

# QFI IRM Model Solutions

## Spring 2020

### 1. Learning Objectives:

3. Understand and be able to apply different approaches to measuring risk exposures.

### Learning Outcomes:

- (3a) Explain the advantages and limitations of different risk metrics
- (3b) Explain how different approaches and tests form a set of complementary investment risk metrics.
- (3d) Evaluate different measures of rare event risks.

### Sources:

Managing Investment Portfolios, Maginn, John L. & Tuttle, Donald L., 3rd Edition, 2007  
Ch. 9: Risk Management (section 5)

QFII-107-14: Value at Risk, Chapter 14, Third Edition, Jorion

### Commentary on Question:

*This question tested candidates' understanding of Value at Risk, stress testing, and how these two methods complement one another. Candidates performed well on this question.*

### Solution:

- (a)
  - (i) Define 99% daily VaR.
  - (ii) Compare the 99% daily VaR results under both the Monte Carlo and analytical approach.
  - (iii) Recommend the more appropriate VaR method in this situation.

### Commentary on Question:

*Candidates performed well on this question.*

## 1. Continued

- (i) 99% daily VaR is an estimate of the loss expected to be exceeded with a 1% probability over a single day under normal market conditions.
  - (ii) With 500 scenarios modeled, the 99% daily VaR corresponds to the 5<sup>th</sup> worst scenario (scenario rank = 496). Thus, the VaR using Monte Carlo is only \$4M compared, much lower than the VaR using the analytical method, which is only \$10M.
  - (iii) Monte Carlo is the more appropriate approach.
    - The analytical method is inappropriate because it assumes a normal distribution. This portfolio contains both stocks and options, which do not follow a normal distribution.
    - A Monte Carlo simulation can handle many different distributions as well as the non-linearity of options.
- (b)
- (i) Explain why the approach proposed by the CRO is not appropriate.
  - (ii) Recommend an alternate approach to determine the capital requirement.

### **Commentary on Question:**

*Most candidates performed well on part (i). Few candidates were able to justify their recommendation of an alternate approach in part (ii).*

- (i)
  - The timeframe proposed by the CRO is much too short. The past five years may not include an event like the 1987 market crash, or even a full economic cycle.
  - VaR is also not a good tool for estimating the impact of an extreme event like a market crash. VaR is best used under normal market conditions as it often underestimates the magnitude and frequency of the worst returns.
- (ii)
  - Stress testing is recommended as a supplement to VaR.
  - A historical scenario can be created based on the market crash of 1987 to help understand the circumstances that would lead to extreme losses and test if the firm's losses would exceed the \$25M limit.

# 1. Continued

(c)

- (i) Describe each method above.
- (ii) Recommend the most appropriate method to assess the tail risk of the new asset class.

**Commentary on Question:**

*Many candidates did not capture key features of each method in part (i). Most candidates performed well on part (ii).*

(i) Standard Portfolio Analysis of Risk (SPAN):

- Unidimensional approach that identifies movements in portfolio values under a series of scenarios, selecting the scenario that results in the largest loss.
- The same probability is placed on the scenarios, ignoring correlations between risk factors.

Prospective Scenarios:

- Represent hypothetical scenarios created with input from managers who are most familiar with the firm's business and the extreme events that might affect it.
- Multidimensional approach that could include correlations, depending on structure.

Historical Scenarios:

- Use historical data to provide examples of joint movements in financial variables.
- Multidimensional approach that incorporates correlations.

(ii)

- Prospective scenarios are the most appropriate method to assess the tail risk. These scenarios can be tailored to best reflect the risk exposure associated with a new asset class.
- SPAN is typically used to set margin requirements for futures and options and does not consider correlation.
- Historical events might not be applicable for this particular private equity fund.

## 1. Continued

(d)

- (i) Describe two shortcomings with your approach to quantifying tail risk.
- (ii) Recommend two improvements to your approach to quantifying tail risk.

**Commentary on Question:**

*Candidates performed well on this question.*

(i)

- This approach does not consider correlation and the diversification benefits between each of the risks.
- Three sigma movements in these risk factors may not be able to capture the risks associated with the portfolio.

(ii)

- Use sensitivity analysis to test the functional form of the model.
- Account for diversification benefits by factoring in correlations between variables. This might be done by using a copula to model tail dependencies.

