

# Exam CFE-101

**Date:** Monday, November 17, 2025

## INSTRUCTIONS TO CANDIDATES

### General Instructions

1. This examination has 4 questions, numbered 1 through 4, with a total of 50 points.

The points for each question are indicated at the beginning of the question. Questions 3 and 4 pertain to the Case Study.

2. 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 provided in this document.

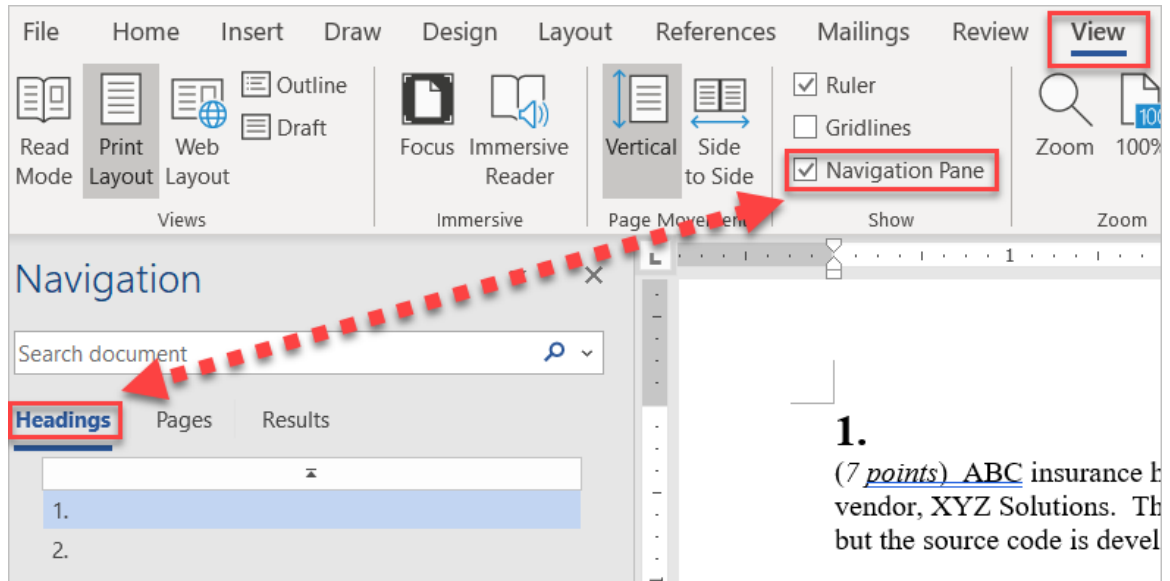
### Written-Answer Instructions

1. Each question part or subpart should be answered either in the Word document or the Excel file as directed. Graders will only look at work in the indicated file.
  - a) In the Word document, answers should be entered in the box marked ANSWER. The box will expand as lines of text are added. There is no need to use special characters or subscripts (though they may be used). For example,  $\beta_1$  can be typed as beta\_1 (and ^ used to indicate a superscript).
  - b) In the Excel document, formulas should be entered. Performing calculations on scratch paper or with a calculator and then entering the answer in the cell will not earn full credit. Formatting of cells or rounding is not required for credit.
  - c) For each question part requiring an answer in Excel, (1) clearly identify the inputs to the calculations, (2) show the necessary interim calculations, adding rows and / or columns, if necessary, and (3) enter the final answer in some or all of the cells highlighted in yellow, as applicable in each circumstance. These cells should contain formulas with links to other calculations in the worksheet. Minimize the use of hard-coded figures and maximize the number of interim steps in the calculations that would demonstrate your line of thinking.
2. The answer should be confined to the question as set.
3. Prior to uploading your Word and Excel files, each file should be saved and renamed with your unique candidate number in the filename. To maintain anonymity, please refrain from using your name and instead use your candidate number.
4. The Word and Excel files that contain your answers must be uploaded before the five-minute upload period expires.

## Navigation Instructions

Open the Navigation Pane to jump to questions.

Press Ctrl+F, or click View > Navigation Pane:



### **CASE STUDY INSTRUCTIONS**

**The case study will be used as a basis for some examination questions. Be sure to answer the question asked by referring to the case study. For example, when asked for advantages of a particular plan design to a company referenced in the case study, your response should be limited to that company. Other advantages should not be listed, as they are extraneous to the question and will result in no additional credit. Further, if they conflict with the applicable advantages, no credit will be given.**

# 1.

(10 points) The CEO of Spirit Life, a small, publicly traded U.S. life and annuity insurance company, wants to enhance the company's Environmental, Social, and Governance (ESG) efforts because she is concerned about the potential impact on the company's strategy and reputation. As an actuary on Spirit Life's Risk & Compliance team, you are assisting with this project.

