CSP-IU Complete Illustrative Solutions
Fall 2011

1. Learning Objectives:

7. The candidate will be able to evaluate risks faced by a Company by virtue of the Company's products, assets and management strategies and practices and be able to evaluate the appropriateness of various methods of risk mitigation.

Learning Outcomes:

(7g) Describe the roles of rating agencies, analysts and regulators together with their methods and impact on insurance companies.

Sources:

ILA-C124-10: "S&P's Insurance Criteria: Refining the Focus of Insurer ERM Criteria," June 2006, excl. pp. 20-26

Commentary on Question:

Part (a) of this question tests the ability of the candidate to apply the S&P ERM Criteria to mortality risk. Part (b) tests the candidate's knowledge of what constitutes an adequate ERM rating and how an adequate ERM rating can be upgraded to strong.
Cognitive levels include Retrieval and Knowledge Utilization.
To receive maximum points the candidate needs to describe how each of the S&P ERM criteria relate to mortality risk for part (a). To receive maximum points for part (b) the candidate must explain why this company was rated as adequate thoroughly and then separately identify the steps the company could take to improve the rating to strong.
Some candidates stated considerations in the ERM criteria but did not apply these to mortality risk as part (a) requested. Some candidates did not separate part (b) into two sections and talked generally about strong and adequate ratings, not how to improve ratings from adequate to strong, and why the rating would only be adequate.

Solution:

(a) Identify the most favorable indicators for mortality risk control

Risk Identification:

ABC needs to be aware of mortality risk as well as associated risks. These associated risks include:

- Risk of underpricing
- Risk of misclassification
- Risk of concentration

1. Continued

Risk Monitoring:
ABC can monitor mortality risk through mortality studies performed with standard frequency and timing. Actual mortality rates can be compared to pricing assumptions and industry studies.

ABC can monitor claims risk through monitoring actual mortality rates to expected mortality rates.

ABC can monitor concentration risk through a chart showing new business distribution by policy size, underwriting class, age of insured, etc.

It's important to give feedback from the monitoring process to pricing, underwriting, and claims departments.

Risk Limits and Standards
Retention limits may be used to limit the amount of insured offered on a single policy.

Underwriting standards are clear and consistent. ABC expects its closely tied sales forces to participate in underwriting as a significant prescreening step.

The amount of insurance ceded to any single reinsurer could be limited.

Risk Limit Enforcement
Underwriters need to be trained on underwriting standards. ABC must monitor and enforce compliance with these standards.

An auditing process for reviewing risk classification decisions such as self-review, peer-review, supervisory review, and independent internal/external review is required.

Insurer follows compliance failures with retraining, limits to authority, compensation limits and/or terminations.

Risk Management
Reinsurance is the primary tool for managing mortality risk. ABC's retention limit for individual lives should be tied to their overall risk tolerance.

An objective process should be used for reinsurer selection and distribution of reinsurance.

Securitization can also provide for a transfer of risk in extreme events.

1. Continued

Risk Learning
Underwriting standards and pricing should be aligned with company and industry experience.

Processes should be developed that extend current mortality trends.

Processes should be developed that subdivide experience into new or developing classifications.

(b) S&P issued an Adequate ERM rating of ABC.

(i) Evaluate the above aspects of ABC's ERM program that contribute to the Adequate rating.

Reasons why ABC's ERM program is rated adequate:
ABC's ERM programs has fully functioning risk control systems in place for all major risks, however they lack an overall risk tolerance and lack a clear vision of their overall risk profile.

ABC's ERM process is solid, classical, and silo-based. Risk limits for various risks have been set independently.

ABC lacks robust processes for identifying and preparing for emerging risks, and for optimizing risk-adjusted returns.

(ii) Recommend improvements ABC Life could make to its ERM program to improve its rating to Strong.

Recommendations to improve ABC's ERM program rating to strong:
ABC must exceed the adequate criteria for risk control. Ways to achieve this would be:

- Creating a vision for overall risk profile and an overall risk tolerance
- Having a goal of optimizing risk-adjusted returns
- Developing robust processes to identify and prepare for emerging risks.