## 2. Learning Objectives:

1. The candidate will understand the requirements and methods of governing investments.

### Learning Outcomes:

- (1b) Identify sources of unethical conduct and explain the role of a fiduciary.
- (1c) Describe governance mechanisms that attempt to address these conflicts.
- (1d) Understand the importance of an organizations culture in effectuating governance.

### Sources:

IAA Note on ERM for Capital and Solvency Purposes in the Insurance Industry

Investment Ethics, Ch. 7, Peck

QFII-111-17: Tracing the True Origins of Bad Behavior

QFII-103-14: Advances in Risk Management and Risk Governance

### Commentary on Question:

*This question tested the candidates' understanding of ethics and governance. It asked them to recall examples of unethical behavior and tested their ability to apply corporate governance principles. Candidate performance was fair on this question.*

### Solution:

- (a) List two components of the CEO's role with respect to ERM.

#### Commentary on Question:

*Candidates performed well on this question.*

- Promoting risk management/control framework with risk tolerances.
- Providing periodic assurance to Board about effectiveness and adequacy of risk management.

#### (b)

- (i) Describe briefly two case studies where weak corporate governance permitted senior management to make poor ethical decisions.
- (ii) Explain why focusing on senior management is not adequate when developing a corporate governance framework.

## 2. Continued

### **Commentary on Question:**

*Candidates performed poorly on this question vs. the rest of the question. Many candidates were unable to recall relevant case studies or provide sufficient descriptions in part (i). Most candidates performed well on part (ii).*

(i)

- Example #1: Countrywide
- Description:
  - CEO was also Chairman of the Board and charged with insider trading.
  - Others on board of directors also had conflicts of interest.
  - Clear lack of independence and oversight within the organization.
- Example #2: Barings Bank
- Description:
  - Actions of lower-level employees were not adequately managed
  - For example, insufficient disclosure protocol led to unethical action at lower levels.

(ii)

- Senior management may be overly optimistic.
- The culture within the department, not senior management, tends to drive behavior, especially at lower levels.

- (c) Recommend three actions senior management can take to immediately counter behavioral issues at the lower management levels.

### **Commentary on Question:**

*Candidates performed well on this question.*

- Implement risk-adjusted rewards, so that success is measured relative to risk taken.
- Educate staff to promote awareness.
- Rotate employees to discourage entrenchment and/or unethical alliances.

- (d) Propose how you would combine the above five committees into A, B, and C.

### **Commentary on Question:**

*Candidates performed well on this question. Multiple committee structures received full credit. Below is an example.*

## 2. Continued

- A – Audit and Compliance
- B – Nomination and Compensation
- C – Risk

*Note: Credit was lost if candidates combined Audit and Compensation, which should be kept independent from each other.*

- (e)
- (i) Assess the suitability of each candidate for the board.
  - (ii) Recommend the most appropriate committee (A, B, or C per part d) for each suitable candidate.

**Commentary on Question:**

*Candidate performance was fair on this question. Most candidates accurately assessed each candidate's suitability in part (i). Many candidates did not recommend the most appropriate committee for each suitable candidate in part (ii).*

- (i)
  - W – not suitable due to conflicts of interests and potential entrenchment.
  - X – potentially suitable; external experience is a positive factor.
  - Y: suitable; external experience is relevant and now has more time since retired.
  - Z – potentially suitable; external experience but would need to address relationship with CEO.
- (ii)
  - X – Committee A, compliance is compatible with IT experience.
  - Y – Committee A, audit is most closely related to accounting experience.
  - Z – Committee B, compensation and nomination is suitable for an external advisor.

### 3. Learning Objectives:

2. The candidate will understand and be able to apply the components of an effective risk management system.

#### Learning Outcomes:

- (2b) Identify and describe the various kinds of risks, including market, credit, operational, etc.
- (2c) Identify and describe various approaches for managing risks including risk budgeting, position limits, etc.
- (2d) Explain the features of a best practices enterprise risk management.
- (2f) Examine examples of risk management failure.

#### Sources:

QFII-103-14: Advances in Risk Management and Risk Governance

Ch. 8: Risk Identification, Financial Enterprise Risk Management, Sweeting, Paul, 2nd Edition, 2017

Ch. 9: Risk Management (sections 1-4 and 6), Managing Investment Portfolios, Maginn, John L. & Tuttle, Donald L., 3rd Edition, 2007

The Top Ten Operational Risks: A Survival Guide for Investment Management Firms and Hedge Funds, Miller and Lawton, 2010

#### Commentary on Question:

*This question tested candidates' understanding of effective enterprise risk management principles. Candidates performed well on this question.*

#### Solution:

- (a) You are the supervisor of a new employee in the risk management department of an investment management firm. The employee attended an internal training on risk management best practices and wrote the following notes.
  - The entire firm is collectively accountable when a risk issue arises. Effective risk management requires participation by everyone.
  - The Chief Risk Officer should be independent since it is strictly a policing role.
  - Compensation should be adjusted for risk using the standard deviation of returns.

