

ILA LRM Model Solutions

Spring 2014

1. Learning Objectives:

1. The candidate will demonstrate an understanding of the principles of Risk Management.
2. The candidate will demonstrate an understanding of the various sources of risks faced by an insurer.

Learning Outcomes:

- (1a) Define and evaluate risk.
- (1b) Evaluate the role of risk management within an insurance company
- (1c) Articulate the economic incentives for applying risk management
- (2a) Identify, categorize and evaluate potential sources of risk in products including but not limited to mortality, morbidity, and lapse.
- (2b) Identify, categorize and evaluate potential sources of risk in investments including but not limited to credit risk, liquidity, equity-based exposure and asset-liability matching.
- (2c) Describe and evaluate the other risks an insurance company faces including operational, marketplace and expense risks.

Sources:

A New Approach for Managing Operational Risk - SoA Research 2008
Sweeting Chapter 7 - Definitions of Risk

Moody's Looks at RM & the New Life Insurance Risks - 2000
Risk Appetite: Linkage with Strategic Planning

ILA-C125-10: Insurance Risk Management Response to the Financial Crisis, CRO
Forum, April 2009

How Fair Value Measurement Changes RM Behavior in the Insurance Industry SoA-
Rosner 2013

Risk Management by Insurers: An Analysis of the Process

1. Continued

Commentary on Question:

Commentary listed underneath question component.

Solution:

(a) Assess the effectiveness of the RMC in dealing with the following risk issues faced by Simple Life:

- (i) Operational risk
- (ii) Non-life insurance risk
- (iii) Liquidity risk

Commentary on Question:

The majority of candidates listed the definitions of the risk and provided very little, if any, assessment of how the risks were being managed or how the risk could be better managed which was the intent of the question.

- (i) Operational risk

Simple Life is currently not assessing the operational risk adequately by merely holding a provision of 10% of the liabilities. Additionally, Simple Life needs to understand that as operational risk represents unexpected losses, basing the provision for operational risk on a value (liabilities) associated with an expected loss may result in a provision that is not commiserate with the risks involve.

To more adequately manage operational risk Simple Life needs to be able to measure and assess the potential risks including understanding the likelihood and potential severity of these events.

- (ii) Non-life insurance risk

Simple Life is not effectively assessing it's non-life insurance risk as there is no define approach as to how these risks are measured and tracked.

To more effectively manage the non-life insurance risks Simple Life should develop approaches to adequately measure non-life insurance risks which would include:

- Underwriting risk, the risk that expected claims could vary from that assumed.
- Volatility Risk, the uncertainty in the incidence and severity of claims.
- Catastrophic Risk, the risk of low probability, high severity events (e.g. market events on variable annuity business)

1. Continued

- Trend Risk, the risk the future incidence or severity of claims differs from current levels assumed (e.g. mortality improvement on single premium immediate annuities).

(iii) Liquidity risk

Simple Life does not effectively assess its liquidity risk as it only currently focuses on reputational liquidity and limited liquidity stress tests, and is expecting regulatory relief in the event of a systematic crisis.

Simple Life needs to determine what level of liquidity risk is acceptable in the event of systematic crisis and not just focus on reputational liquidity. In addition, Simple Life needs to develop a better understanding of what potential unanticipated events could stress the liquidity position of the company.

- (b) Identify risks associated with the plans to disband the RMC and recommend an appropriate transition plan to maintain good risk management practice.

Commentary on Question:

Most candidates correctly indicated that disbanding the RMC was a bad/risky idea but most failed to articulate why it was a poor recommendation.

An effective risk management program would require not only a CRO but a Risk Management Committee. Only having a CRO exposes the organization to having a lack of oversight for the risk management function. The CRO may also lack the expertise to understand the actions and time needed to implement solutions and may lack the authority to take corrective actions.

As such, it would be recommended that the Risk Management Committee continue in its current form to provide the necessary oversight and maintain a more effective risk management program.

