

CFE 101 Model Solutions

March 2026

1. Learning Objectives:

2. The candidate will understand the types of risks faced by an entity and be able to identify and assess these risks.
3. The candidate will understand how an organization can articulate its approach to risk and how to assess risk and return trade-offs. The candidate will understand the approaches for managing risk. The candidate will understand different concepts of risk capital, risk measures in capital assessment and techniques to allocate risk capital once aggregated.

Learning Outcomes:

- (1) Risk Identification
 - (c) Determine an appropriate monitoring mechanism for emerging risks
- (2) Risk Assessment
 - (c) Demonstrate risk aggregation techniques that illustrate the concept of risk diversification
 - (e) Demonstrate the use of techniques to assess risk accumulations and compounding risks
 - (h) Analyze risks that are not easily quantifiable, such as operational, environmental and contagion-related risks
- (3) Risk Capital
 - (b) Demonstrate a conceptual understanding of economic measures of value and capital requirements (e.g., EVA, embedded value, economic capital, regulatory measures, and accounting measures) and their uses in decision-making processes

Sources:

CFE101-113-25: Identifying and Evaluating Emerging Risks - RIMS (LO 2)

CFE101-114-25: Measurement and Modeling of Dependencies in Economic Capital (Ch 7 only) (LO 2)

CFE101-115-25: How CEOs Can Mitigate Compounding Risks (LO 2)

Regulatory Capital Adequacy for Life Insurance Companies: A Comparison of Four Jurisdictions (excluding appendices) (LO 3)

1. Continued

Commentary on Question:

Commentary listed underneath question component.

Solution:

(a)

- (i) Provide one relevant example for XYZ for each of the three types of compounding risk.
- (ii) Recommend one strategy to strengthen XYZ's risk management for each risk in part (i). Justify your answer.

Commentary on Question:

For part (i), it was important that candidates provide examples of each of the compounding risk types, rather than simply defining the terms. These examples must have been both relevant to XYZ and shown a firm understanding of the compounding risk types.

*For part (ii), it was important to recommend traditional risk management strategies and provide enough information to illustrate why the strategy would be effective. Examples of non-traditional risk management strategies that **were not** given credit include XYZ building/financing the construction of medical facilities or importing food to Tropicia.*

a(i)

The three main types of compounding risks are connected risks, cumulative risks, and novel risks.

Connected risks refer to those that have unforeseen, cascading effects on other areas that were previously thought to be unrelated. In this context, an example of a connected risk might be the second-order impact of the tsunami on healthcare quality due to the destruction of infrastructure, which might have a long-term effect on Tropicia's mortality rate. This would be considered a connected risk because the initial climate risk of the tsunami had indirect, inconspicuous impacts on the viability and sustainability of business.

Cumulative risks refer to those that build up incrementally over time, going unnoticed by risk detection techniques. In this instance a cumulative risk might be a gradual depopulation of Tropicia due to concerns over safety and climate. A dwindling workforce and customer base, if gone unnoticed, could preclude any attempts to expand to the island.

1. Continued

Novel risks refer to a combination of various known risks that, in conjunction, produce a wholly new risk. A novel risk in Tropica might be a famine scenario brought about by both the destruction of farmland and a loss of critical laborers who harvest crops. These two risks in conjunction could cause an acute, catastrophic shock that XYZ should take into consideration.

a(ii)

For connected risk, XYZ can conduct frequent scenario testing and their stressed scenarios should assume integrations between different risks. For instance, XYZ can invite an expert to build modeling scenarios capturing continued hunger problem, hospital resources and the feedback in between. XYZ can test the scenario to analyze the consequences, and come up with potential alternative solutions.

For cumulative risk, XYZ should set a risk appetite and tolerance statement as well as early indicators (Key Risk Indicators). For instance, they can set the losses due to climate disaster cannot exceed 1M, and set KRIs for ongoing meteorology indicators and local economic indicators and the indicator should be early enough like expected change in CPI instead of lagging indicators. Contingency plans can be set up including roles and responsibilities in the cumulative risk events and ensuring adequate capital resources and plan B if it did occur.

