ILA LRM Model Solutions
Spring 2017

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:
(1b) Evaluate the role of risk management within an insurance company

(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.

(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:
CIA: Dynamic Capital Adequacy Testing (DCAT) Education Note, November 2013 (pages 4-33)

ERM Specialty Guide, May 2006 – Chapters 1-6

Commentary on Question:
Many candidates were able to describe the DCAT process but to achieve full marks had to be able describe how it fit within an overall risk management framework.

1. **Continued**

Solution:

(a) Define each of the following Enterprise Risk Management Components as described in the COSO Report:
- Objective setting
- Event identification
- Risk assessment
- Information and communication

Commentary on Question:
Part (a) was done reasonably well. Many candidates did not fully grasp the finer points of the COSO Report but were able to give reasonable answers based on their knowledge of risk management.

Objective setting – The company must have a clearly laid out mission and vision or strategic goals so they can define what they are trying to achieve. This is because risk events are identified in terms of their effect on the achievement of objectives.

Event Identification – Internal and external events are identified in terms of their impact on achieving objectives. Potential events identified could represent either an opportunity or loss.

Risk Assessment – Identified risk are assessed in terms of their likelihood of impact and range of potential outcomes.

Information and communication – Management ensures that risk policy is communicated to all levels throughout the organization. All employees understand their roles and responsibilities within the organization.

(b) Assess how the DCAT exercise contributes to each of the applicable Enterprise Risk Management Components listed in part (a).

Commentary on Question:
This part was not as well done as part (a). Many candidates could give an overview of the DCAT process but failed to connect how the specifics of the DCAT process related to the items from the COSO Report identified in part (a).

Objective setting – DCAT starts with the company's business plan or outlook as its base scenario. The base scenario should already be in line with the company's goals or vision. The base scenario is then stress tested based on a few adverse scenarios. The results from these tests give insight into not just the company's capital adequacy, but also how the company is projected to perform under adverse conditions.

1. **Continued**

Event identification – DCAT requires the development of adverse scenarios and putting thought into what could stress the company. The results of the adverse scenarios help identify what events are losses or opportunities with respect to the capital adequacy of the company and achieving its objectives.

Risk assessment – DCAT is performed at the company level. It helps assess the impact of adverse events over a longer period of time which may not be provided by point in time stress testing. DCAT will present potential outcomes from adverse events in terms of the impact to capital adequacy.

Information and communication – DCAT is a company-wide exercise and forces each area of the company to assess its risks. It provides a framework to make conversations happen at all levels of the organization in terms of risk management.

(c)

(i) The following tests have been recommended for DCAT adverse scenario testing:

- Increase mortality by 10% for all products
- Increase lapse rates by 10% for all products

Critique this plan and propose any changes.

(ii) Based on the actual mortality experience, a proposal has been made to increase premiums for Term and UL. Assess possible risks of this proposal.

Commentary on Question:
This question was generally done well. Most candidates identified the key weaknesses of the proposal. Some candidates responded without a full explanation or included a counterproposal to inappropriate tests which did not make sense. For part (ii) some candidates provided risks that were not specific or related to the question.

(i) Increase mortality by 10% for all products:
This plan is not appropriate for all of the company's products. For annuities, an increase in mortality is beneficial, as customers would die sooner and there would be fewer annuity payments. For annuities, a mortality decrease scenario would be a more appropriate test. Also the A/E ratios for the other products suggests mortality experience may vary by a margin greater than the proposed test. For example, an A/E of 25/18=139% for Term suggests a 10% shock may not be severe enough and that a larger mortality shock could be more appropriate.

1.   **Continued**

Increase lapse rates by 10% for all products:
This plan is not appropriate for all of the company's products. As with mortality, an increase in lapse rates for annuities may not be adverse, but it could depend on the product features so testing of both higher and lower lapses may be appropriate. Term and WL have cash values less than the reserve suggesting that if they lapse the company could benefit. Therefore, testing a lapse decrease for WL and Term may be appropriate. The UL cash value by comparison exceeds the reserve so an increase in lapse is a directionally appropriate test.

(ii)   Increasing premium can have a ripple effect. Price increases can reduce new sales for these products. UL could see an increase in lapses; cash values are higher than reserves and policyholders may choose to lapse their policies, take the cash value, and go buy UL policies from a competitor with lower premiums. Another ripple effect for both products could be an increase in mortality due to anti-selection. Healthier policyholders may choose to lapse their policies, while the less healthy lives would stay since they are less likely to be approved for a better premium rate elsewhere.