- (c) Assess the consultant's proposed compensation structure and recommend changes to ensure that the CRO is provided with appropriate incentives to establish and manage an effective ERM process for Lyon that is consistent with Lyon's long term strategic direction.

Commentary on Question:

Most candidates only addressed a subset of the items in the compensation structure. A good number of candidates did identify that the focus of the compensation structure should be on managing risk and long term growth, which was the general intent of the question.

1. Continued

The proposed compensation structure may work provided it focuses more on the elements that promote long term value and at the same time manages the level of risk within the organization. Elements which focus on short term measures are not appropriate as they may incent behavior which increases risk or do not provide long term value.

Embedded Value growth is a good metric as it provides a measure of long-term value and is a risk adjusted.

The 2-year moving average US GAAP earnings metric is too short of a period and is also too volatile of a metric to be an effective indicator for a performance bonus.

A long-term incentive using a Black-Scholes method is effective when using growth of share price relative to competitor's share price. This reflects the value added relative to the rest of the industry as growth not relative to competitors could result from other market factors that are beyond the company's control.

An innovation bonus is not appropriate as should the company not have the expertise to manage the business effectively it could increase the overall risk exposure of the company.

An acquisition bonus is also not appropriate as even though an acquisition will help the company grow it could introduce additional risk including risk the company may not be equipped to manage.

2. Learning Objectives:

4. The candidate will demonstrate an understanding of the principles of modeling, cash flow testing and asset-liability matching, and perform related calculations.

Learning Outcomes:

- (4a) For an ALM model
 - (i) Select appropriate assumptions and scenarios
 - (ii) Model dynamic behavior of both assets and liabilities
 - (iii) Model and explain various strategies, including hedging
 - (iv) Analyze and evaluate results (including actual v. projected differences)
 - (v) Recommend appropriate strategies
- (4b) Define and calculate duration, convexity and key rate durations including the rationale for matching as a means to manage risk.

Sources:

ERM-111-12 Key Rate Durations: Measures of Interest Rate Risk

ILA-C112-07: ALM for Insurers

Commentary on Question:

The candidate should be able to describe ALM techniques and perform calculations related to key rate durations. Most candidates listed techniques and few calculated key rate shifts and price changes correctly.

Solution:

- (a) Describe Asset Liability Management techniques available to insurers.

Commentary on Question:

Candidates should provide some description and not just list techniques. Below are the key techniques and their descriptions. Candidate should list and describe at least four techniques. Several candidates listed techniques but did not describe them and so did not get credit.

- Cash Flow Testing
 - Assess the potential impact of various interest rate scenarios
 - Can flag potential problems before they arise
 - Excludes new business that a going concern can be expected to generate
- Cash Flow Matching or Exact Matching
 - Matching Liability CFs with Asset CFs
 - Uncertainty of timing of liability CFs can make it difficult to implement

2. Continued

- Immunization or Duration Matching
 - Matching Liability and Asset Durations, Can also consider using convexity
 - Uncertainty of timing of liability CFs makes liability duration uncertain
 - Cannot deal with changes in spread between short- and long-term yields
- Dynamic Financial Analysis (DFA)
 - Enables insurer to assess how it would fare under a range of scenarios, and how things would change in response to different strategic moves
 - 5 main components: Initial Conditions, Scenario Generator, Financial Calculator, Optimizer, Summarized results
- Horizon Matching
 - Hybrid between Exact Matching and Duration Matching
 - Exact Matching for the first several years (e.g. 5, 10 yrs), then Duration Match remaining future years
- Dynamic Hedging
 - Establish a hedge portfolio with equity market sensitivities that match those of the liabilities
 - Use the Greeks: Delta, Gamma, Vega, Rho, Theta
 - Allows for more comprehensive and more economical hedging
 - Requires price/value sensitivities of portfolio and liabilities are aligned
 - Frequent re-balancing can lead to material transaction costs

(b) Calculate the yield curve for years 1 through 10 based on a 10 basis point increase in each of the following key rates. Show all work.