For novel risk, XYZ can reinsure excess losses brought on from famine. The amount of defined excess loss should be consistent with XYZ's risk tolerance, and could be identified by consulting with experts or extrapolating loss amounts from historical periods of famine.

(b) The CEO wants more information about risks that may emerge for XYZ if it moves forward with the expansion into Tropica.

To evaluate emerging risks, an analyst on your team, Chris, suggests using a Bow-Tie diagram because it is a linear Cause-and-Effect model that helps users visualize emerging risks. She believes this method will help the CEO to better understand emerging risks.

Another analyst, Kyle, recommends using Scenario Analysis. He mentions that this is a simple but powerful method where XYZ can identify the two or three most likely scenarios and then allocate resources evenly among them to effectively prepare for emerging risks.

(i) Critique Chris' suggestion.

(ii) Critique Kyle's suggestion.

1. Continued

Commentary on Question:

It was important to provide more information than provided in the stem to illustrate understanding of both Bow-Tie and Scenario Analysis. For both sub-parts, it was required for candidates to specifically disagree/identify the incorrect aspect of the stem statement to receive full credit.

For Scenario Analysis, it was common for candidates to explain Sensitivity Analysis which is inconsistent with the source material and therefore was awarded minimal points. Example commentary that was inconsistent with Scenario Analysis includes quantifying a VaR and/or being computationally intensive or model dependent.

b(i)

Chris is partially correct. Chris is right that the Bow-Tie method is a great Cause-and-Effect model that can be used to visualize emerging risks. It is a diagram that can be shown to the CEO. However, Chris is incorrect in his statement that the model is linear. One event can lead to multiple risks, and one risk can be caused by multiple events. This complicates the method and might be hard to explain to the CEO.

b(ii)

Kyle is partially correct. He is right that the Scenario Analysis is simple and powerful. It can be used to effectively identify risks. However, XYZ should list out as many possible scenarios as possible, rank them in the order of importance/likelihood. Resource allocation should be based on the rankings instead of evenly distributed. This method provides an approach to quantify the amount of resources to allocate.

(c) XYZ's CEO has now switched his focus to regulatory capital. Tropica is subject to European Solvency II capital requirements. The CEO asks you to calculate how much more capital XYZ needs to meet the Solvency Capital Requirement.

Refer to tab "Q1.c" of the Excel spreadsheet.

You are given:

- XYZ follows the standard Basic Solvency Capital Calculation method.
- Your assistant provided the correlation matrix shown in the Excel file for use with the Solvency Capital Calculation.
- You are given the capital amount provided in the Excel file for each risk.

Calculate the additional capital XYZ needs to satisfy the Solvency Capital Requirement. Show your work.

1. Continued

Commentary on Question:

Candidates were expected to demonstrate understanding of how to apply a correlation matrix to calculate required capital amounts.

See Excel answer template for answer

- (d) Recommend to the CEO whether XYZ should move forward with its expansion in Tropica. Justify your answer using all of the analysis from parts (a) through (c).

Commentary on Question:

Candidates should give a firm recommendation with strong supporting arguments. These arguments should leverage the results of at least (a) and (c), and should provide more details than simply provided in the stems.

I recommend that the company does not move forward with expansion into Tropica. While the market may provide an opportunity for the company, the current environment and potential for emerging risks result in too many concerns. We should first aim to better identify and quantify the emerging risks and any potential upside before committing to such an expansion. At a high level the expansion would be costly, the additional capital required to meet the SCR after expanding into Tropica would be \$1,503.7MM, which is a capital intensive 52% increase over our existing requirements under the same framework. The compounding risks that we have identified in Tropica since the 2023 tsunami have already proven costly to the country. Recovering from the known risks is largely driving the capital requirements to invest in the country, but knowing that these risks will continue and may compound further means that the risks of entry into the market may continue to rise. If the company is still interested in potential expansion in the future, we should use existing methods to identify, track, and quantify the emerging risks and opportunities in the market. While we discussed the benefits of bow-tie diagrams and scenario analysis, it is important to take a step back to search for any other potential risks emerging from the country's recovery using more unstructured techniques.