The plan has also not addressed the mortality experience of the Annuity product. Actual deaths are much lower than expected, which is a poor result for annuities.

2.

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:

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

(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:

LRM-100-14: The Theory of Risk Capital in Financial Firms

A New Approach for Managing Operational Risk - SOA Research 2008

LRM-105-14: Mapping of Life Insurance Risks, AAA Report to NAIC (same as ERM - 401 - 12)

Commentary on Question:

This question tested the candidates' knowledge of operational risk and the factors that influence changes in risk capital. Candidates received maximum credit for identifying various operational risks and the priority level as well as demonstrating that this risk cannot be measured by expected loss.

In addition, candidates received significant credit for demonstrating via calculation how the risk capital of a portfolio is dependent on the correlations and weights of the various assets.

Finally, candidates were tested on their knowledge of how hedging can be used to mitigate the amount of risk capital.

2.   **Continued**

Solution:
(a)   PHX Life is considering acquiring a block of business from TUS Life, including its employees who process claims. The Chief Risk Officer (CRO) of PHX has expressed concern about several claims processing errors recently experienced at TUS.

   (i)   Assess the priority level (high or low) in dealing with the claims processing errors to address the CRO's concern.

   (ii)   List four other operational risks PHX could face by acquiring the block of business from TUS.

   Commentary on Question:
   This question was relatively straightforward. However, a significant number of candidates did not recognize that the priority level was low due to the frequent, well understood nature of the risk.

   (i)   The priority level in dealing with the processing risk is "low". Processing risks are part of "operations risk", which is a small subset of operational risk. These risks stem from failures of normal operating procedures and the losses from these types of failures are generally relatively small. These small, frequent losses are usually well-understood and can be managed by ordinary control and audit processes.

   (ii)   Four other operating risks are:
      a.   Pricing risk
      b.   Reserving risk
      c.   Underwriting risk
      d.   Expertise risk
      e.   Inadequate capital risk

(b)   Critique the CRO's statement. Justify your answer.

   Commentary on Question:
   This question tested candidates' knowledge of the modern risk management methods. A significant number of candidates did not recognize that expected loss is not a good measure of operational risk. Candidates received a majority of credit for indicating that expected loss is not the best measure, even without performing the calculation.

   Expected loss = frequency * severity
   For C, expected loss = 1 * 100,000 = 100,000
   For F, expected loss = 0.8* 125,000 = 100,000

2. **Continued**

So both C & F has the same expected loss.

However, operational risk is more concerned about low frequency, high severity events (i.e. the tail of the distribution).

Better measures of operational risk is unexpected loss and cost of risk.
Unexpected loss = aggregate exposure – expected loss
Cost of Risk = Expected Loss + cost of capital * unexpected loss

For C,
Unexpected loss = 2,000,000 – 100,000 = 1,900,000
Cost or Risk = 100,000+ 10% * 1,900,000 = 290,000

For F,
Unexpected loss = 2,300,000 – 100,000 = 2,200,000
Cost of Risk = 100,000 + 9% * 2,200,000 = 298,000

Therefore, F has higher cost of risk and higher unexpected loss. Therefore, the CRO's statement is inappropriate.

(c)   Calculate the marginal increase in risk capital by acquiring this block of business.

Commentary on Question:
The candidates understood what was being asked from this question for the most part. The major pitfalls which caused candidates to lose credit were:

1. *Some candidates did not attempt to do the numeric calculation*
2. *When candidates did the numeric calculation, some used the net asset minus liabilities to calculate the weights*
3. *Some candidates did not square weights in the portfolio variance calculation*

Current Business:				
	Assets	Liabilities	Standard Deviation of Earnings	Correlation of Profits
A	5000	1000	25%	50%
B	5000	3000	75%	

2. **Continued**

Potential Acquisitions					
	Assets	Liabilities	Standard Deviation of Earnings	Correlation of Profits with A	Correlation of Profits with B
Z	5000	2500	50%	20%	80%

$$\text{Risk Capital} \approx .4 A_0 \sigma \sqrt{T}.$$

Portfolio variance is given by :

$\Sigma\Sigma w_i w_j \rho_{ij} \sigma_i \sigma_j$, where ρ_{ij} is the correlation between the profits of businesses i and j, and w_i is the fraction of gross assets in business i. The formula is an

Current Portfolio:
w1 = 5000/(5000+5000) = ½. w2 = 1/2

Portfolio Variance = (1/2)^2 * (.25)^2 + (1/2)^2 * (.75)^2 + 2*(1/2)*(1/2)*(.25)*(.75)*(.5)
Portfolio variance = 0.203125
Portfolio standard deviation = sqrt(0.203125)=0.4507

Current Risk Capital = 0.4 * (5000 + 5000) * 0.4507 = 1,803.

