
SOCIETY OF ACTUARIES
QFI Investment Risk Management Exam

Exam QFIIRM

Date: Tuesday, November 1, 2016

Time: 2:00 p.m. – 4:15 p.m.

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This examination has a total of 40 points.

This exam consists of 5 questions, numbered 1 through 5.

The points for each question are indicated at the beginning of the question.

2. Failure to stop writing after time is called will result in the disqualification of your answers or further disciplinary action.
3. While every attempt is made to avoid defective questions, sometimes they do occur. If you believe a question is defective, the supervisor or proctor cannot give you any guidance beyond the instructions on the exam booklet.

Written-Answer Instructions

1. Write your candidate number at the top of each sheet. Your name must not appear.
2. Write on only one side of a sheet. Start each question on a fresh sheet. On each sheet, write the number of the question that you are answering. Do not answer more than one question on a single sheet.
3. The answer should be confined to the question as set.
4. When you are asked to calculate, show all your work including any applicable formulas. When you are asked to recommend, provide proper justification supporting your recommendation.
5. When you finish, insert all your written-answer sheets into the Essay Answer Envelope. Be sure to hand in all your answer sheets because they cannot be accepted later. Seal the envelope and write your candidate number in the space provided on the outside of the envelope. Check the appropriate box to indicate Exam QFIIRM.
6. Be sure your written-answer envelope is signed because if it is not, your examination will not be graded.

Tournez le cahier d'examen pour la version française.

****BEGINNING OF EXAMINATION****

1. (7 points) Samantha joined a leading asset management company, ZKP Life, as the Chief Risk Officer. ZKP Life uses one-week VaR(95) as the main risk measure for all its portfolios. The VaR of the portfolio is measured using the historical simulation method.

(a) (1 point) Describe the advantages and disadvantages of using the historical-simulation method to estimate VaR (95).

A few analysts calculated a weekly VaR (95) using the historical simulation method and obtained different estimates.

(b) (1 point) Explain possible reasons for the differences in the estimates.

(c) (1 point) Recommend two approaches to address the issue of multiple estimates from historical simulation method when reporting VaR.

Samantha is considering using correlation matrix to evaluate tail dependency of the portfolio.

(d) (0.5 points) Identify a family of distributions where using correlation matrix is appropriate.

The Chief Actuary asks Samantha to recommend a risk aggregation model for a variety of asset classes. Samantha is exploring the following three approaches for the dependency structure:

- Linear Correlation
- Rank Correlation
- Copula

(e) (1.5 points) Compare and contrast these three approaches.

(f) (2 points) Recommend an approach that is most appropriate to model multi-risk factors dependency structure of credit default risk of structured assets and justify your recommendation.

2. (8 points) David recently joined the risk management division of ABC Fund Management Company. The company offers a variety of services such as private wealth management, pension fund management and risk management. ABC has over 30 fund managers with \$20 billion assets under management.

As a way to maximize risk adjusted returns, ABC has been looking into the various methods to evaluate the investment performance. The Sharpe Ratio and the Sortino Ratio have been proposed as possible metrics.

- (a) (1 point) Compare and contrast the functionality of the Sharpe Ratio and the Sortino Ratio.

David is comparing the risk-return performance of two portfolios, A and B. The table below compares key metrics for the two portfolios.

	Portfolio A	Portfolio B
Mean Portfolio Return	8%	5%
Risk Free Rate	3%	3%
ABC's Minimal Acceptable Return	4%	4%
Maximum Return	35%	20%
Minimum Return	-40%	-10%
Standard Deviation	29%	5%
Coefficient of Variation	3.6	1.0
Downside Deviation	15%	5%

- (b) (2.5 points)
- (i) Calculate the Sharpe Ratio and Sortino Ratio for each portfolio.
- (ii) Evaluate which portfolio's performance is better based on your response from b(i).

In addition to assessing the risk-return performance, David used tracking error to measure risk against their respective benchmarks.

- (c) (1 point) Describe two disadvantages of using tracking error as a risk measure.

2. Continued

ABC did not pay special attention to setting appropriate benchmarks and they used the S&P 500 Index as the benchmark for both portfolios. Portfolio A experienced an ex-post tracking error of 200bps and Portfolio B experienced an ex-post tracking error of 100bps. David's colleague makes the following statement:

“Since Portfolio B has a lower tracking error, its manager is more effective than Portfolio A's manager.”

(d) (1 point) Critique the above statement.

A year after implementing the performance and risk measures, David reassesses the performance of the two portfolios. David employs his own metric Ω :

$$\Omega = \frac{\text{Realized Tracking Error}}{\text{Forecasted Tracking Error}}$$

Forecasted Tracking Error reflects the expected variance from the forecasted performance of the benchmark.

He observes this metric monthly over a one year period. Below are statements about David's risk metric:

- A fund manager who achieves $\Omega = 1.5$ is more effective than another fund manager who achieves $\Omega = 1.7$.
- The forecasted tracking error should be lower if the S&P500 is replaced by a more representative index as the benchmark.
- Changing the benchmark will encourage fund managers to execute the investment strategy more effectively.
- David's metric encourages fund managers to maximize risk.

(e) (2.5 points) Critique each of the statements.

3. (8 points) You have recently taken a new job as a risk manager for an investment management firm, FundPro. Your colleague is concerned about accounting risks in light of potential new regulations. You are also worried about other risks that could emerge.

- (a) (1 point) List two ways FundPro might cope with these accounting risks.
- (b) (1.5 points) Describe three risk identification tools that will help identify other emerging risks.