2. Learning Objectives:

3. The candidate will understand how an organization can articulate its approach to risk and how to assess risk and return trade-offs. The candidate will understand the approaches for managing risk. The candidate will understand different concepts of risk capital, risk measures in capital assessment and techniques to allocate risk capital once aggregated.

Learning Outcomes:

- (1) Making Decisions
 - (b) Assess the risk and return trade-offs for decisions (e.g. those targeting changes in the organization's risk profiles)
- (3) Risk Capital
 - (b) Demonstrate a conceptual understanding of economic measures of value and capital requirements (e.g., EVA, embedded value, economic capital, regulatory measures, and accounting measures) and their uses in decision-making processes

Sources:

Embedded Value Calculation for a Life Insurance Company, 2006 (LO 3.3b)

Risk Appetite: Linkage with Strategic Planning Report (LOs 1.2a, 3.1a, 3.1b, 3.3e)

Commentary on Question:

The goal of this question is to evaluate the candidate's understanding of how Economic Value Added (EVA) is used as a performance measurement tool—as discussed in Section 7 of the Risk Appetite: Linkage with Strategic Planning report.

The question aims to test both technical differentiation and the strategic application of EVA in aligning risk appetite with performance evaluation.

Solution:

- (a) Evaluate each of the four statements by identifying one valid point and one invalid point. Justify your assessment.

Commentary on Question:

Candidates needed to provide both valid and invalid aspects for each statement.

Most candidates struggled to identify both sides, often responding in a true / false manner with little justification.

2. Continued

Statement A

Valid Aspects:

- Since EV includes the present value of future distributable profits, a higher EV generally suggests stronger financial performance and future cash flows, which can positively influence stock price.

Invalid Aspects:

- Stock price is influenced by many external factors beyond EV, such as investor sentiment, market conditions, and macroeconomic trends.

Statement B

Valid Aspects:

- Economic factors, particularly discount rates and investment returns, have a direct impact on EV calculations due to their effect on present value calculations.

Invalid Aspects:

- Non-economic factors such as lapse rates, mortality, morbidity, and expense assumptions also have a substantial impact on EV.

Statement C

Valid Aspects:

- Using EV as a performance metric can encourage management to make decisions that enhance long-term company value rather than focusing solely on short-term stock price fluctuations.

Invalid Aspects:

- EV is highly sensitive to actuarial assumptions (e.g., discount rates, lapse rates, mortality assumptions), which could incentivize management to manipulate assumptions for higher compensation.

Statement D

Valid Aspects:

- Goodwill is determined based on the difference between the purchase price and the fair value of net assets, and EV plays a role in estimating the fair value.

2. Continued

Invalid Aspects:

EV does not capture all intangible assets (e.g., brand value, customer relationships, proprietary technology), which can significantly contribute to goodwill.

(b) You are given:

- Opening Free Capital: \$30 million
- Opening Locked-In Capital: \$0 million
- Hurdle Rate: 10%

Amounts in \$ million	After-Tax Profits	After-Tax Investment Income on Capital	Increase in Locked-In Capital
Year 1	\$5	\$2.0	\$5
Year 2	\$6	\$2.2	\$4
Year 3	\$7	\$2.5	\$3
Year 4	\$0	\$0.0	-\$12

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

- (i) Calculate the Embedded Value at time 0 using the Profits to Shareholders Method. Show your work.
- (ii) Calculate the Embedded Value at time 0 using the Cost of Capital Method. Show your work.