2. Learning Objectives:

4. The candidate will be able to explain and apply the basic methods, approaches and tools of financial management and value creation in a life insurance company context.

Learning Outcomes:

(4d) Apply methods of valuation to business and asset acquisitions and sales.

Sources:

ILA-C106-07: Mergers and Acquisitions, Chapter 4 (Sections 4.1-4.6)

Commentary on Question:

Commentary listed underneath question component.

Solution:

(a) List adjustments a buyer may make to a seller's analysis to develop its own actuarial appraisal.

Commentary on Question:

This part of the question was trying to test the candidate's understanding of the adjustments that may be made by the buyer to the seller's actuarial appraisal of its company.

This cognitive level of this part of the question is retrieval of information from the pertinent study material in the syllabus.

Candidates should elaborate on each item that they list to demonstrate their understanding of adjustments which may be made by one company to an actuarial appraisal developed by another company.

In general, candidates did not perform well on this part of the question. Most candidates just listed "key words" rather than disclosing the significance of the items they listed as adjustments to an actuarial appraisal.

A buyer may make the following adjustments to a seller's analysis to develop its own actuarial appraisal:

1. Reflect buyer's own view of the discount rate.
2. Adjust experience and product management assumptions in actuarial appraisal to fit buyer's assessment.

2. Continued

3. Actuarial appraisal may be adjusted for specific structure anticipated by buyer with regard to tax benefits or costs associated with the transaction and capital structure.
4. Adjust values with respect to new business based on buyer's view.
5. Adjust for anticipated benefits due to anticipated synergies, cost savings, and/or one-time acquisition costs.

(b) You are preparing the best estimate mortality assumptions for the actuarial appraisal of Alta Life Co's business.

Evaluate the appropriateness of:

(i) Using Alta Life's experience

(ii) Using SLH Life's experience

Commentary on Question:
This part of the question was trying to test the candidate's understanding of how to select an appropriate mortality assumption for developing an actuarial appraisal.

The cognitive level of this part of the question was knowledge utilization of the pertinent study material on the syllabus.

Candidates must demonstrate an understanding of the criteria for selecting a mortality assumption to be used in the development of an actuarial appraisal.

Most candidates were able to state the appropriateness of using either company's mortality assumption, but they had difficulty supporting their evaluation. There were a number of candidates who failed to state the appropriateness of either company's mortality experience and this was unfortunate because these candidates lost some "easy" points. It's important for the candidate to understand that when they are asked to make a recommendation that they should make a recommendation and then provide support for their recommendation. Valuable points are lost when this is not done.

2. Continued

Using Alta Life's mortality experience in the actuarial appraisal of Alta Life's business would be appropriate if:

1. Alta Life's mortality experience is credible provided its mortality experience is significant.
2. Alta Life's mortality experience is reflective entirely of its own company experience.
3. Alta's Life mortality experience is relevant provided there is no change to the nature of the business after it is sold to SLH Life.

Using SLH Life's mortality experience would not be appropriate because of the following differences underlying the products in SLH Life's portfolio relative to Alta Life's portfolio:

1. Types of underwriting.
2. Distribution of sales.
3. Treatment of substandard risks.
4. Mortality anti-selection due to policyholder's lapsation.
5. Assumed improvement in future mortality.
6. Different mortality risks from premature death as opposed to longevity risk.

(c) Calculate the Actuarial Appraisal Value for Alta's closed block on December 31, 2010.

Commentary on Question:
This part of the question was testing the candidate's ability to calculate an actuarial appraisal value.

This part of the question was testing the candidate's comprehension of how to perform a calculation covered in the study material on the syllabus.

For the candidate to receive maximum points on this part of the question, the candidate must show all of his/her work including formulas "in words" as well as numerical formulas.

In general, candidates performed well on this question. But, many candidates failed to show all formulas "in words" and as a result, lost some points. Also, many candidates erroneously did not include the deduction of the cost of required capital as part of the formula for the Value of Inforce Business and instead included this item as part of the formula for the Actuarial Appraisal Value. Fortunately, even with this mistake, the candidate was able to get the correct final result, but failed to demonstrate the proper understanding of the Value of Inforce Business.

