 million

The CRO would pursue the external, so our EOL reduction = $2.8m - $1.5m = $1.3 million

The expected EVI = probability of increase * EOL reduction of increase + probability of decrease * EOL reduction of decrease = 50% * $2.1m + 50% * $1.3m = $1.7m

Because the expected value of information ($1.7m) exceeds the cost ($1m), the additional information should be obtained.

(e) Evaluate whether each of the above approaches is appropriate for back-testing the models.

Commentary on Question:
Candidates performed reasonably well on this section. Some candidates described the back-testing methods, but did not evaluate whether they were appropriate to use in this context, specifically whether the tests would identify if the models would understate large losses or fail to react to changing volatility.

I. Basic Frequency
Not appropriate – The basic frequency back-test measures the frequency of exceedances over a sample period. This test only looks at frequency, and does not capture whether probability of a tail loss is independent and identically distributed (to evaluate whether the model reacts to changing volatility), or whether the model would understate tail losses

11. Continued

II. Conditional Testing (Christoffersen)
Not appropriate – This test examines both the prediction that the frequency of exceedance is correct and that the exceedances are independent of each other. This test would be able to indicate if the model did not respond well enough to changes in volatility, and had grouped exceedances. However, because the sizes of the excess losses are still ignored, the back-test would not be able to indicate whether tail losses are understated.

III. Distribution Equality Tests
Appropriate – These tests transform the daily loss data into their forecast percentiles or cumulative probability values. By doing so, we are able to directly compare our observations based on their size relative to the predicted distribution. By taking into account the size of the excess losses, we would be able to test whether the model understates large losses, and these tests can also be easily adapted to test independence.

(f) Assess the validity of the current model under the three back-testing approaches, I-III.

Commentary on Question:
On this and part (g), candidates were expected to interpret back-testing results based on the three above approaches. Candidates were not given the profit and loss data, but were expected to interpret the graphs and the summary statistics to assess the models. Candidates received credit for both valid and invalid assessments for the same model and back-test, as long as they provided reasonable justification.

I. Basic Frequency
The current model features about 6 exceedances each side, which is about what you would expect given the value at risk percentile. Because the frequency of the exceedances is consistent with expectations, it would likely pass a basic frequency test.

II. Conditional Testing (Christoffersen)
The current model seems to exhibit clustering due to the number of consecutive exceedances, and would appear to fail the Christoffersen test.

III. Distribution Equality Tests
The current model has several instances of very large exceedances, which would likely cause the model to fail tests based on distribution transformations.

11. Continued

(g) Assess the validity of the new model under the three back-testing approaches, I-III.

Commentary on Question:
Same as part(f) above.

I. Basic Frequency
The new model features 3-4 exceedances each side, which is about what you would expect given the value at risk percentile. Because the frequency of the exceedances is consistent with expectations, the new model would likely pass a basic frequency test.

II. Conditional Testing (Christoffersen)
The new model has no instances of consecutive exceedances, and would likely pass the Christoffersen test.

III. Distribution Equality Tests
For the new model, there are instances where the VaR estimates are both slightly and significantly exceeded, giving the impression that the model would pass a test of distribution equality.

12. Learning Objectives:

4. The candidate will understand how to identify and recommend appropriate model risk assessment and vetting techniques for risk management models.

Learning Outcomes:

(4a) Assess methods and processes for quantifying and managing model risk within any business enterprise.

Sources:

Proposed ASOP on Modeling, ASB
Measuring Market Risk, Dowd - Chapter 16
Model Validation for Insurance Enterprise Risk and Capital Models, SOA

Commentary on Question:

This question evaluated candidates' basic understanding of model risk and model validation.

Solution:

(a) Evaluate whether Joe has followed the guidance in the Proposed ASOP on Modeling. Justify your answer.

Commentary on Question:

Most candidates performed reasonably well on this question. A small group of candidates provided answers based on ASOP 23 (Data Quality) instead of the Proposed ASOP on modeling.

Joe has not followed the guidance in Proposed ASOP on Modeling.
Joe took a model designed for a hotel loyalty program and built by someone else (i.e. by the staff in hotel) and then added it to the term pricing model directly. The model from the hotel does not meet the intended purpose of the FTS model. Joe should make a reasonable attempt to have a basic understanding of the model, including:

(i) the designer's or model builder's original intended purpose for the model;
(ii) the general operation of the model;
(iii) major sensitivities and dependencies within the model;
(iv) key strengths and limitations of the model

Joe should also review and evaluate whether the structure of the model is appropriate. Joe should consider modifying the model to improve the model's ability to meet its planned use. When doing this, Joe should consider whether the model can be easily updated for anticipated changes in data, parameters and/or assumptions.

12. Continued

(b)

(i) Identify three sources of model risk that Joe should consider while developing the FTS model.