Critique each statement above.



### 3. Continued

**Commentary on Question:**

*Candidates performed well on this question.*

- An effective risk management system should have an enterprise-wide scope and participation by everyone, but there should be one person accountable when a risk issue arises (e.g., CRO).
- The CRO should be independent but should also have a strategic role in addition to policing role.
- Compensation to be adjusted for risk, but risk should not solely be assessed using standard deviation of returns.

(b)

- (i) Describe two potential benefits of using a survey as a risk identification technique.
- (ii) Describe three potential problems your team could face while conducting this survey.
- (iii) Propose a way to overcome each potential problem identified.

**Commentary on Question:**

*Candidates performed very well on this question.*

- (i)
  - Can canvas a larger group and cover a wider range of risks
  - Limits degree to which participants may influence each other
- (ii)
  - The way questions are asked can influence responses
  - Low response rate could invalidate the results
  - Collecting and analyzing information may be challenging
- (iii)
  - Conduct a pilot survey first to help ensure questions are as unambiguous as possible and that the full survey gives results that are as useful as possible.
  - Monitor and require certain participation levels to ensure adequate representation by key business units.
  - Consider using a mix of multiple choice and free response. Multiple choice is easier to quantify, but limits responses. Free response can be used instead but is difficult to analyze.

### 3. Continued

- (c) Critique the employee's risk budget concern.

**Commentary on Question:**

*Candidates performed well on this question.*

- The sum of risk budgets for individual units are expected to exceed the risk budget for the organization due to diversification.
- Unless the individual units are perfectly correlated, this should generally be the case and the employee's observation is not cause for concern.

- (d) Recommend an action that management should take based on a risk budgeting analysis.

**Commentary on Question:**

*Candidates performed poorly on this question. Many candidates did not provide appropriate supporting analysis to justify their recommendation.*

This implies there is no diversification benefit and management should close the less efficient business.

- BU1:
  - Return on capital is 2% for BU1 (10/500)
  -
- BU2:
  - Return on capital: 3% (30/1000)
- Organization:
  - Return on capital: 2.67% (40/1500)
  - Return on risk budget: 26.7% (40/150).
- Returns if BU1 is closed:
  - Return on capital: 3%
  - Return on risk budget: 30% (3%\*1500/150).
- Returns if BU2 is closed:
  - Return on capital: 2%
  - Return on risk budget: 20% (2%\*1500/150).
- Recommend closing BU1 and reallocating to BU2, as this maximizes both the organization's return on capital and return on risk budget.

### 3. Continued

(e)

- (i) Describe four “Top Ten” operational risks which may have contributed to the problems with the firm’s risk budgeting. Support your answer with facts from the table.
- (ii) Recommend improvements to address the four risks from (i).

**Commentary on Question:**

*Candidates performed well on this question.*

(i)

- Novices, Apprentices, and Soloists
  - The number of risk management employees has remained relatively stable, but with significant number of new employees being added.
  - The firm may have lost key personnel responsible for risk budgeting.
- Playbooks
  - Lack of workflow documents (only 1 starting in 2Q)
- Poor Planning and Slow Response Times
  - The risk metric has been increasing and competitor activity has also shown significant changes.
  - Could indicate some fundamental shift in the environment or marketplace that the firm is not responding to.
- Complacency
  - The risk metric keeps increasing yet there is no management action or change in the risk budget.

(ii)

- Novices, Apprentices, and Soloists
  - Enhance training and/or cross-training (e.g., lunch-and-learns, job rotation, job shadowing, etc.).
- Playbooks
  - Create and maintain useful workflow documents; and ensure staff follow workflows, policies, and procedures as documented.
- Poor Planning and Slow Response Times
  - Keep abreast of emerging developments in the environment, marketplace, and other external factors.
  - Consider benchmarking against peers/competitors.

### **3. Continued**

- Complacency
  - Adopt a more proactive approach toward operational risk.
  - Be more receptive to feedback and consider whether news of a risk is rewarded, punished, or ignored.