2. Continued

Actuarial Appraisal Value = Adjusted Book Value + Value of Inforce Business + Value of New Business

Value of New Business = 0 because Alta Life's business is a closed block.

Adjusted Book Value = 100

Value of Inforce Business = Present Value of After-Tax Statutory Earnings discounted at the discount rate of 10% - Cost of Required Capital.

Cost of Required Capital = 5.84

After-Tax Statutory Earnings = Pre-Tax Statutory Earnings – Taxes

Pre-Tax Statutory Earnings for 2011 = 800
Pre-Tax Statutory Earnings for 2012 = 700

So, After-Tax Statutory Earnings for 2011 = 800 – Taxes
After-Tax Statutory Earnings for 2012 = 700 – Taxes

Taxes = Taxable Income x Tax Rate

Tax Rate = 35%

Taxable Income = Pre-Tax Statutory Earnings + Change in Statutory Reserves – Change in Tax Reserves

Taxable Income for 2011 = 800 + (-155) – (-100) = 745
Taxable Income for 2012 = 700 + (-250) – (-200) = 650

So, Taxes = Taxable Income for 2011 x Tax Rate
Taxes for 2011 = 745 x 35% = 260.75
Taxes for 2012 = 650 x 35% = 227.50

So, After-Tax Statutory Earnings = Pre-Tax Statutory Earnings - Taxes
After-Tax Statutory Earnings for 2011 = 800 – 260.75 = 539.25
After-Tax Statutory Earnings for 2012 = 700 – 227.50 = 472.50

So, Value of Inforce Business = Present Value of After-Tax Statutory Earnings discounted at the discount rate of 10% - Cost of Required Capital
Value of Inforce Business = 539.25 / (1+0.1) + 472.50 / (1+0.1)^2 – 5.84
Value of Inforce Business = 490.23 + 390.50 – 5.84 = 874.89

2. Continued

Thus, Actuarial Appraisal Value = Adjusted Book Value + Value of New Business + Value of Inforce Business

Actuarial Appraisal Value = 100 + 0 + 874.89 = 974.89

(d) SLH Life is looking at other methods to determine the value of this block of business.

Commentary on Question:
This part of the question requires the candidate to demonstrate an understanding of two methodologies to appraise the value of a block of business and discuss their differences.

The cognitive level of this part of the question is knowledge utilization of the pertinent study material on the syllabus.

For the candidate to receive maximum credit for this part of the question, the candidate must describe each of the two appraisal methods and then discuss their differences. In addition, the candidate must recommend a preference as to which of the two appraisal methods should be used to develop an appraisal value for a block of business and then support his/her recommendation.

Candidates, in general, did not do well on this part of the question. They had difficulty describing each of the two appraisal methods and very few candidates compared the two appraisal approaches. Almost all candidates recommended an appraisal method to use for determining the appraisal value of a block of business, few were able to support their recommendation adequately.

(i) Contrast an Actuarial Appraisal with a Comparable Transaction Analysis.

Actuarial Appraisal Method

1. Discounted cash flow analysis
2. Contains projection of statutory earnings
3. May involve sensitivity analysis
4. Need for assumptions to be used in projections
5. Examples of projection assumptions include mortality, lapse, discount rates, morbidity, investment return, expenses

Comparable Transaction Analysis

1. Review financial data (price-to book ratios, price to earnings ratios, or embedded values) of targeted acquisitions
2. Compare to comparable recent insurance transactions
3. Review what other companies would pay for similar blocks of business

2. Continued

4. Adjustments must be made to ensure value multiples are converted to equity multiples

Actuarial Appraisal Method (AA) Versus Comparable Transaction Method (CTA)

1. CTA is not on U.S. GAAP basis, AA is.
2. CTA is available publicly, AA is prepared by seller.
3. CTA doesn't involve projections or sensitivity analysis while AA does.