- Year 2
- Year 5
- Year 10

Commentary on Question:

Candidates should show work for each key rate shift. Several candidates shifted the key rates correctly but interpolated incorrectly. Also, some candidates incorrectly combined the three shifts creating a parallel shift in the curve, for which they did not get credit.

First Key Rate Shift (Year 2)

Year 1: $1.20\% + 0.10\% = 1.30\%$

Year 2: $1.50\% + 0.10\% = 1.60\%$

Year 3: $1.80\% + 0.10\% \times (5-3) / (5-2) = 1.87\%$

2. Continued

Year 4: $2.00\% + 0.10\% \times (5-4)/(5-2) = 2.03\%$
Year 5: 2.10%
Year 6: 2.50%
Year 7: 2.60%
Year 8: 3.00%
Year 9: 3.80%
Year 10: 4.50%

Second Key Rate Shift (Year 5)

Year 1: 1.20%
Year 2: 1.50%
Year 3: $1.80\% + 0.10\% \times (3-2)/(5-2) = 1.83\%$
Year 4: $2.00\% + 0.10\% \times (4-2)/(5-2) = 2.07\%$
Year 5: $2.10\% + 0.10\% = 2.20\%$
Year 6: $2.50\% + 0.10\% \times (10-6)/(10-5) = 2.58\%$
Year 7: $2.60\% + 0.10\% \times (10-7)/(10-5) = 2.66\%$
Year 8: $3.00\% + 0.10\% \times (10-8)/(10-5) = 3.04\%$
Year 9: $3.80\% + 0.10\% \times (10-9)/(10-5) = 3.82\%$
Year 10: 4.50%

Third Key Rate Shift (Year 10)

Year 1: 1.20%
Year 2: 1.50%
Year 3: 1.80%
Year 4: 2.00%
Year 5: 2.10%
Year 6: $2.50\% + 0.10\% \times (6-5)/(10-5) = 2.52\%$
Year 7: $2.60\% + 0.10\% \times (7-5)/(10-5) = 2.64\%$
Year 8: $3.00\% + 0.10\% \times (8-5)/(10-5) = 3.06\%$
Year 9: $3.80\% + 0.10\% \times (9-5)/(10-5) = 3.88\%$
Year 10: $4.50\% + 0.10\% = 4.60\%$

- (c) Estimate the bond prices based on each of yield curves 1, 2, and 3. Show all work.

Commentary on Question:

Candidates should notice that Yield Curve 1 is a parallel shift of +20bps and, therefore, can simply use the duration of the bond to estimate price. The candidates who did not recognize this but used key rate durations got partial credit.

For Yield Curves 2 & 3, candidates should notice that they are steepening and curvature shifts respectively. These yield curves require the use of key rate durations in order to estimate the bond prices. Candidates need to realize that

2. Continued

the 10-year duration is missing, but is easily determined. Several candidates did not calculate and use this key rate duration. In those instances, they received partial credit. Only the shifts at the key rates are needed to estimate the price. Technically, one can use the entire yield curve to determine the price, but the idea for this question was just to utilize the key rates to estimate the price.

$$\begin{aligned}\text{Total Price Change} &= \text{Bond Price} * \text{Duration} * \text{Yield Curve Shift} \\ &= 1000 * 7 * 0.20\% = 14 \\ \text{Bond Price} &= 1000 - 14 = 986\end{aligned}$$

$$\begin{aligned}\text{Duration of Key Rate at Year 10: Total duration} &= \text{Sum of all Key Rate Durations} \\ &= 7 - 1 - 2 = 4\end{aligned}$$

YC 2

$$\begin{aligned}\text{Total Price Change} &= \text{Bond Price} * [\text{Sum over of all Key Rates (Key Rate} \\ &\text{Duration} * \text{Yield Curve Shift at each Key Rate) } \\ &= 1000 * [1*(1.20\%-1.50\%) + 2*(2.10\%-2.10\%) + 4*(4.60\%-4.50\%)] \\ &= 1 \\ \text{Bond Price} &= 1000 - 1 = 999\end{aligned}$$