#### 4. Learning Objectives:

3. Understand and be able to apply different approaches to measuring risk exposures.

#### Learning Outcomes:

- (3a) Explain the advantages and limitations of different risk metrics.
- (3b) Explain how different approaches and tests form a set of complementary investment risk metrics.
- (3e) Evaluate a company's or a portfolio's exposures to various risks.

#### Sources:

Value at Risk, Third Edition, Jorion Chapters 7 & 17

#### Commentary on Question:

*This question tested the candidate's understanding of the benefits, mechanics, and uses of VaR in a portfolio management context. Candidates performed poorly on this question.*

#### Solution:

- (a) Compare and contrast Marginal VaR and Incremental VaR.

#### Commentary on Question:

*Candidate performance on this question was fair. While most candidates were able to provide a relevant distinction between Marginal and Incremental VaR, many candidates did not provide any similarities nor the efficiency benefits of using Marginal VaR.*

- Incremental VaR is the exact change in VaR due to a trade,  $VaR_{\text{new}} - VaR_{\text{old}}$
- Marginal VaR is the change in VaR per dollar change in each of the assets
- Both are risk measures that capture the change in VaR
- Marginal VaR can be used approximate the exact Incremental VaR
- Using Marginal VaR is significantly faster than recalculating the exact Incremental VaR when many potential trades are involved

- (b)
  - (i) Estimate the incremental 95% annual VaR for the proposed position above using the marginal-VaR method.
  - (ii) Calculate the incremental 95% annual VaR for the proposed position above from a full revaluation of the portfolio.
  - (iii) Explain why the results from (i) and (ii) are different.

## 4. Continued

### Commentary on Question:

*Candidates performed poorly on this question. Some candidates applied correct formulas for parts (i) and (ii), but most did not calculate correctly.*

(i)

First calculate  $\Sigma w$ :

$$\begin{bmatrix} \sigma_1^2 & \rho\sigma_1\sigma_2 \\ \rho\sigma_1\sigma_2 & \sigma_2^2 \end{bmatrix} \begin{bmatrix} w_1 \\ w_2 \end{bmatrix} = \begin{bmatrix} .01 & .003 \\ .003 & 0.09 \end{bmatrix} \begin{bmatrix} \frac{2}{3} \\ \frac{1}{3} \end{bmatrix} = \begin{bmatrix} .00767 \\ .03200 \end{bmatrix}$$

From this we obtain the marginal VaR vector by normalizing and multiplying by the 95% one-sided z-value. Normalizing requires first calculating  $\sigma_p$  via:

$$\begin{aligned} \sigma_p &= \sqrt{w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + 2\rho w_1w_2\sigma_1\sigma_2} \\ &= 12.56\% \end{aligned}$$

Then we obtain the marginal vector:

$$\Delta VaR = \frac{1.65}{\sigma_p} \times \begin{bmatrix} .00767 \\ .03200 \end{bmatrix} = \begin{bmatrix} 0.10039 \\ 0.4203 \end{bmatrix}$$

Multiplying this vector by the change in assets due to the trade gives:

$$\begin{bmatrix} 0.10039 \\ 0.4203 \end{bmatrix} \times [\$2500 \quad -\$2500] = \$251 - \$1048 = -\$798$$

(ii)

Using the equation

$$\sigma_p = \sqrt{w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + 2\rho w_1w_2\sigma_1\sigma_2}$$

one can obtain the standard deviation of both portfolios:

$$\sigma_p^0 = 12.56\%$$

$$\sigma_p^1 = 10.14\%$$

Then, each individual 95% VaR can be calculated directly:

$$VaR_0 = 1.65 \times 15,000 \times 12.56\% = \$3,099$$

$$VaR_1 = 1.65 \times 15,000 \times 10.14\% = \$2,501$$

Thus:

$$Incremental VaR = VaR_1 - VaR_0 = -\$598$$

## 4. Continued

(iii)

- Executing the trade reduces VaR at the 95% level by exactly \$598
- The Marginal-VaR method significantly overestimates the decrease in VaR, due to the large amount of the trade relative to the starting positions.
- The benefits of increasing weight in the lower volatility asset (i.e. reduction in VaR) are decreasing with increasing weight in this asset, which is not captured using the Marginal VaR approximation method.

(c) Describe active-management risk and policy-mix risk.