Commentary on Question:

Most candidates did well on part (i), with the most common error forgetting to add the opening capital to the present value of the net contributions. Most candidates struggled with part (ii). While several realized both methods under (i) and (ii) should produce the same answer, they either repeated the same method as under part (i) or could not correctly calculate the Cost of Capital method showing all the right steps.

Refer to Excel Answer Template

2. Continued

- (c) In Year 2, the regulator in SHL’s state of domicile is considering a revision to the capital adequacy framework, which would reduce required capital levels. SHL currently maintains a solvency ratio well above the regulatory minimum.

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

- (i) Analyze how the lower capital requirement impacts the calculation of Embedded Value.

The CFO is considering adjusting the company’s capital strategy in response to the upcoming regulatory changes. The management team is evaluating the following three proposals:

- Proposal A: Increase shareholder dividends and share buybacks to enhance investor returns.
- Proposal B: Invest in riskier asset classes, such as high-yield bonds or equities, to improve investment income.
- Proposal C: Expand into new product lines with different risk characteristics, such as variable annuities or long-term care insurance.

- (ii) Evaluate the three proposals in terms of impact on risk profile of SHL and potential impact on Embedded Value by completing the chart in tab “Q2.c” of the Excel spreadsheet. Justify your response.

Commentary on Question:

*There was mixed performance on this question from candidates. Those who did well on part (i) provided clear explanations and justifications on **how** the lower capital requirement impacts EV, rather than just analyzing the formula for EV. Candidates who did well on part (ii) correctly identified the direction of EV change and impact on the risk profile for each proposal, with justification for why. Candidates who merely stated the direction (increase / decrease) without proper justification did not do well.*

Refer to Excel Answer Template

3. Learning Objectives:

1. The candidate will understand the foundations of ERM and be able to apply them to organizations.
2. The candidate will understand the types of risks faced by an entity and be able to identify and assess these risks.

Learning Outcomes:

- (2) The Internal Environment
 - (a) Recommend an appropriate enterprise risk management framework for an organization
 - (c) Demonstrate an understanding of governance issues, such as agency, compliance and legal risks and the need for audit and market conduct compliance activities
- (3) The External Environment
 - (a) Examine the impact of the external environment on an organization's ability to achieve its objectives
- (1) Risk Identification
 - (a) Identify specific risks faced by an organization

Sources:

CFE101-101-25: IAA Note on ERM for Capital and Solvency Purposes in the Insurance Industry - pg. 33 document, pdf pg. 37

Rating Agency Perspectives on Insurance Company Capital - page 8

CFE101-105-25: Agency Theory And Asymmetric Information - Page 2

CFE101-104-25: The Importance of Managing Conduct Risk and Maintaining An Effective Risk Across the Business - Page 3 - 5

Quantitative Enterprise Risk Management by M. Hardy & D. Saunders, Chapter 2: Risk Taxonomy - pg. 18 – 22

Commentary on Question:

This question tests the candidate's understanding of the roles and responsibilities of effective risk management in an organization, including use of controls and for risks that are not easily quantifiable. The candidate should demonstrate knowledge of elements for successful risk management and management of compounding risk.

3. Continued

Solution:

(a)

(i) Evaluate the expected impact of a rating's downgrade on the following aspects of ABC Life's business operations.

1. Raising Capital
2. Sales

(ii) Propose two drivers, other than sales distribution and producer incentives, that might be contributing to the higher observed lapse rates. Justify your response.

MODEL SOLUTION

(a)(i)

1. Raising capital

- Cost of capital goes up because ratings downgrade implies increased default risk.
- Access to certain investment grade debt markets may be curtailed.
- Investment portfolio may need to be de-risked to preserve capital adequacy ratio – this will reduce investment yields/income on the portfolio.
- Getting new reinsurance or renegotiating exiting reinsurance will become more difficult and/or expensive.

2. Sales

- Erosion of goodwill with its existing distribution partners and policyholders.
- It is harder to acquire/retain new/existing customers, which adversely impacts topline and inforce growth.
- New markets or distribution channels may become less accessible.