YC 3

$$\begin{aligned}\text{Total Price Change} &= \text{Bond Price} * [\text{Sum over of all Key Rates (Key Rate} \\ &\text{Duration} * \text{Yield Curve Shift at each Key Rate) } \\ &= 1000 * [1*(1.80\%-1.50\%) + 2*(1.90\%-2.10\%) + 4*(4.80\%-4.50\%)] \\ &= 11 \\ \text{Bond Price} &= 1000 - 11 = 989\end{aligned}$$

3. Learning Objectives:

2. The candidate will demonstrate an understanding of the various sources of risks faced by an insurer.

Learning Outcomes:

- (2c) Describe and evaluate the other risks an insurance company faces including operational, marketplace and expense risks.

Sources:

A New Approach for Managing Operational Risk - SoA Research 2008

Commentary on Question:

Overall, candidates had relatively modest performance on this question. This question tested the candidate's understanding of what is needed in a modern approach and how the described framework in the question is following a mix of modern and traditional operational risk management. The candidate did perform well on identifying which parts of the framework followed a traditional and which followed a modern approach. Most candidates did not perform well on recommending what to change in the described approach to follow entirely a modern approach. In addition, most candidates produced a memorized list rather than answer the question in the context.

Solution:

- (a) You are asked to audit IRM Life's new framework. Critique the framework and recommend changes so their new ORM process follows the modern approach.

Commentary on Question:

Overall, most candidates received partial credit for describing some features of the existing framework. However, to receive full credit, candidates must go beyond retrieval and show comprehension by answering under the context and recognizing where the modern approach was used and mention it. They also must identify when a traditional approach was used and suggest what should have been done instead. The candidate should also be able to tell what has been missed in the described approach – i.e. they tried to integrate modern approach techniques to a traditional operational risk management framework.

- The way IRM determines the risks is a combination traditional approach (mixes risk factors, controllable factors, events and effects) and modern approach (using hard and soft data, using the severity/frequency mapping)
- The modern approach categorizes and looks at both expected (magnitude) and unexpected (frequency) losses while the traditional approach only looks at expected losses. From the graph, we can assume they used the modern approach and considered both.
- The fact that they monitor and assess the risks quarterly points to a traditional approach since a modern approach would require simulation, scenario analysis and stress testing. They should move to an annual assessment but implement the modern techniques of measuring operational risks.

3. Continued

- IRM should have defined the risk universe (exclusive, non-overlapping risk that can be aggregated)
 - The mitigation actions should be defined to prevent the loss from routine events.
 - IRM should look to optimize risk-reward, risk control and risk-transfer.
- (b) Identify the highest risk for IRM Life under the modern approach based on the graph above. Justify your answer.

Commentary on Question:

Overall, candidates did well on this part. Most candidates were able to recognize that the modern approach was trying to identify the risks with small frequency and higher severity which means they are unexpected losses. Hence the biggest risk is a natural disaster in this case.

In the modern approach the risk with the smallest frequency and high severity is usually the biggest risk because it represents the unexpected loss. The biggest risk is then a natural disaster

4. Learning Objectives:

1. The candidate will demonstrate an understanding of the principles of Risk Management.

Learning Outcomes:

- (1c) Articulate the economic incentives for applying risk management
- (1d) Describe how risk management techniques may be used to manage capital deployed by insurers and how they impact strategic decision making.

Sources:

Chapter 31 The New Corporate Finance - The Theory of Risk Capital in Financial Firms - Chew

Chapter 29 The New Corporate Finance - Rethinking Risk Management - Chew 2001

Commentary on Question:

Commentary listed underneath question component.

Solution:

- (a)
 - (i) The CRO states “I am concerned about the profitability of the Annuities unit due to high risk capital requirements. We should consider exiting this line of business.” Analyze this statement.
 - (ii) Determine the amount of required risk capital that should remain unallocated to the business units. Show all work.