(ii) Recommend which of the two appraisal methods SLH should choose.

SLH Life should choose the Actuarial Appraisal Method because

1. Of the difficulty finding similar comparable transactions.
2. Either method requires adjustments and cannot be used directly.

3. Learning Objectives:

3. The candidate will be able to evaluate various forms of reinsurance, what the financial impact is of each form and describe the circumstances that would make each type of reinsurance appropriate.

Learning Outcomes:

(3a) For traditional and financial reinsurance, explain the consequences and calculate the effect on both ceding and assuming companies with respect to:
- (i) Risk transfer
- (ii) Cash flow
- (iii) Financial statement presentation
- (iv) Tax impact, and
- (v) Reserve credit requirements.

Sources:

Life and Health Reinsurance, Ch. 4 Basic Methods of Reinsurance

Life and Health Reinsurance, Ch. 5 Advanced Methods of Reinsurance

Life and Health Reinsurance, Ch. 6 The Reinsurance Treaty

Commentary on Question:

This question tested knowledge and application of modified coinsurance and appropriate methods of reinsurance in general. For full credit, it was important to show proper use of Mod-Co Adjustment formula, income statement components, and making multiple valid recommendations for the non-admitted reinsurer concern.

Candidates did well revising the income statement for the reinsurance, and listing the advantages/disadvantages of Mod-Co. Candidates did not do as well recommending the use of an insolvency clause in the reinsurance agreement.

Solution:

(a) List the advantages and disadvantages of this reinsurance arrangement.

Advantages:

- Life Co will get surplus relief from the regulatory capital requirements that are transferred to the reinsurer.
- Life Co has more control over its investments and maintains the policy reserves.

The main disadvantage is that it is more complicated to administer due to the Mod-Co adjustment calculation.

3. Continued

(b) Determine the impact on Life Co's capital, at the end of 2011, as a result of the Mod-Co agreement.

Income Statement for Life Co (Revised to include Mod-Co agreement)

Revenue		
Net Premium	150	[250 * (1 – 40%)]
Reinsurance Allowance	5	[250 * 40% * 5%]
Expense Allowance	20	[250 * 40% * 20%]
Investment Income	13.13	[7% * (150+5+20-105-50-5-20+180+200)/2]

Mod-Co Adjustment = ending policy reserves – beginning policy reserves – "interest" on beginning policy reserves

Mod-Co Adjustment	2.96	[40%*(200-180-180*7%)]
Total Revenue	191.09	[150+5+20+13.13+2.96]
Benefits & Expenses		
Net Claims	105	[175 * (1 – 40%)]
Expenses	50	
Commissions	5	
Reserve Increase	20	
Total Benefits & Expenses	180	[105+50+5+20]
Gain from Operations	11.09	[191.09 – 180]
Surplus	511.09	[500 + 11.09]

Expected Additional Capital = Surplus at end of 2011 (with treaty) - Surplus at end of 2011 (without treaty)

Expected Additional Capital	-2.91	[511.09 – 514]

(c) Recommend appropriate reinsurance methods and approaches that could be used to optimize Life Co's tax and reported income position.

Modified Coinsurance is an appropriate reinsurance method in this situation. Mod-Co eliminates the reserve credit problem that coinsurance would have when the reinsurer is not admitted.

Life Co should consider the use of trusts, escrow accounts or letters of credit. A trust is considered a true transfer of ownership and is less suspect in the eyes of tax and regulatory authorities. Life Co can take reserve credit if it is properly structured.

3. Continued

Finally, Life Co should include an insolvency clause in the reinsurance agreement. This is needed for the ceding company to take the statutory financial statement credit.

4. Learning Objectives:

8. The candidate will understand the professional standards addressing financial reporting and valuation.

Learning Outcomes:

(8c) Identify and apply actuarial standards of practice relevant to financial reporting and valuation.

(8d) Explain the actuary's professional responsibilities to stakeholders including obligations under Sarbanes-Oxley.