(a) (5 points)

- (i) (2 points) Identify three key responsibilities that an actuary in Risk & Compliance might typically have for determining how ESG risks should be managed.

ANSWER:

- (ii) (2 points) Describe how each type of compounding risk could arise within the ESG risk framework.

ANSWER:

- (iii) (1 point) Describe one action Spirit Life can take to address ESG-related compounding risk.

ANSWER:

## 1. Continued

- (b) (5 points) The CFO of Spirit Life indicates that the company has sufficient coverage of ESG risks through activities already in place, especially in the areas of investments and modeling.
- Spirit Life follows specific guidelines from the Task Force on Climate-Related Financial Disclosure of the Financial Stability Board and participates in industry climate surveys. However, the company does not have a risk appetite statement or policy around investments in climate-related industries.
  - The company has an established Model Governance Committee, responsible for oversight of the Model Risk Policy and the controls for financial, pricing, projection, and valuation models. A small team that supports model validation reviews, as part of complying with the policy, reports to the CFO. The team leader suggests the existing policy and controls may address the use of Artificial Intelligence and Machine Learning in underwriting but believes that use of these emerging technologies may introduce unfamiliar risk, especially with new regulations.

The CFO asserts that these activities provide adequate assurance to the Board that ESG controls are effective.

- (i) (1 point) Evaluate the CFO's assertion.

ANSWER:

- (ii) (2 points) Explain what your role should be, as an actuary in Risk & Compliance at Spirit Life, in establishing a risk appetite for investment in certain climate-related industries.

ANSWER:

- (iii) (2 points) Recommend how Spirit Life's existing Model Risk Policy and controls framework could serve as a template for addressing the company's regulatory risk.

ANSWER:

## 2.

(13 points) XYZ, a life and annuity company, is considering acquiring ABC, a public life and annuity company based in the U.S. XYZ is evaluating key metrics related to Embedded Value (EV) and risk modeling.

- (a) (4 points) As part of this analysis, an XYZ actuary has proposed the following considerations for calculating EV and assessing an appropriate purchase price of ABC.
- I. XYZ can evaluate ABC's EV without factoring its capacity to generate new business.
  - II. XYZ can assess ABC's after-tax profit by using the change in reserve based on company-specific economic assumptions.
  - III. In its calculation of normal increase in EV, XYZ should assume that ABC's free capital is growing at the hurdle rate from one period to the next.
  - IV. As a public company, the calculated EV of ABC is an appropriate value to use as the purchase price without modification.

Evaluate each of the considerations in the proposal.

ANSWER:
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- (b) (3 points) Understanding the potential impact of extreme losses is crucial for assessing the financial stability of ABC. To help XYZ prepare for extreme events that could significantly impact ABC's risk profile, an actuarial analyst has simulated 100 scenarios from a Weibull distribution. Results are shown in the "Q2.b" tab of the Excel spreadsheet, with the parameters and Cumulative Distribution Function provided below:

- $F(x) = 1 - e^{-\left(\frac{x}{\theta}\right)^\tau}$
- $\tau = 2$
- $\theta = 3$
- $x$  is the loss variable

## 2. Continued

Refer to tab “Q2.b” of the Excel spreadsheet.

- (i) (2 points) Calculate the loss amounts based on the Weibull distribution with the given parameters by using the simulated percentiles in the Excel workbook. Show your work.

*The response for this part is to be provided in the Excel spreadsheet.*

- (ii) (1 point) Calculate the Expected Shortfall at the 90% confidence level by using the losses calculated in part (i). Show your work.

*The response for this part is to be provided in the Excel spreadsheet.*

- (c) (6 points) The Profits to Shareholders Method and the Cost of Capital Method are two approaches for calculating EV.

Your manager asks you to use the given information to demonstrate the following equality by performing the calculations of each of the following components:

$$\begin{aligned} &PV \text{ of Increase in Capital} \\ &= \text{LockedInCapital} \\ &+ PV \text{ of Hurdle Rate Multiplied by the Change in Capital} \end{aligned}$$

You are given the following assumptions:

- Hurdle Rate: 15%
- Risk-Free Rate: 10%
- Projected Capital: Provided for each year over 100 years; the projected capital on and after 12/31/2124 is assumed to be 0.

Refer to tab “Q2.c” of the Excel spreadsheet.

- (i) (2 points) Calculate the present value of increase in capital. Show your work.