Commentary on Question:

Most of the candidates correctly identified that looking only at the standalone capital didn't provide the complete picture and the decision to exit the annuity market may be the incorrect one. That said many of the candidates didn't mention marginal capital in their response but did indicate that if annuities provided a higher return it could be adequate compensation for the higher capital.

- (i) The CRO's statement does not consider the possible effects of diversification. While annuities may have a high level of capital on a standalone basis, it really should be assessed on the marginal capital that it adds to the company.

The marginal capital for annuities = Total Capital after diversification – Required Risk Capital for Life +AD&D = 610 – 490 = 120

4. Continued

The marginal capital of 120 is significantly lower than the standalone capital of 450 which means that the Annuities business may not be as unprofitable as the CRO expects.

- (ii) Marginal Risk Capital = Total Capital After Diversification – Require Risk Capital for other two lines of business

Marginal Risk Capital for Life = $610 - 475 = 135$

Marginal Risk Capital for AD&D = $610 - 530 = 80$

Marginal Risk Capital for Annuities = $610 - 490 = 120$

Total Marginal Risk Capital = $135 + 80 + 120 = 335$

Unallocated Capital = Total After Capital Diversification – Total Marginal Risk Capital = $610 - 335 = 275$

Therefore 275 million of capital should remain unallocated.

- (b) Determine whether each strategy is worth taking. Show all work.

Commentary on Question:

There were many different calculations attempted in this question to assess whether the opportunities were worth taking. A lot focused on a return on capital metric but most resulted in an incorrect assessment of which opportunity was worth taking. The most common calculation was the correct one.

For a strategy to be worth taking the level of expected profits should be greater than the expected cost of distress times the increase in the probability of distress.

Strategy 1

Expected Cost of Distress x Increase in probability of distress = $25 \times 0.18 = 4.5$

As the expected profit of 8 exceeds the additional cost of distress strategy 1 is worth taking.

Strategy 2

Expected Cost of Distress x Increase in probability of distress = $75 \times 0.28 = 21$

As the expected profit of 12 is less than the additional cost of distress strategy 2 is not worth taking.

5. Learning Objectives:

1. The candidate will demonstrate an understanding of the principles of Risk Management.
3. The candidate will demonstrate an understanding of important risk measurement techniques along with their uses and limitations, and be able to perform risk measurement calculations.

Learning Outcomes:

- (1a) Define and evaluate risk.
- (1b) Evaluate the role of risk management within an insurance company.
- (3a) Analyze and evaluate risk measures & estimators (e.g., Value-At-Risk, Conditional Tail Expectations, etc.)
- (3b) Apply and analyze scenario and stress testing in managing risk including the calibration and setting of assumptions.

Sources:

ILA-C125-10: Insurance Risk Management Response to the Financial Crisis, CRO Forum, April 2009

ERM Specialty Guide, May 2006– Chapters 1-6
Chapter 14: Stress Testing, Jorion

ERM - 102 - 12 Value-At-Risk: Evolution, Deficiencies and Alternatives - Vozian 2010
(also FE-C181-11)

Commentary on Question:

Commentary listed underneath question component.

Solution:

- (a)
 - (i) Describe the CRO's role in the successful implementation of an ERM framework.
 - (ii) Critique Mr. Lyon's preference that the CRO report to the EVP-Planning at Simple Life.

Commentary on Question:

In general, candidates answered this part well. Some did not mention the holistic nature of ERM. Very few commented on the need for risk adjusted performance measures for senior management compensation. Most candidates correctly commented on the need for the CRO to report to the Board and the conflict of interest inherent in the current structure.