After adding Z:
w1 = w2 = w3 = 1/3 (i.e. 5000/(5000+5000+5000)
Portfolio Variance = (1/3)^2*(.25)^2+(1/3)^2*(.75)^2+(1/3)^2*(.5)^2+ 2*(1/3)(1/3)(.25)(.75)(.5)+ 2*(1/3)(1/3)(.25)(.5)(.2)+2*(1/3)(1/3)(.75)(.5)(.8)

Portfolio variance = 0.19028
Portfolio standard deviation = sqrt(0.19028) = 0.43621

Risk Capital post acquisition = 0.4* 15,000*0.43621 = 2,617

Marginal increase in Risk Capital = 2,617 – 1,803 = 814

2. Continued

(d)   Assess how the marginal increase in risk capital would change if PHX was able to hedge the asset exposure of the acquisition.

Commentary on Question:
This question tested the candidates' knowledge on the use of hedging to reduce risk capital. Candidates received significant credit if they demonstrated this impact.
Many candidates did not discuss the impact of spread cost on risk capital, which was necessary for full credit.

Hedging away these exposures would reduce asset risk, which in turn would reduce the required capital.
Exposure to market risk can usually be hedged by using derivatives such as swaps and options.
If there are no spread costs for risk capital, larger amounts would impose no additional costs on the firm so they should be indifferent to hedging.
If there are spread costs, and the spread depends on the amount of risk capital, a reduction in risk capital from hedging will lead to lower costs for the firm.

3. **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.)

(3b)   Apply and analyze scenario and stress testing in managing risk including the calibration and setting of assumptions

Sources:

LRM-111-14: Value-At-Risk: Evolution, Deficiencies and Alternatives

LRM-112-14: Stress Testing OSFI E-18

LRM-121-14: Value at Risk - Uses and Abuses

Getting to Know CTE , Ingram, Risk Management Newsletter, July 2004, Issue No. 2

Commentary on Question:
Refer to separate comments for each part.

Solution:
(a)

(i)   Calculate VaR(95) and CTE(95) for each portfolio.

(ii)   Assess which portfolio is riskier. Justify your answer.

Commentary on Question:
This question required candidates to perform risk measurement calculations and tested the candidates' knowledge of VaR and CTE pros/cons.

Most of the candidates did (i) well, with the exception that some candidates identified the 5th best result instead of worst result among the distribution for VaR(95).

For (ii), candidates generally did well in identifying the use of CTE to assess riskiness; candidates receiving full credit explained VaR shortcomings and the advantages of CTE over VaR.

(i)   At 95% confidence level, VaR(95) is the 5th worst result among the distribution. So for Portfolio A VaR(95) = 52,000 and for Portfolio B VaR(95) = 55,000

3. Continued

CTE(95) is the average of the 5 worst results. So for Portfolio A CTE(95) = 74,600 and for Portfolio B CTE(95) = 70,000

(ii) Portfolio A is riskier.
Although Portfolio A has a lower VaR(95), this is not indicative of the tail risk because VaR only measures the loss at a certain probability level. By only looking at the VaR value, you may overlook possible extreme losses or worst case scenarios.
Portfolio A has a higher CTE(95), meaning it has higher average losses in the tail than Portfolio B does, indicating Portfolio A being risker.

(b)

(i) Explain a situation in which the company would choose to use VaR(90) instead of VaR(95).

(ii) The Chief Risk Officer states *"since the VaR(95) for a one day horizon is 2.5 million, we can say with 95% confidence that we will lose no more than 2.5 million on approximately 18 days over the next year"*. Critique this statement.

(iii) In order for SFO's assets to remain sufficient to cover its liabilities, the one day loss must never be more than 20 million. The CRO believes the given metrics provide enough confidence that the portfolio will not lose more than 20 million. Assess the appropriateness of using these metrics. Propose any changes.