**Commentary on Question:**

*Candidates performed well on this question.*

- Policy-Mix Risk is the risk of loss due to the policy-mix (asset allocation) of a fund as implemented with benchmark/passive funds.
- Active Management Risk is the risk of loss due to the deviations from benchmarks by managers.

(d)

- (i) Critique your colleague's statements above.
- (ii) Explain whether increasing active management is appropriate with respect to fund performance and risk limit.

**Commentary on Question:**

*Candidates performed poorly on this question. Most candidates did not explain that active management risk is positively correlated with the policy-mix risk.*

(i)

- The result may be due not to small deviations by managers but rather to negative correlations between deviations by managers.
- Since the Total VaR exceeds the sum of policy-mix VaR and active-management VaR, active management is positively correlated with the policy mix

(ii)

- Increasing active management is not appropriate
- Total VaR is close to the 20% limit
- Increased active management would increase Total VaR, due to positive correlation between active management VaR and policy mix VaR.

## 4. Continued

(e) You review Fund B's investment guidelines, which include the following components:

- Asset class restrictions
- Notional limits for each asset class
- Duration gap limits between the portfolio and benchmark

Explain one shortcoming of each component.

**Commentary on Question:**

*Candidates performed poorly on this question. Some candidates could explain shortcomings for notional limits, but most candidates did not explain shortcomings for the other two components.*

- Asset class restrictions can often be skirted by use of specially tailored assets.
- Notional limits do not account for correlations between assets and/or leverage.
- Duration gap limits fail to capture higher-order risks (e.g. convexity).



## **5. Learning Objectives:**

2. The candidate will understand and be able to apply the components of an effective risk management system.

### **Learning Outcomes:**

- (2b) Identify and describe the various kinds of risks, including market, credit, operational, etc.
- (2c) Identify and describe various approaches for managing risks including risk budgeting, position limits, etc.
- (2e) Evaluate a company's risk management process.
- (2f) Examine examples of risk management failure.

### **Sources:**

Ch. 8 of Financial Enterprise Risk Management, Sweeting, Paul, 2nd Edition, 2017

Ch. 20 of Financial Enterprise Risk Management, Sweeting, Paul, 2nd Edition, 2017

ERM-127-17: Quantitative ERM, Chapter 2 Risk Taxonomy, Hardy

The Top Ten Operational Risks: A Survival Guide for Investment Management Firms and Hedge Funds, Miller and Lawton, 2010

QFII-117-19: Chapter 7 of Strategic Risk Management Practice: How to Deal Effectively with Major Corporate Exposures, Andersen & Schroder

### **Commentary on Question:**

*This question tested candidates' understanding of various non-financial risks. Candidates performed well on this question.*

### **Solution:**

- (a)
  - (i) List two significant non-financial risk categories that contributed to the collapse of Equitable Life.
  - (ii) Explain how Equitable Life failed to address each of these risks.

### **Commentary on Question:**

*Candidates performed well on this question.*

## 5. Continued

(i)

- Legal Risk
- Operational Risk

(ii)

- Legal Risk: Equitable incorrectly assumed the courts would agree with its use of bonuses to offset the GAR liability
- Operational Risk: The CEO and Chief Actuary were the same person, which is a conflict of interest. CEO is focused on interest of shareholders, and Chief Actuary is focused on policyholders.

(b) One of ABC's consultants observing the current risk management practices made the following comments:

1. Currently risk identification and analysis are performed by the same group of individuals, but these functions should always be independent.
2. ABC can conduct Gap Analysis by exclusively surveying executives.
3. ABC's risk identification process should require input from multiple independent departments in order to avoid convergent thinking.
4. The Delphi Technique is appropriate for ABC since it is a small company with several experts willing to participate in risk management activities.

Assess each of the statements above.

### **Commentary on Question:**

*Candidate performance was fair on this question. Most candidates assessed at least two statements well.*

- Quantifiable risks typically require specialized expertise and therefore is usually performed by a different team. However, unquantifiable risks are not restricted by this, so they are often analyzed and identified by the same team.
- It is important to include participants who know the desired and actual levels of risk exposure. While executives know the desired levels of risk exposure, more junior members will be able to provide insight to the actual levels of risk exposure.
- Involving independent participants does not in itself avoid convergent thinking. The method of collecting responses from the participants, not the composition of the participants, determines whether convergent thinking applies.
- No improvements need to be made. Delphi Technique works better with small teams of experts, since it requires multiple iterations of surveys.

## 5. Continued

- (c) Identify and explain the two most important operational risks for each option.