5. Continued

(i)

- The CRO needs to work with the corporate management and the management of the business units to determine the form of the risk management functions.
- When addressing the needs for ERM with the business management, emphasis should be on the benefits to the organization. Such as the benefits of understanding all the risks an organization faces or a business unit's return should reflect the amount of risk that they are taking.
- Risk adjusted ROE should become a key component in executive compensation. However, there will be those whose above average results as measured by GAAP and ROE will look less stellar when measured with a risk adjusted ROE. Acceptance by these business managers may not be readily obtained.
- The CRO needs to have a close relationship with the business unit risk managers even though they report up through the business unit management. It is necessary for each business unit to put in place a process to evaluate and manage their risks. Since most business units will not have a full-time team dedicated to ERM, it is important that the annual objectives, performance review and bonus include a significant factor related to the implementation and success of the business unit ERM.

(ii)

- The CRO must, therefore, be given a powerful role in the organization, with an equal seat at its highest level of executive management and direct access to the Board or the Board's dedicated Risk Committee.
- This is essential both to maintain a comprehensive view of the company's risk landscape and to help establish a strong risk culture throughout the company, from the top down.
- There will be conflict of interest if CRO is reporting to the new planning officer

(b) Describe alternative measures of a 4-sigma daily event.

Commentary on Question:

The exam question never asks the candidate to determine the loss for a 4-sigma event. However, if the candidate provides the calculation below they got credit. It is possible to get full marks without that calculation. Some candidates did not provide alternative measures and some who listed them did not describe them. Some listed VaR as an alternative (to a 4-sigma event which is VaR by itself).

5. Continued

- (i) Total portfolio value = \$4,730mil (page 23, Balance Sheet of case study)
Daily volatility = Annual Volatility * SQRT(1/250)
 $= 0.1 * (1/250)^{0.5} = 0.00632$
4-sigma event implies loss = VaR at 4 SD = 4 SD * daily volatility
 $= 4 * 0.00632 * 4,730 = \120mil
- (ii) Alternatives to VaR
ES (Expected Shortfall), at a% level
- This is expected return on the portfolio in the worst a% of the cases
 - This is the average loss of a% possible outcomes of portfolio
 - Shortcomings:
 - Only consider extreme event
 - Assume risk neutrality
- Conditional VaR
- This is weighted average of VaR and ES
 - Differs for noncontinuous distribution compared with ES
- (c) Propose strategies the ERM department can implement to meet stakeholders' demands to improve the trade-offs between risk and return in Simple's Life's Variable Annuity block.

Commentary on Question:

Candidates should add sub-points to bolded items in order to get points for the bolded items themselves. Several candidates focused on product related changes. A few added items related to hedging and immunization. Most candidates listed and described items in this part of the question.

Insurers are taking a closer look at what actions should be taken for a better trade-off between risk and return through:

More advanced ALM strategies

- Closer duration matching
- Duration and convexity management with derivatives

Strategies for hedging equity risk

- Purchasing derivatives
- Dynamic hedging

Risk transfer vehicles

- Reinsurance, securitization of xxx reserves, factoring of trail commissions

6. Learning Objectives:

3. The candidate will demonstrate an understanding of important risk measurement techniques along with their uses and limitations, and be able to perform risk measurement calculations.

Learning Outcomes:

- (3a) Analyze and evaluate risk measures & estimators (e.g., Value-At-Risk, Conditional Tail Expectations, etc.)

Sources:

Chapter 33 The New Corporate Finance - Value at Risk - Uses and Abuses - Chew 2001
Getting to Know CTE , Ingram

Commentary on Question:

Overall candidates did relatively well on this question. The goal of this question was to test the candidate's understanding and calculation of VAR using a continuous normal distribution and CTE under continuous and discrete distributions. To get full marks, candidates needed to be able to cite the correct information from the case study to support their calculation and be able to distinguish the different approaches mentioned.

Solution:

- (a) Refer to the *Portfolio Summary* (section 2.14) and the *Historical Market Data* (section 2.15) in the Case Study. Calculate the 1-year VaR (99%) of the new portfolio of assets backing the Term Insurance product, as proposed by the CIO, at December 31, 2013.

Commentary on Question:

Most candidates received partial credit; however, the formula for portfolio variance given by some candidates lacked key components (such as weight of asset classes or correlation factor) to support VaR calculation.