(iv) To help control risk, SFO plans to implement an incentive program in which the manager of each asset portfolio will receive a quarterly bonus if the company's VaR(95) stays below 3 million. Evaluate this plan.

Commentary on Question:
This question required candidates to understand the usage of VaR, limitations of VaR and CTE measures, and alternative measures.

Most candidates did well in part (i) and (ii). For part (ii), candidates were able to recognize 1-day VaR cannot be used to represent exposures for a longer period. However, many omitted to comment on the underlying distribution and therefore did not receive full credit.

For part (iii), while candidates understood the shortcoming of VaR, most of them failed to recognize CTE also does not provide certainty. The candidates also failed to comment that actual experience may not be normally distributed. In addition, many candidates did not perform well in recommending alternative measures, which was necessary for maximum credit.

3.   Continued

Candidates did moderately well for part (iv). Most explained agency problems, but struggled or omitted to comment on additional metrics.

(i)   The company may choose to use VaR(90) if similar companies are using VaR(90) for reporting and comparison purposes.

   OR
   The company may choose to use VaR(90) for backtesting purposes, in order to get a reasonable proportion of excess loss observations.

   OR
   The company may choose to use VaR(90) to set their risk limits, although companies are more likely to use a higher confidence level when setting risk limits to minimize exposure to severe losses.

(ii)   This is only true if the underlying probability distribution is stable. Since this VaR(95) statistic was calculated on a one-day horizon, it means the company can expect to lose no more than $2.5M on the next day with 95% confidence. It is likely that the portfolio will not change significantly over a one-day horizon, but it is very possible for the portfolio to experience changes over the course of a year which would make the one-day VaR statistic irrelevant.

(iii)   Neither VaR nor CTE can give certainty that a loss will never be greater than a certain amount. If the underlying probability distribution is non-normal, the VaR and CTE statistics can change on any given day and the portfolio could experience an extreme tail loss.

   The company should use shortfall risk measures if they want to be assured of never losing more than the stated amount. These allow the user to define a target value that the portfolio must not fall below. Two such shortfall risk measures are Below Target Probability (BTP) and Below Target Risk (BTR).

   The company should also use stress testing to help determine how severe their losses could be. Stress testing can validate the models used to determine VaR. It can also help predict potential severe events or interactions of risks in a stressed environment that may be overlooked under normal conditions.

3. **Continued**

(iv)   This is not a very good plan for managing risk since it can introduce agency problems. VaR is not indicative of the tail risk. A manager may exploit the shortcoming of VaR to take excessive risks in order to get a bonus. This is because as long as the manager is taking risks that lie in the 5% tail, VaR(95) will not be affected. This could potentially place the company at risk of extremely large losses and management would be unaware of this risk. SFO should consider using additional metrics to evaluate its portfolio managers' performance, such as CTE, cash flow risk, shortfall risk, etc.

(c)   The CEO states *"this is a clear indication that SFO is less risky than OAK"*. Critique this statement. Recommend any additional considerations.

Commentary on Question:
The question tested candidates' understanding of VaR shortcomings when used for comparison purposes.

Most candidates commented on VaR not addressing tail risk or giving a complete picture of risk; candidates who received full credit recognized the two companies may have differences in VaR methods and risk management programs.

This is not necessarily true. Only looking at one or two VaR statistics does not give a complete picture of a company's overall risk, since VaR does not provide insight into the tail risk. SFO could have much higher risk in the tail (and a large CTE statistic), which may suggest SFO to be riskier. In order to properly assess the riskiness of the two companies, one would need to look at more data than just a VaR number.

When comparing the VaR statistics of two companies, you should also consider how the VaR was calculated. The companies could have used a different simulation method (e.g. Monte Carlo method, historical simulation method). If historical simulation was used, you should consider the observation period used by the companies. You should also consider whether the companies used the same time horizon period in their VaR calculation. The companies may also have different degrees of parameter risk within their models. Lastly, you should also consider each company's total risk management program (risk appetite, risk management practices, etc).

4. **Learning Objectives:**
2. The candidate will demonstrate an understanding of the various sources of risks faced by an insurer.

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:
(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.