(a)(ii)

Product Development

- Review current product designs to ensure they still meet customers' needs.
- Check out competitors' products to see if any key features are missing.
- Review Easy Term's pricing to confirm its competitiveness in the market.

Economic Environment

- Recessionary environment which adversely impacts employment and disposable income could force customers to prioritize "essentials" over insurance coverage.

On further analysis of the lapse experience study, you find that persistency of business sold by One IFA is lower than persistency for business sold by the in-house team.

3. Continued

Currently, ABC and One IFA have a Service Level Agreement (SLA) which specifies that ABC Life will provide marketing materials to One IFA and perform reviews every three years on One IFA's sales practices. This SLA has not been reviewed or revised in the past few years to keep it in line with new, stricter regulations related to sales incentives, commission clawbacks and advisor training.

ABC's CEO has suggested hiring ACE Insurance Consulting to help with analyzing ABC's arrangement with One IFA.

ACE Insurance Consulting is known for expertise in managing product portfolios, risk management and strategic turnarounds.

- (b) ACE has started analyzing One IFA's effectiveness in selling the Easy Term product and is evaluating shortfalls which might be affecting persistency for Easy Term.
- (i) Describe the Principal-Agent Problem and how it applies to ABC Life in this situation.
 - (ii) Describe two actions for each of the following that, if taken by One IFA, could lead to conduct risk for ABC.
 - 1. Sales Incentives
 - 2. Advisor Training
 - (iii) Evaluate whether each of following is an appropriate area of focus for ACE. Justify your response.
 - Commission and commission clawback rules in the outdated SLA.
 - Sales training conducted by the One IFA for selling Easy Term by its sales team.
 - Administrative system used by the One IFA to record sales of Easy Term and report to ABC.

3. Continued

MODEL SOLUTION

(b)(i)

The principal-agent problem can be described as the tension that arises between principal, in this case ABC Life, and its managers/agent, in this case One IFA. Agents should act in the best interests of principals but, in reality, they may act in their own best interests.

The problem manifests in the following ways:

- The brokers have their own training system, which might not align with ABC's corporate standards.
- There might be mismatch between ABC strategic objectives and the Broker's objectives.
- Service Level Agreement (SLA) between ABC and Sales channel might be outdated and/or not be strictly followed.
- Brokers might have an incentive to promote another company's products over ABC's products.
- Adverse Selection - Agent has private information about the client's adverse health which is not disclosed to ABC in its underwriting application.

(b)(ii)

1. Sales incentives

- Inadequate transparency in fees and charges - not being transparent with customers about fees and charges embedded in the products.
- Mis-selling products – products which do not meet customer's needs, leading to potential buyer's remorse and early lapsation.

2. Advisor Training

- Inaccurate disclosures – Not providing correct information about ABC Life's products to attract customers.
- Collusion with market participants – asking customer to initially buy and lapse policies in future years.

(b)(iii)

- Commission and Clawback rules – is appropriate.
 - These rules are outdated, and it is likely that the sales team is still following the SLA and taking advantage of lower and less strict clawback policy.
- Sales training conducted by the One IFA – is appropriate.
 - Sales training conducted is not sufficient to understand the Easy Term product and differentiate it from other similar products.
 - Advisors are trained more to focus on their earnings than meeting customer needs.

3. Continued

- Admin system used by the One IFA – Not appropriate.
 - Although there is a chance of errors in data entry by its staff, any impact of such errors on the persistency would be limited, if any, and can be easily corrected in the next report.
- (c) ACE is currently developing a report following its assessment of ABC’s sales distribution channels and the impact on the overall persistency for ABC’s term product.

Propose three actions, based on the preceding analysis, that ACE can recommend to ABC to improve persistency for Easy Term. Justify your response.

MODEL SOLUTION

(c)

Incentives

- ABC needs to review its SLA with One IFA – update its commission and commission clawback rules.
- Ensure the incentives offered to advisors are in line with competitors and with the latest regulations.
- Review the incentive rules more frequently and act in case of any misconduct or industry misalignment.