Sources:

Actuarial Aspects of SOX 404, Financial Reporter, Dec 2004

ILA-C126-10: KPMG SEC Guidance on Internal Control Over Financial Reporting, June 2007

Commentary on Question:

Question 4 tested the candidate's understanding of risk assessment under the COSO control framework.

The cognitive level required for part (a) is comprehension since the candidate is required to identify the risks of the Diversity 2010 reserving process under the four areas. Overall, the candidate did a fair job in answering part (a). Some candidates were given marks for points that were not in the grading outlines but were valid e.g. suggesting password protection or write protection on spreadsheet in the actuarial valuation system section. Some candidate did a poor job of answering the compilation process section because they either did not have an understanding of the compilation or confused it with the actuarial valuation system.

The cognitive level required for part (b) is knowledge utilization since the candidate is required to make a recommendation on which control that will most likely fail in the reserving process. Overall, the candidate did a fair job of answering the question. The common mistakes made were assuming that automation of the reconciliation of inputs/outputs or junior IT staff perform the reconciliation will contribute to greater risk than complexity of sampling.

Solution:

(a) Evaluate the Diversity 2010 reserve process for the following four risk areas:

(i) Data

- There is a high risk the data is inaccurate or incomplete
- Was not validated against the administration system (or not independently validated)

4. Continued

(ii) Actuarial valuation systems

- How was the spreadsheet reviewed or validated
- Risk that assumptions were used to project the account values are not correct

(iii) Compilation process

- Was the manual entry checked/verified for accuracy
- Did the adjustment go through the financial statement process correctly

(iv) Management review process

- Risk that the adjusted reserve is too low, understating the balance sheet.
- Does the CFO have the proper knowledge to recommend the adjustment

(b) Identify which control is more likely to fail

The sample testing control is more likely to fail for the following reasons:

- Sampling is a manual process and infrequent
- Sampling is brand new; it is unknown if it is effective
- Sampling is much more complex than data reconciliation
- Senior actuarial consultant is more competent than IT person, but doesn't mitigate other risks

5. Learning Objectives:

1. The candidate will understand basic financial statements and reports of Canada life insurance companies and be able to analyze the data in them.

6. The candidate will be able to integrate data from various sources into model office and asset/liability models.

Learning Outcomes:

(1a) Construct the basic financial statements for a life insurance company under U.S. GAAP and Statutory accounting methods and principles.

(1c) Compute the basic taxable income of a life insurance company.

(1e) Describe and critique the framework and principles used in the calculation of reserves under a Fair Value approach.

(6d) Explain limitations of models and possible sources of error
- (i) Quality of data
- (ii) Granularity of the model

Sources:

Valuation of Life Insurance Liabilities, Ch. 1, Overview of Valuation Requirements

ASOP #23 Data Quality

ILA-C102-07: Actuarial Review of Reserves and Other Annual Statement Liabilities"

July 2010 Exposure Draft - Insurance Contracts, IASB, pages 19 to 84

Commentary on Question:

Commentary listed underneath question component.

Solution:

(a) Identify concerns addressed by establishing a liability for this benefit from the perspective of GHPF.

Commentary on Question:

This question was intended to start the candidate thinking about the basic purposes of reserve - that the reserve is designed to address both solvency and financial reporting issues.

- Fund will help ensure there is money available to pay potential claims
- Not having fund would overstate current income - purchase price might be booked into income in one financial period while claims might show up in another
- Concern as to whether this fund will be recognized in tax reporting

5. Continued

(b) Explain the actuary's considerations using *ASOP 23* (*Data Quality*) in using this data to establish the liability.

Commentary on Question:
This part was testing the candidate's knowledge of the actuary's responsibilities under ASOP 23 with application to the situation. Candidates who did poorly on this part missed the need to disclose the reliance on others or did not reference the situation as outlined in the question.