(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:
LRM-114-14: ALM for Insurers (pages 14-15, 26)

LRM-120-14: Chapter 14 of Life Insurance Products and Finance, Atkinson/Dallas Section 14.4 only on ALM Matching (page 762)

LRM-105-14: Mapping of Life Insurance Risks, AAA Report to NAIC (same as ERM - 401 - 12)

Chapter 2, Defining Asset-Liability Management, Society of Actuaries

Commentary on Question:
Commentary listed underneath question component.

4. **Continued**

Solution:
(a)

    (i)   Define spread management.

    (ii)   Explain how Simple Life's UL interest crediting method complicates spread management, including potential risks.

    (iii)   Assess the appropriateness of Simple Life's current market risk policy for its UL line of business and the ramifications of the revised investment plan described in the case study. Justify your answer.

Commentary on Question:

Most candidates did well on parts (i) and (ii) but struggled with part (iii). In part (iii) candidates failed to refer to the specific of the case study. For section (ii), for full credit the candidate needed to include potential risks.

For section (iii), the candidate needed to discuss the ramification of the revised investment plan which most candidate focusing on assessing the appropriateness of Simple Life's current market risk policy.

    (i)   Spread management is a return-based ALM method where the focus is maintaining a spread between the yield of assets and the promised yield in liabilities

    (ii)   The company's UL crediting rate strategy is complicated from a spread management perspective because it is driven by the portfolio earned rate less a spread, but is also subject to two guarantees; a fixed rate guarantee and one based on treasury rates.

             The potentials risks may include the following:

- Liquidity Risk – the assets may be sold at suboptimal prices to fund obligations (e.g. death benefits, cash values)
- Reinvestment Risk – if interest rates remain low it may not be possible to earn enough to cover the guarantee return

    (iii)   The current market risk policy for UL measures the Macaulay duration for asset and liabilities and rebalances when the durations are apart by more than 0.5. A more appropriate strategy is to rebalance more frequently than semi-annually.

4. **Continued**

It is difficult to estimate the duration of the 320 million of Mortgage Backed Securities in the UL portfolio due to uncertain cash flows and embedded options, therefore making it difficult to manage the duration within the current strategy and should be reviewed.

The revised strategy includes private equity, for which it is also difficult to estimate the duration therefore, it is not appropriate in combination with the current market risk policy.

(b)   Calculate the cost of asset duration mismatch in excess of Simple Life's market risk policy using modified duration and a decrease in interest rates of 125 basis points.

Commentary on Question:
Candidates generally did well on applying the duration and calculating the change in market value of the asset. Many candidates failed to capture the maximum duration mismatch in the case study.

Simple Life' market risk policy is to rebalance the asset portfolio to match the Macaulay duration of the liabilities if the asset duration is apart by more than 0.5.

The cost of the duration mismatch is the impact to surplus if interest rates fall 125 basis points with an asset Macaulay duration of 6.5 compared to if the Macaulay duration was 7.5, and therefore within the market risk tolerance.

The first step is to calculate the modified duration of each component:
The modified duration is Macaulay duration $\div$ (1 + interest)
- Liability modified duration = $8 \div 1.05 = 7.62$
- Current asset modified duration = $6.5 \div 1.05 = 6.19$
- Asset modified duration at the minimum compliant level = $7.5 \div 1.05 = 7.14$

The second step is to calculate the new market value of the assets and liabilities based on the interest shock of -125 basis points, where the change in market value of the assets is the duration $\times$ change in interest rate
- Liability = $1.55B - 1.55B \times 7.62 \times -1.25\% = 1.698B$
- Current Asset = $1.83B - 1.83B \times 6.19 \times -1.25\% = 1.972B$
- Maximum Duration Mismatch Asset = $1.83B - 1.83B \times 7.14 \times -1.25\% = 1.993B$

4. Continued

The third step is to calculate the surplus, or asset minus the liability:
- Using current asset duration = 1.972B – 1.698B = 0.274 B
- Using maximum duration mismatch asset = 1.993B – 1.698B = 0.296B

The last step is to calculate the cost of the asset duration mismatch in excess of the market risk policy
- Cost = 0.296B – 0.274B = 0.022B = 22M

(c)   Calculate the optimal portfolio mix. Show all work.

Commentary on Question:
This section was a numerical calculation; partial credits were given for setting up the formulas and full credits were provided for solving the optimal mix. Many candidates set up the formulas but failed to solve for the weights.

To solve the questions, there are 3 equations and 3 variables.