Sales training

- Provide better product information along with training on its product to the distribution channel.
- Review sales practices by One IFA more frequently than once every 3 years.
- Create awareness among advisors around reputational risk due to poor persistency.

Overall

- Talk to customers who are lapsing to understand their concerns and reasons behind lapsing their policies.
- Ask for more detailed sales and persistency information on a more frequent basis for regular monitoring.
- Periodically assess the optimal balance of new business production between the in-house sales channel and One IFA.

4. Learning Objectives:

3. The candidate will understand how an organization can articulate its approach to risk and how to assess risk and return trade-offs. The candidate will understand the approaches for managing risk. The candidate will understand different concepts of risk capital, risk measures in capital assessment and techniques to allocate risk capital once aggregated.

Learning Outcomes:

- (1) Making Decisions
 - (b) Assess the risk and return trade-offs for decisions (e.g. those targeting changes in the organization's risk profiles)
- (3) Risk Capital
 - (b) Demonstrate a conceptual understanding of economic measures of value and capital requirements (e.g., EVA, embedded value, economic capital, regulatory measures, and accounting measures) and their uses in decision-making processes
 - (c) Apply risk measures (such as VaR and TVaR) and demonstrate how to use them in value and capital assessment

Sources:

- *Quantitative Enterprise Risk Management*, Hardy, Mary and Saunders, David, 2022
 - Ch. 3: Risk Measures, Pages 77-93
- *Quantitative Enterprise Risk Management*, Hardy, Mary and Saunders, David, 2022
 - Ch. 18: Risk-Adjusted Measures of Profit and Capital Allocation, Pages 518-521
- CFE101-114-25: Measurement and Modeling of Dependencies in Economic Capital, Pages 9-11
- CFE101-117-25: Economic Capital-Practical Considerations, Milliman, Pages 25-27, 29-31

Commentary on Question:

The goal of this question is to test candidates' understanding of VaR and ES, focusing on their comparison and how each responds to data adjustments. Candidates should demonstrate knowledge of VaR's lack of subadditivity and the practical implications of that property in real-world applications.

4. Continued

Solution:

- (a) Refer to the tab labeled “Q4.a” in the Excel spreadsheet.
- (i) Calculate the Economic Capital for MEK using both VaR and ES at a 99.5% confidence level. Show your work.
- (ii) Calculate the Diversification Benefit for both measures. Show your work.

Commentary on Question:

Candidates performed well on this part overall. For part (i), candidates who treated inverted simulation values as losses (i.e., treated negatives as losses) may still receive full credit, provided the rest of their work is correct, since the question stem did not clearly state that positives represented losses. Similarly, candidates can earn full credit for part (ii) if they performed the corresponding calculations correctly.

See Excel answer template

- (b) An analyst has alerted you that the total simulated losses for the four scenarios with the highest total losses were each underestimated by 50 million Euros. No other errors were found. The CFO would like to understand the impact of the corrected losses.
- (i) Evaluate (qualitatively) the impact of the corrected data on VaR, ES, and their respective diversification benefits.
- (ii) Evaluate whether to shift from VaR to ES as a risk measure used for Economic Capital for MEK considering the results obtained.

Commentary on Question:

Candidates performed well on part (i) but poorly on part (ii). For part (i), full credit was given for either assuming the total losses were impacted but not the individual risks, or that the individual risks were impacted as well as the question was not clear. For part (ii), candidates must justify their recommendations by linking them to real-world implications for MEK; merely restating the technical properties of a coherent risk measure is insufficient.

4. Continued

(b)(i)

Assume only the total was impacted.

- Since VAR is a point estimate, and the 4 scenarios are above the 99.5% percentile, the aggregate VAR and the diversification benefit from VAR do not change with the correction of the error.
- Since ES averages the scenarios above the 99.5% percentile, the aggregate ES will increase as a result of the error correction. The diversification benefit decreases, since the aggregate ES increases but the individual risks stay the same, which is consistent with coherency.