- What information is available on the purchase records
- Can this information be relied on
- Does GHPF have other sources of information
  - If so, what would be the cost of acquiring that information
- Under ASOP 23 the actuary may rely on this information subject to a review
  - This review should be looking for inconsistencies in the data
  - It should determine whether the data has material limitations
  - The actuary is not required to investigate for fraud
  - Any material limitations need to be disclosed
- Has the auditor already reviewed the records
- Is there some way of enhancing the data
- The actuary must disclose his reliance on these records
- If the records are inadequate and there is nothing else he should refuse the assignment

(c) Propose a methodology for calculating this liability which satisfies the requirements of the *International Financial Reporting Standard's Exposure Draft* on insurance contracts.

Commentary on Question:
This part was testing the candidate's knowledge of the Proposed IFRS reserving method. Candidates who missed out on grading points usually did not mention discount rates or expenses. Partial points were also given to those candidates who treated the liability as a short term arrangement.

- We need to come up with best estimate cash flows
- May need to determine how much of the purchase price goes for insurance
- Then get best estimate of claims and expenses
- Only incremental expenses are included (i.e. no overhead)
- Then we need to add a risk margin for the uncertainty of these cash flows
- Flows are discounted at the current risk-free rate for the expected period
  - With an adjustment for illiquidity
- No gain is possible at issue - if the present value of inflows less outflows is positive we need to set up a residual margin that reduces the gain to zero

5. Continued

- Losses are allowed to flow through (i.e. no negative residual margins)
- The residual margin is run off over the period of the contract
- Using the initial discount rate
- In future periods the discount rate is the rate current at that time - it's not
- locked in
- May need ruling as to whether liability is insurance or a warranty
  - Warranties are outside the scope of this draft

6. Learning Objectives:

1. The candidate will understand basic financial statements and reports of Canada life insurance companies and be able to analyze the data in them.

Learning Outcomes:

(1a) Develop, use and recommend methods for performing actuarial reviews of reserves.

Sources:

ILA-C102-07: Actuarial Review of Reserves and Other Annual Statement Liabilities

Commentary on Question:

Candidates had a lot of trouble answering part (c). There were very few candidates who provided the answer specified by the author for this particular question.

Solution:

(a) List the categories for actuarial reserve review techniques.

Spot checks (test calculations, transactional checks, policy traces)
Independent Full Recomputations
Tests of aggregate progress of reserves from one period to the next
Tests of relationship of reserve items to other financial items, and reasonableness of trend in that relationship over time
Tests of inventory
Tests of reserve adequacy

(b) Recommend items to review in validating this 40% reserve increase. Support your recommendation.

Split the traditional life reserves and the purchased in-force block of term business
Spot check reserve calculations
Test reserve assumptions vs. Assumptions used to purchase the block
Tests of aggregate progress of reserves from one period to the next
Tests of relationship of reserve items to other financial items, and reasonableness of trends in that relationship over time
Can the 40% increase be attributed to MCL's original block or the new block in particular?

(c) Evaluate the audit considerations of following the CFO's suggestion.

CFO thinks no auditable actions can be taken, however, even estimates should have a process backing them.
There should be a check of the policy or contract language to see if reserving methods are proper and all-inclusive.

6. Continued

Spot checks should be performed with the selection of elements to be tested paying attention to sample stratification, systems changes, method changes, and new plans of insurance.

There are two types of validation, static validation and dynamic validation. Static validation encompasses validation of invested assets, face amounts of life insurance in-force, statutory reserves, and other balance sheet items. Dynamic validation speaks to the alignment of income statement items with historical company results.

7. Learning Objectives:

1. The candidate will understand basic financial statements and reports of U.S. life insurance companies and be able to analyze the data in them.

7. The candidate will be able to evaluate risks faced by a Company by virtue of the Company's products, assets and management strategies and practices and be able to evaluate the appropriateness of various methods of risk mitigation.

Learning Outcomes:

(1e) Describe and critique the framework and principles used in the calculation of reserves under a Fair Value approach.

(7a) Identify, categorize and evaluate potential sources of risk in products including but not limited to mortality, morbidity and lapse.

(7b) Identify, categorize and evaluate potential sources of risk in investments including but not limited to credit risk, liquidity and asset-liability matching.

(7e) Describe and apply methods of risk mitigation and hedging and to understand the limitations of such methods.