(ii) Recommend steps Joe can take to mitigate each of the risks you identified in part (i).

Commentary on Question:
Performance for part (b) and part (d) was more mixed. Most candidates performed well, while it was clear that some candidates did not understand the source reading well and were confused about the focus of the question.

The key difference between part (b) and part (d) was to recognize that (b) pertained to model development, while (d) pertained to model validation. Some candidates did not read the question carefully and did not address the correct phase.

(i) Joe should consider any of the three sources of model risks stated below while developing the FTS model:

- incorrect model specification

such as having a bad process, missing risk factors, oversight or mis-specify the relationship between variables (e.g. correlations) in the model assumptions.

- incorrect model application

using the wrong model in the process, for example, using the hotel model even if it does not apply in FTS.

- implementation errors

such as wrong parameters were used in the model, errors made when building the model

- data problems

The model from hotel loyalty program uses the membership reward data combined with points earned from credit cards. Joe needs to find data that is similar to the reward program provided by FTS. Other data problems could be using bad data or the wrong data.

12. Continued

(ii) The following answers are possible mitigation strategies for the model risks identified in (i) above:

- model specification
  - understand the model, be aware of model risk, especially since Joe took the model from a hotel loyalty program
- model application
  - choose the simplest reasonable model
  - test the model against known problems
- implementation errors
  - ensure that calibration is up-to-date and upgrade models to current best practices
  - use back-testing, stress tests, etc.
  - estimate model risk quantitatively
- data problems
  - don't ignore small problems, heed warning signals from small discrepancies
  - plot results and use non-parametric statistics
  - identify, evaluate and check key assumptions

(c) Describe how the team should validate the FTS model according to the Proposed ASOP on Modeling.

Commentary on Question:
Many candidates missed the basic understanding that the model can be validated by testing if it replicates actual experience.

- the actuary should show that each run reasonably represents what is being modeled;
- reconciling relevant input values to actual information, addressing and documenting the differences that appear;
- checking formulas, logic, and table references;
- testing model projection results and comparing against historical results to see if the actual/expected results would have been consistent over a given period;
- taking in-force data by gender and age over the last five years from Term Life and measuring against their claims data.

12. Continued

(d)

(i) Identify three major subcategories of model risks to consider in model validation.

(ii) Describe the validation steps to minimize the model risks you identified in part (i).

Commentary on Question:
As commented above, part (b) and part (d) showed mixed results among candidates. Most performed well, while it was clear that some candidates did not understand the source reading well and were confused about the focus of the question. Some candidates only provided a list for part (i) without further definition.

Candidates received credit for identifying any three of the five subcategories of model risk in model validation and the validation steps to minimize the model risks. All possible responses are listed below.

(i)

1. Conceptual risk - occurs when the model is not suitable for the purpose.
2. Implementation risk - occurs when there are incorrect algorithms or coding errors.
3. Input risk - occurs when inappropriate, incomplete or inaccurate data is being used.
4. Output risk - occurs when the results produced by model do not support the business purpose.
5. Reporting risk - occurs when output is incomplete or misleading

(ii)

1. Conceptual risk:
   - check whether the concept documentation refers to external sources;
   - check that the concept documentation describes how the modeling pieces are connected and why they can be used together;
   - check whether there is enough emphasis on describing the limitations of the concepts;
   - check vendor model concept, this could be more challenging if a vendor does not provide documentation of the limitations;

12. Continued

2. Implementation risk
   - check that the risk modeling experts have been involved in the selection of the algorithms that implement the modeling concepts;
   - check whether everything in the model development is versioned;
   - check whether the accountability for code changes, bug fixes, or improvement is clearly assigned;
   - check whether there is an automated test procedure in place and run regularly;
   - check if a warning signal must be raised if the implementation experts have specified the test cases;
   - check the test coverages;
   - check the test contents;
   - check limitation of the algorithms;
   - check whether the process has been appropriately automated;
   - check whether user acceptance testing has been performed;
   - back testing should be performed when possible.

3. Input risk
   - check that the model input data and parameters are clearly assigned to either raw data or calibrated data;
   - if raw data is used, then check if it has been interpreted correctly and verify the tool does not allow a user to edit the raw data;
   - if a calibrated data is used, then check that the calibration uses the data consistently;
   - check if there is an explanation of any substantial deviation of input parameters used previously;
   - use industry results as a benchmark for major input parameters;
   - verify if there is an effective peer review process in place

4. Output risk
   - check that the correct input data and model version are referenced by the output;
   - check whether the output can be reproduced;
   - check whether breaches of input parameter limits are indicated in the output;
   - check whether documentation exist on the selection of input parameters for sensitivity tests;
   - check if the sensitivities results are documented;
   - check the materiality of input parameters based on the sensitivities;
   - check whether the ranges of output key figures are made available;
   - check whether benchmark models were used to validate the output;
   - check that the analysis of change starts from a validated model and input dataset

12. Continued

5. Reporting risk
    - check that reports clearly state which model and dataset were used;
    - check if business users are made aware of situations in which some of the parameters are outside of a comfort range or limits;
    - check if the frequency and timing of the report is in line with the decision(s) they support;
    - check whether the results are communicated using institutionally accepted metrics that are readily understood by all end users;
    - check whether the report uses means to convey the robustness of key results.