(b)(ii)

Implementing ES for Economic Capital purposes allows MEK to understand the impact of losses that go beyond the 99.5%. VAR would not reflect the risk differences before vs after the error was corrected. But the properties of ES would allow management to be on the lookout for scenarios like the ones where the level of losses was underreported. The CRO has expressed concern about the tail, and ES gives insight into the tail where VAR does not. However, uncertainty over these tail scenarios is also high and the aggregate level of complexity and uncertainty might not justify the change from VaR which is simpler and widely understood framework.

5. Learning Objectives:

2. The candidate will understand the types of risks faced by an entity and be able to identify and assess these risks.
3. The candidate will understand how an organization can articulate its approach to risk and how to assess risk and return trade-offs. The candidate will understand the approaches for managing risk. The candidate will understand different concepts of risk capital, risk measures in capital assessment and techniques to allocate risk capital once aggregated.

Learning Outcomes:

- (1) Risk Identification
 - (a) Identify specific risks faced by an organization
- (2) Risk Assessment
 - (a) Determine the implication of risks on the balance sheet and income statement
- (2) Responding to Risks
 - (a) Demonstrate application of the following responses to risk, including consideration of their costs and benefits: avoidance, acceptance, reduction without transfer, and transfer to a third party
 - (c) Demonstrate how derivatives or similar methods may be used to manage or reduce risk
 - (f) Demonstrate possible techniques for managing non-financial risks
- (3) Risk Capital
 - (b) Demonstrate a conceptual understanding of economic measures of value and capital requirements (e.g., EVA, embedded value, economic capital, regulatory measures, and accounting measures) and their uses in decision-making processes

Sources:

Quantitative Enterprise Risk Management by M. Hardy & D. Saunders, Chapter 2: Risk Taxonomy

Financial Enterprise Risk Management, Sweeting, 2011 Ch. 16 Responses to Risk

Quantitative Enterprise Risk Management by M. Hardy & D. Saunders, Chapter 13: Liquidity Risk

Quantitative Enterprise Risk Management by M. Hardy & D. Saunders, Chapter 15: Risk Mitigation Using Options and Derivatives

Corporate Pension Risk Management and Corporate Finance: Bridging the Gap between theory and Practice in Pension Risk Management

5. Continued

Commentary on Question:

The goal of this question is to evaluate a candidate's ability to analyze the financial and non-financial risks associated with a corporate pension derisking strategy, including its impact on financial statements and stakeholders. The candidate is expected to (i) integrate ERM & corporate finance frameworks, (ii) apply actuarial judgment to a real-world corporate decision, and (iii) communicate risks and consequences across financial, strategic and human dimensions.

Solution:

- (a) You are advising GAM on risks associated with the VBW initiative.
- (i) Identify one financial risk associated with the VBW that cannot be effectively mitigated. Justify your response.
 - (ii) Identify one financial risk associated with the VBW that can be mitigated and recommend an appropriate risk mitigation strategy. Justify your response.

Commentary on Question:

Candidates performed poorly on this question: they confused financial and non-financial risks, misclassified which risks can or cannot be mitigated, and failed to provide sufficient justification for the risks they identified. Acceptable responses should include proper risk identification and justifications that are related to VBM.

(a)(i)

Adverse selection is a financial risk that can't be mitigated. The question indicates that the VBW must be offered on a voluntary basis per federal requirements, and that 70% of the window group is expected to accept the offer. Healthy people may choose to keep their annuity, subjecting the pension plan to longevity risk

Unhealthy people may choose the lump sum buyout, depriving the pension plan of mortality gains that would have otherwise been present

Since the parameters of the VBW are federal requirements, there is no way to mitigate this risk, for example, by introducing underwriting tests or similar constraints on the choice.

(a)(ii)

The parameters of the VBW introduce interest rate risk as a financial risk that can be mitigated.