**Commentary on Question:**

*Candidate performance was fair on this question. Some candidates did not identify and explain two risks for each option.*

- First Option
  - Project Risk: There is the risk that the project will not go as planned, resulting in investment losses and/or opportunity cost. This includes the cost of establishing the relationship with the third party distributors, building the infrastructure for the agents, training, etc.
  - People Risk: Since agents will be competing against the third party distributor, some may feel pressured to act unethically to achieve sales.
- Second Option
  - Technology risk: Increasing the company's reliance on technology will inevitably increase exposure to security breaches and potential loss of data.
  - Blind Leading the Blind: Company does not have technology expertise, which can create a situation where managers make suboptimal decisions due to misunderstanding the project needs.

- (d)

- (i) Describe selectionism and trial-and-error learning approach.
- (ii) Recommend the most appropriate approach in this situation.

**Commentary on Question:**

*Candidates performed well on this question.*

- (i)
  - Selectionism: Parallel tests are set up for the 2 options tested to evaluate the effectiveness of each. Over time, the worse option(s) drop off and are no longer considered, until only the best option remains.
  - Trial-and-error learning: Identify the best option based on planning considerations, and then make adjustments as needed based on results.

## 5. Continued

(ii)

- Learning is most appropriate. When the relative cost of parallel trials is higher, then learning is preferable, regardless of the complexity of the competitive environment.
- Parallel trials are more expensive to implement than learning because it requires sustaining the costs of both options simultaneously until the best approach is found.
- There is no corresponding sense of urgency with identifying the best solution quickly to justify this expense.

## 6. Learning Objectives:

1. The candidate will understand the requirements and methods of governing investments.

### Learning Outcomes:

- (1a) Compare the interest of key stakeholders.
- (1f) Demonstrate understanding of how ethics relates to business decision-making, and relate ethics in business to personal ethics.

### Sources:

QFII-101-14: Ch. 11 of Strategic Management: An Integrated Approach, Hill & Jones

Investment Ethics, Ch. 3, Peck

### Commentary on Question:

*This question tested candidates' understanding of the interests of key stakeholders as well as how ethics relates to decision-making. Candidate performance was fair on this question.*

### Solution:

- (a) Explain how HAQ's high fees could impact the short-term and long-term interests of its stockholders and XYZ.

#### Commentary on Question:

*Candidates performed well on this question.*

#### HAQ's stockholders

- Short-term: High fees will increase HAQ's profits, which aligns with stockholder interests.
- Long-term: High fees can result in HAQ losing clients to asset managers with lower fees, which will decrease profits and therefore hurt stockholder interests.

#### XYZ

- Short-term: High fees will decrease investment returns, which is against XYZ's interests.
- Long-term: High fees will continue to decrease investment returns. XYZ may seek a different asset manager if fees remain high.

- (b) Critique each bullet above from an ethics perspective.

#### Commentary on Question:

*Candidates performed well on this question.*

## 6. Continued

- Bullet 1: This is ethical. Returns should be presented net of fees and trading costs to provide a transparent view of returns.
- Bullet 2: It may be unethical to exclude terminated accounts. Clients may have terminated due to poor performance, so excluding them would result in overstated composite returns.
- Bullet 3: It may be unethical to assume past returns continue into future projections. Future returns will vary based on many factors such as changing market conditions or changes in the investment management team.

(c)

- (i) Critique Manager A's methodology for reporting performance.
- (ii) Recommend improvements, if any, to the methodology for reporting performance.
- (iii) Calculate the performance based on your proposed improvements.

### **Commentary on Question:**

*Candidate performance was fair on this question. Many candidates were able to answer parts (i) and (ii) correctly, but most struggled to provide an appropriate calculation in part (iii).*

(i)

- Manager A is only reporting the average annual return for the past 5 years, excluding 2014's performance, which was negative. This 5-year time horizon is not a full market cycle and this reporting could be considered unethical as a result.
- Using a simple average of the past 5 years is an unethical method because it overstates performance.

(ii)

- A more appropriate alternative is showing the holding period return, which would show the client what was actually earned based on dollars invested and ending amounts.
- Increasing the holding period to use data since inception. This change will increase transparency and include a more complete economic cycle by incorporating the negative returns 6 years ago.

(iii)

- Holding period return since inception =

$$[1.19 \times 1.082 \times 1 \times 1.066 \times 1.071 \times 0.944] - 1 = 38.8\%$$