The three variables are:
x = weight for Mortgage Backed Securities
y = weight for Corporate High Yield
z = weight for Long Treasuries

The three equations are:

$x + y + z = 1$ (weights add up to be 100%)

$(2.74\%)x + (7.73\%)y + (3.11\%)z = 3.82\%$ (returns multiplied by weights equals desired return. Yield to maturity was required for the calculation.)

$3.32x + 4.19y + 15.9z = 8$ (duration multiplied by weight equals desired duration.)

Solution:

$z = 1 - x - y$

New equations with 2 equations and 2 variables to solve:
$(2.74\%)x + (7.73\%)y + (3.11\%)(1 - x - y) = 3.82\%$
$3.32x + 4.19y + 15.9 \times (1 - x - y) = 8$

$(-0.37\%)x + (4.62\%)y = 0.71\%$
$-12.58x - 11.71y = -7.9$

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4. **Continued**

Solve for x and y
From first equation, x = (0.71% − (4.62%)y) ÷ (-0.37%)
Then using second equation solve for y
-12.58 × (0.71% − (4.62%)y) ÷ (-0.37%) − 11.71 y = -7.9
24.14 − 157.08 y − 11.71 y = -7.9
-168.79 y = -32.04

y = 18.98%
x = 45.13%
z = 35.89%

5.

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

Learning Outcomes:
(1b)   Evaluate the role of risk management within an insurance company

(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:
ERM Specialty Guide, May 2006– Chapters 1-6

Risk Appetite: Linkage with Strategic Planning

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a)   Describe considerations for a risk appetite framework.

   Commentary on Question:
   Many candidates tended to lose marks here by not answering in the context of the question.

   Some considerations for a company are as follows:
   - Will the new market create value for the company?
   - How will the quantitative and qualitative analysis assist senior management in deciding whether the return justifies the risk
   - Are risk limits consistent with the risk appetite?
   - The importance of the framework to rating agencies and shareholders
   - How will the framework integrate into business strategy for proposals?

(b)   Assess each of the following statements as they relate to the company's entry into the Canadian market:

   (i)   There must be an agreement reached on event-related probabilities for both the Canadian and U.S. business.

   (ii)   Assessing the liquidity for the U.S. and Canadian divisions separately is more important than integrating the assessment at the total company level.

5. **Continued**

Commentary on Question:
Candidates generally performed well on this part of the question. Most candidates did assess the applicability of the statements to the question. The key for section (i) was to recognize that it is more important to analyze adverse deviation rather than the expected probability itself; for section (ii), it was important to recognize that analysis is better performed at the corporate level, but also recognizing any limitations caused by country-specific concerns.

(i) Not true – probabilities might be quite different by region, and it is more meaningful to determine appropriate stress levels and remediation strategies rather than assigning probabilities.

(ii) Not entirely true – usually prefer company-wide integrated approach, but may need to asses liquidity at country level to reflect possible difficulties in moving cash in and out of entities, particularly under a stressed scenario

(c) Another actuary at the company has proposed allocating more capital to the travel insurance line of business because it requires the least capital. Assess the actuary's proposal.

Commentary on Question:
Most candidates performed well on this part of the question. In addition to not always showing all work to demonstrate an understanding of the problem, other common errors included the following:
- *Not deducting income taxes*
- *Not including interest income on required capital in taxable income*
- *Not calculating RAROC at the corporate level, i.e. sum of all 3 lines of business*

Decision based on Return on Required Capital (RC)
$RAROC = ((1 - \text{tax rate}) \times (PV(\text{underwriting profit}) + \text{InvInc on RC}) \div PV(RC)$
$RAROC_{Health} = (1 - 0.3) \times ((200 - 100 - 50) + 0.1 \times 800) \div 800 = 11.38\%$
$RAROC_{Travel} = (1 - 0.3) \times ((100 - 50 - 20) + 0.1 \times 500) \div 500 = 11.20\%$
$RAROC_{Term} = (1 - 0.3) \times ((400 - 50 - 200) + 0.1 \times 1600) \div 1600 = 13.56\%$
$RAROC_{Company} = (1 - 0.3) \times ((700 - 270 - 200) + 0.1 \times 2900) \div 2900 = 12.55\%$

Conclusion: the actuary is incorrect – Term Life has the highest RAROC and whose RAROC is greater than the hurdle rate and so should receive greater allocation first.