13. Learning Objectives:

2. The candidate will understand how an enterprise's structure and policies allow its management to prioritize and select among projects or business activities that are competing for scarce capital resources especially when opposing factors are key decision criteria.

Learning Outcomes:

(2a) Evaluate how the legal form of an organization, corporate governance, compensation dynamics and other market frictions impact business decisions.

Sources:

Corporate Finance, Berk & Demarzo – Chapter 29
Raising Capital, Sherman - Chapter 2

Commentary on Question:

Overall, candidates did well on this straightforward question, with many showing their familiarity with SOX requirements, the benefits/drawbacks of incorporation, the construction and responsibilities of a Board of Directors as well as compensation structures that mitigate agency risk.

Solution:

(a)

(i) Describe three central themes of SOX which are intended to achieve the goal of providing accurate financial data.

(ii) Explain why SOX is relevant even if Conradz decides to remain privately held.

Commentary on Question:

Most candidates did well on part (i); however, explaining why SOX is relevant even to privately held firms was more of a struggle.

(i)

1) Overhauling incentives and independence of the auditing process.
2) Stiffening penalties for providing false information.
3) Forcing companies to validate their internal financial control processes.

(ii)

1) Some SOX provisions apply to private companies.
2) "Trickle-down" effect of requirements for accountability and responsibility in corporate America that affects board members and executives of companies of all sizes as shareholders look for better, more informed leadership.
3) To be prepared for potential future strategies that may involve an IPO or merger.

13. Continued

(b) Your colleague, Ed, recommends that Conradz form a corporation instead of creating a general partnership. Ed says:

"As a corporation, Conradz owners will have more flexibility, lower costs, limited personal liability, and easier access to capital. In addition, as a corporation, Conradz will avoid the double taxation of income."

Critique Ed's statement.

Commentary on Question:
Almost all candidates were able to identify the elements of Ed's statement that were correct or incorrect, but many didn't provide a true critique as to why.

1) Ed is correct in that corporations have limited liability. Shareholders are not personally liable for corporate debt or claims against the corporation.
2) A corporation has more flexibility in raising money and has no limit to the number of shareholders, but a corporation has less flexibility in that it has to meet a number of registration requirements in order to obtain and maintain corporate status. In addition, a corporation has to answer to shareholders.
3) Ed is incorrect in saying that corporations avoid double taxation of income. Corporations pay taxes on their profits, and shareholders pay income tax on the dividends that they receive.
4) Corporations can be more expensive to form and maintain because of filing fees and annual fees imposed by state agencies and financial authorities.

(c) Describe corporate governance best practices for a Board of Directors with respect to the following:

(i) Size and composition of the Board

(ii) Committee structure

(iii) Experience requirements

(iv) Compensation of Board members

Commentary on Question:
Most candidates were able to describe at least some corporate governance best practices for each of the four items.

13. Continued

(i)
- Smaller boards are associated with greater firm value and performance because smaller groups make better decisions.
- Composition of board should reflect diversity goals.
- Need for outside/independent directors.

(ii)
- Audit committee must be objective and independent to satisfy SOX.
- Nominating committee should have clear selection criteria and adhere closely to established company policy.
- Compensation committee needs appropriate knowledge, skills, and discipline.

(iii)
- Skills should align with the company's business model.
- Skill set of board members should be consistent with the company's strategic goals.
- Succession plans in place for board members.

(iv)
- How compensation affects board objectivity, in particular, whether directors are required to hold stock.
- Performance review process for board members.
- Tie director compensation to company performance.

(d) Identify four general guidelines for the Board of Directors to meet its legal obligations.

Commentary on Question:
Most candidates were able to identify at least a couple of guidelines, with stronger candidates getting four guidelines (including some not listed here).

- Know the principles of corporate law.
- Keep good records.
- Focus on the best interests of all shareholders.
- Avoid conflicts of interest.

(e) Recommend two ways to mitigate agency conflict through management compensation policy.

Commentary on Question:
Candidates were also awarded credit for stating that compensation to managers should be in line with the overall leverage ratio of company.

13. Continued

1) Make part of the managers compensation be the company's stock and related options to give a direct incentive to increase stock price.
2) Tie a manager’s compensation to progress towards long term corporate goals (i.e. market share, corporate financial measures such as ROE, EPS, etc.).