*The response for this part is to be provided in the Excel spreadsheet.*

- (ii) (1 point) Calculate the present value of hurdle rate multiplied by the change in capital. Show your work.

*The response for this part is to be provided in the Excel spreadsheet.*

## 2. Continued

- (iii) (1 point) Calculate the locked-in capital. Show your work.

*The response for this part is to be provided in the Excel spreadsheet.*

- (iv) (2 points) Evaluate what additional information is needed to make a recommendation about whether to purchase ABC.

*The response for this part is to be provided in the Excel spreadsheet.*



***Questions 3 and 4 pertain to the Case Study.  
Each question should be answered independently.***

**3.**

(17 points) You are an actuary at Helios working on economic capital reporting. Helios's CRO believes the company can enhance its economic capital reporting by adding a provision for political risk impact to the investment portfolio.

Refer to Section 3.5 of the Case Study and the October 8, 2024, memo from Chris Wings.

- (a) (3 points) Propose three types of political risk that the consultant should consider as most relevant to Helios when building the predictive analytics model for political risk. Justify your selections.

ANSWER:

- (b) (6 points) You are reviewing the predictive analytics model built by the consultant and the accompanying documentation in the Case Study.
- (i) (2 points) Describe three relevant sources of model risk and how they apply to the model.

ANSWER:

- (ii) (2 points) Propose model governance controls that address each of the risk sources identified in part b(i). Justify your answer.

ANSWER:

- (iii) (2 points) Assess how well the proposed controls in b(ii) fit a risk-based controls approach.

ANSWER:

### 3. Continued

- (c) (8 points) The newly built model is now in use and the economic capital provision for political risk in the investment portfolio is aggregated into the counterparty default solvency capital risk.

The Solvency II correlation factors associated with each of the solvency capital risks, the economic capital estimates, and a summary balance sheet are provided in tab “Q3” of the Excel file.

- (i) (2 points) Calculate the change in the Basic Solvency Capital Requirement because of including the political risk provision. Show your work.

*The response for this part is to be provided in the Excel spreadsheet.*

- (ii) (2 points) Calculate Basic Solvency Capital ratios after the inclusion of the political risk provision in c(i). Show your work.

*The response for this part is to be provided in the Excel spreadsheet.*

- (iii) (2 points) Assess, using the results from c(ii), the need for regulatory intervention according to the European defined capital requirement actions.

*The response for this part is to be provided in the Excel spreadsheet.*

- (iv) (2 points) Critique the approach Helios has chosen to use to include a political risk provision.

*The response for this part is to be provided in the Excel spreadsheet.*

*Questions 3 and 4 pertain to the Case Study.  
Each question should be answered independently.*

**4.**

(10 points) Regulators are reviewing Lyon's Own Risk and Solvency Assessment (ORSA) report.

Refer to Sections 4.2, 4.3 and 4.4 of the Case Study.

- (a) (3 points) Describe three key considerations when evaluating the maturity of Lyon's ERM practices in the areas of risk appetite, risk tolerance, and risk limits.

ANSWER:

- (b) (3 points) Lyon's Board seeks to update Lyon's ERM strategy to ensure resilience under extreme conditions while optimizing capital deployment. The Board is satisfied with the current financial and debt rating from Kelly Rating, which provides a favorable balance of risk and cost of capital. However, considering the Kelly Rating analysis, the Board wants to emphasize the importance of maintaining earnings stability and regulatory solvency, even under the extreme conditions of a 1-in-200-year stress event.

The updated strategy aims to:

- A. Preserve enterprise financial stability.
- B. Prevent a 10% reduction in projected earnings.
- C. Ensure the Risk-Based Capital ratio remains 50% above the regulatory minimum.
- D. Uphold a strict no-appetite policy for reputational risk.

These measures safeguard stakeholder interests, support sustainable growth, and maintain the company's financial strength and reputation under adverse conditions.

Propose an enterprise risk tolerance statement for Lyon Group given the new objectives outlined above.

ANSWER:

#### 4. Continued

- (c) (4 points) SLIC is considering improving its Asset-Liability Management (ALM).

Refer to Section 3.2 of the Case Study.

- (i) (2 points) Describe three methods that insurers can increase the yield on their portfolios.

ANSWER:
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SLIC is evaluating the implementation of a carve-out strategy with dollar duration immunization for its ALM:

- The current Fixed-Income asset allocation is 75% of the total portfolio;
- The ALM team also determines the company is comfortable raising the Non-Fixed-Income asset allocation to 35%.

- (ii) (2 points) Describe two methods that can be used to determine the carve-out point in a carve-out strategy.

ANSWER:
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**\*\*END OF EXAMINATION\*\***