Interest rate risk arises from the mismatch in dates: the lump sum buyout is determined using IRS discount rates from 9/30/2026, yet the payment is not made until July 1, 2027.

5. Continued

If interest rates fall, fixed income assets will increase. If interest rates rise, fixed income assets will decrease, however the buyout will remain unchanged since the valuation assumptions are locked in.

GAM can mitigate this risk by purchasing a put option using a corporate AA bond index. That way, if interest rates increase, the option will pay out, helping to mitigate any financial loss attributable to rising interest rates.

(a)(iii)

There is operational risk with the VBW – managing a voluntary buyout program is complicated – first the calculations themselves, as well as effectively communicating and recording the choices being made. This risk can be mitigated through managerial oversight, use of steering committees, etc. GAM could also seek the help of qualified professionals that have run similar projects.

While nothing can ever be done to perfection, with proper managerial oversight/use of external consultants, the operational risks associated with running the VBW can be minimized.

- (b) The CFO of GAM asks you to conduct a risk impact assessment following the completion of the Voluntary Buyout Window (VBW), using a July 1, 2027, measurement date.

Assume the following:

- The June 30, 2027, Corporate and Pension Balance Sheet entries are equal to the values provided in Section 1.6 of the Case Study.
- Lump Sum payments totaling \$12 billion are made on July 1, 2027.

Refer to tabs “Q5.b.i”, “Q5.b.ii”, and “Q5.b.iii” in the Excel spreadsheet.

- (i) Calculate GAM pension plan’s surplus and funding ratio after the VBW. Show your work. Refer to tab “Q5.b.i” in the Excel template.
- (ii) Calculate GAM’s corporate debt-to-equity (D/E) ratio under the current accounting standards (FAS 158 and IAS 19) before and after the VBW. Show your work. Refer to tab “Q5.b.ii” in the Excel template.
- (iii) Calculate GAM’s corporate debt-to-equity (D/E) ratio under the Augmented (or Holistic) Balance Sheet approach, before and after the VBW. Show your work. Refer to tab “Q5.b.iii” in the Excel template.
- (iv) Evaluate which balance sheet method, mentioned in (b)(ii) or (b)(iii), provides a more informative view of the economic impact of the VBW on GAM’s corporate leverage.

5. Continued

- (v) Evaluate the impact of the VBW on three key stakeholders, considering the findings from above.

Commentary on Question:

Candidates performed well on part (i), average on part (iv), but poorly on the remaining sections. Weak understanding of D/E ratios led to miscalculations in parts (ii) and (iii). Parts (iv) and (v) require candidates to provide well-justified recommendations.

Refer to Excel answer template for Parts (b)(i), (b)(ii), and (b)(iii)

(b)(iv)

One way to assess corporate leverage is to look at D/E ratios. Under the FAS158/IAS19 approach, the D/E ratio remains unchanged as a result of the VBW. This doesn't make sense realistically, given the overall reduction in pension assets and liabilities after the VBW (\$12 billion is released).

The Augmented balance sheet approach does indicate a slight reduction in corporate leverage, as shown in the D/E ratio before and after the VBW. This makes sense economically.

Since the Augmented balance sheet indicates a change in leverage resulting from the VBW, and the FAS158/IAS19 method does not, the Augmented approach provides a more informative view of the economic impact.

(b)(v)

VBW Participants - when they were receiving an annuity from the pension plan, the plan bore the longevity and investment risks. Now that the individual has received a full buyout, they are responsible for managing their own longevity risk as well as investment risks.

GAM Participants - after the VBW, the GAM pension plan is less well capitalized (funded ratio decreased), suggesting GAM pension plan participants are less well off after the VBW. However, since GAM has been derisked, they are in a better position to pay for any funding shortfalls that may arise. On balance, the VBW is probably neutral to the GAM plan participants.

Rating agencies - Moody's has indicated that derisking activities are typically credit neutral, so there is no downside to running the VBW from a ratings perspective.