Prior to this role, you worked for five years in risk management in the banking industry.

- (c) (1 point) Identify and explain two biases that you might bring into your new role in the investment fund industry based on your past experience.

You quickly discover that the risk culture of the firm is not very healthy. You noted the following characteristics of FundPro's risk culture:

- The company's objective is to avoid losses.
- FundPro's risk culture includes a significant amount of policies and procedures.
- Risk management training is provided to managers only in order not to distract other workers from focusing on their daily responsibilities.

- (d) (1.5 points) Critique FundPro's risk culture based on these characteristics.

To improve the risk culture, you propose that more investment data be made available to all employees in real-time.

- (e) (1 point) Explain the importance to risk management of making real-time daily Net Asset Values (NAV) widely available.

3. Continued

Based on your feedback, end of day NAV for the firm's funds as well as other economic data are now easily accessible on the company intranet site. Three weeks worth of data on the FundPro's LargeCapEquity fund are shown below.

Date	S&P500 Daily Return (%)	End of Day LargeCapEquity NAV (\$M)	Daily Change in LargeCapEquity NAV (%)
1-Jul	-0.07%	100.0	-0.20%
2-Jul	-0.18%	99.8	-0.23%
3-Jul	0.62%	100.2	0.47%
5-Jul	0.46%	101.0	0.56%
8-Jul	1.52%	102.6	1.63%
9-Jul	0.70%	103.4	0.72%
10-Jul	2.05%	105.4	1.92%
11-Jul	0.88%	106.3	0.93%
12-Jul	0.02%	106.5	0.12%
15-Jul	-0.83%	105.5	-0.93%
16-Jul	0.00%	105.6	0.14%
17-Jul	1.31%	106.9	1.23%
18-Jul	-0.83%	106.0	-0.89%
19-Jul	0.71%	106.6	0.61%
22-Jul	-1.78%	104.6	-1.86%
23-Jul	1.49%	106.2	1.47%
24-Jul	0.27%	106.5	0.29%
25-Jul	0.31%	107.0	0.48%

Today is July 26th and you are reviewing fund values. You are reviewing the following 3 scenarios for the July 26th daily performance:

- Scenario 1 – Daily S&P Return: -1.26%, End of Day Fund NAV: 105.8
- Scenario 2 – Daily S&P Return: 0.71%, End of Day Fund NAV: 109.8
- Scenario 3 – Daily S&P Return: -0.38%, End of Day Fund NAV: 107.5

(f) (2 points) Assess the reasonableness of the fund NAV for each scenario.

4. (10 points) XYZ is a large stock company with many stakeholders. The Board of Directors of XYZ would like you to conduct a stakeholder impact analysis to better understand the key stakeholders.

(a) (1 point) List the key steps of a stakeholder impact analysis.

Your stakeholder impact analysis revealed the following key stakeholders:

- Stockholders
- Bondholders
- Managers
- Suppliers
- Customers
- Employees

(b) (0.5 points) Categorize the above stakeholders into internal and external stakeholders.

(c) (2 points) Assess the importance of current profitability and future profit growth for each of the stakeholders above.

(d) (1.5 points) Identify two additional stakeholders of XYZ and explain how they would have an interest or stake in the company.

The Board of Directors of XYZ is reviewing the agency problem within the company. Some directors are worried that some agents like the CEO may be taking advantage of the information asymmetries to maximize their own interests at the expense of stockholders. One Board member makes the following comment:

“There is nothing good about information asymmetry between the CEO and stockholders so we have nothing to lose by completely opening information channels between the firm’s management and our stockholders.”

(e) (1 point) Critique the above statement.

4. Continued

The Board is considering ways to mitigate the agency problems through a pay-for-performance system for senior managers. A member has proposed giving managers stock options as a part of their compensation.

- (f) (2.5 points)
- (i) Evaluate the advantages and disadvantages of partly compensating senior managers by granting them stock options.
 - (ii) Describe two other governance mechanisms that would mitigate agency problems.

XYZ is having trouble competing with overseas competitors that have access to low cost labor. The CEO is proposing closing down its marginally profitable manufacturing operations in the U.S. and moving them to a developing country. The developing country is known for not complying with basic environment standards and working conditions. In terms of pure economics, the developing country definitely provides an advantage, which the CEO argues will be favorably received by the company's stockholders.

- (g) (1.5 points) Critique the CEO's proposal.

5. (7 points) You are a manager in an investment management firm. You are reviewing a hedge fund that has consistently outperformed the market. You believe the reason for the higher-than-market returns may be due to some overlooked risks. While your firm is sophisticated in managing market and economic risks, you believe it should also be looking into operational risks.

(a) (2.5 points) Define the following risks and describe two examples of each:

- (i) Market risk
- (ii) Operational risk

You find the hedge fund's team has a competent employee that has been doing most of the portfolio trading and reconciling the books. He set up documentation during a thorough due diligence review a few years ago. The hedge fund team feels confident everything has been reviewed.

(b) (1.5 points) Recommend three potential improvements to the hedge fund's operations.

You want to emphasize the potential impact of these operational problems so you mention to your boss the case of Long Term Capital Management (LTCM).

(c) (3 points)

- (i) Describe two operational failures that occurred at LTCM and led to their near collapse.
- (ii) Recommend what LTCM could have done to address each of these two operational failures.

****END OF EXAMINATION****

USE THIS PAGE FOR YOUR SCRATCH WORK

USE THIS PAGE FOR YOUR SCRATCH WORK