The first step is to determine new weights of the asset classes for the Term LOB, given the CIO is proposing only US Agencies and US Corporate Investment Grade by looking at the bottom of page 24 in the Case Study. The question implies that the values of US Treasuries and US Mortgage Backed Securities will be shifted to US Agencies.

Weight of US Corp Investment Grade = $866/940 = 92.1\%$, Weight of US Agencies = $100\% - 92.1\% = 7.9\%$

Next, calculate the portfolio variance (note, refer to pg 26 of case study to find standard deviations and correlation, and apply weights):

Formula: Variance (portfolio) = $(\text{Weight}(i) \cdot \text{SD}_i)^2 + (\text{Weight}(j) \cdot \text{SD}_j)^2 + 2 \cdot \text{Weight}(i) \cdot \text{Weight}(j) \cdot \text{SD}_i \cdot \text{SD}_j \cdot \text{Correlation}_{ij}$

6. Continued

$$\text{Variance (portfolio)} = [7.9\% \cdot (3.68\%)]^2 + [92.1\% \cdot (5.59\%)]^2 + 2 \cdot 7.9\% \cdot 92.1\% \cdot 0.76 \cdot 3.68\% \cdot 5.59\% = 0.003212$$

Finally calculate the Value at Risk at 99% confidence (look at the normal table for 99% to determine alpha):

$$\text{VaR} = \alpha \cdot \text{sd}(\text{portfolio}) \cdot \text{Market Values} = 2.326 \cdot \sqrt{0.003212} \cdot 940 = 123.92$$

- (b) Determine the VaR (95%) and CTE (95%) of the annual return for the new asset.

Commentary on Question:

Candidates did well on this question. Some received partial credit because the answer lacked evidence to support the final answer or the wrong reference of the CTE 95% to the ranked results was given.

The negative numbers from worst to best are: -25, -23, -16, -10, -8, -4, -1

VaR (95%) is quantile based, so the 5th worst scenario = -8

CTE (95%) is the average of the worst 5 scenarios = Average (-25, -23, -16, -10, -8) = -16.4

7. **Learning Objectives:**

1. The candidate will demonstrate an understanding of the principles of Risk Management.

Learning Outcomes:

- (1a) Define and evaluate risk.
- (1d) Describe how risk management techniques may be used to manage capital deployed by insurers and how they impact strategic decision making.

Sources:

CIA: Dynamic Capital Adequacy Testing (DCAT) Education Note, November 2007 (pages 1 - 33)

Risk Management by Insurers: An Analysis of the Process

Commentary on Question:

Overall, this was a poorly answered question by candidates. Most candidates provided a general list of scenarios/risks to stress test but very few related to how they apply in the context of managing risk and capital within the DCAT framework.

Solution:

Recommend enhancements to Simple Life's current stress testing method so that it can be more useful for testing capital adequacy. Justify your recommendations.

Commentary on Question:

To obtain full credit, the candidate needed to identify the key categories of stress testing enhancements for testing capital adequacy, and demonstrate what that means for Simple Life.

Aggregation

- Capital test should still be applied at a company level to take advantage of benefits of aggregation ie. single model run

Plausible adverse scenarios

- Need to determine how far risk factors need to be changed to drive insurer's surplus negative
- Should set up long term persisting shocks as well as instantaneous shocks
- Should try different stress tests based on Simple Life's product line characteristics. Example: Term and SPIA sensitive to mortality risk testing, and risks other than interest and equity risk should be explored

7. Continued

Integrated scenarios should be tested

- Two or more scenarios should be combined but be realistic
- Ripple effects should be analyzed (e.g. policyholder behavior, regulatory/rating agency actions, insurer's expected response, liquidity risk, reputational risk)
- Should incorporate risk mitigation strategies in combination with stress tests
- For VA, increase frequency of Greek calculation to improve hedging, and use stochastic on stochastic to more accurately project reserves and capital for block

Trend analysis

- Analyze recent trends in statement values and be aware of underlying reasons for any trends