Sources:

ERM Specialty Guide, Chapters 1-6

ILA-C116-07: Mapping of Life Insurance Risks, AAA Report to NAIC

Stochastic Analysis of Long Term Multiple-Decrement Contracts, Clark and Runchey, Jan 2008 (Excl. Appendices)

"An Approach to Fair Valuation of Insurance Liabilities Using the Firm's Cost of Capital", NAAJ, Apr 2002, p. 18-23

Commentary on Question:

Commentary listed underneath question component.

Solution:

(a) Define key elements of the ERM process as outlined in the *ERM Specialty Guide* (*May 2006*) of the ERM Working Group of the Society of Actuaries Risk Management Section.

Commentary on Question:

In order to receive full credit, candidates needed to not only list the 4 elements of the ERM process but also explain what each of those elements involved.

7. Continued

1. Risk Control
   - Identify, monitor, limit, or avoid risks; offset and transfer risks

2. Strategic Risk Management
   - Reflect risk and risk capital in strategic choices
   - Calculate economic capital for the actual risks
   - Use risk adjusted product pricing
   - Use risk adjusted performance measures

3. Catastrophic Risk Management
   - Envision and prepare for extreme events; develop contingency plans
   - Use trend analysis, stress testing, active catastrophic management; look at events post-mortem

4. Risk Management Culture
   - Incorporate ERM in all decision-making
   - Identify best practices
   - Senior management support
   - Communication through risk reporting

(b) Your company has a large closed block of a traditional whole life insurance business. Identify risks.

Commentary on Question:
Most candidates did well on this part and were able to identify a variety of risks that could affect this product.

- Asset/Liability Matching Risk
- Credit, liquidity, interest rate, duration risk
- Pricing/Underwriting risk
- Reserve adequacy risk
- Economic environment
- Net retention; insufficient capital
- Mortality/morbidity/longevity risk
- Lapse risk

(c) Due to the size of the whole life block, you have been asked to perform a stochastic analysis of the associated mortality risk:

(i) List considerations in performing a stochastic analysis of the mortality risk.

7. Continued

- Need to derive a scenario generator to produce a set of scenarios
- Consider stochastic mortality factors:
  - Underwriting error – best estimate may be wrong
  - Volatility – depends on the size of the population
  - Catastrophe – difficult to calibrate
  - Trend – not a critical component
- Stochastic processes can be used to generate a mortality rate for each period

(ii) Calculate CTE(70) for the above two elements of mortality risk.

Commentary on Question:
The majority of candidates were able to calculate CTE(70). One common error was combining the scenario results for u/w and catastrophe before calculating the CTE.

Scenarios should be sorted from best to worst; for death benefits, a higher PV is "worst."

CTE(70) = average of the worst 30% of scenarios = average of 3 highest scenarios

U/W: Worst 3 scenarios
Scen 10 = 4.25
Scen 1 = 4.75
Scen 3 = 5.25

CTE(70) = (4.25 + 4.75 + 5.25)/3 = **4.75**

Catastrophe: Worst 3 scenarios
Scen 9 = 6.95
Scen 2 = 7.55
Scen 8 = 8.95

CTE(70) = (6.95 + 7.55 + 8.95)/3 = **7.82**

(d) As part of your risk analysis of the whole life block, you will calculate the fair value liability.

(i) Explain the steps you would take to calculate the fair value liability, using the direct method.

Insurance risks are accommodated by adjusting either the discount rate or the expected future cash flows.

7. Continued

1. Generate a set of stochastic economic scenarios
2. For each scenario, model the expected liability cash flows
3. Discount the cash flows directly with some mechanism to adjust for risk

The formula is:

$FVL(t-1) = (FVL(t) + L(t) + E(t))/(1 + r(t) + Theta(t))$
$FVL(N) = 0$

Time period: t = 1 to N
FVL = Fair Value Liability
R(t) = risk free interest rate
Theta(t) = interest rate spread
L = expected policy cash flows
E = expected expense cash flows

(ii) Explain the advantages and disadvantages of the direct method to calculate fair value liability.

Advantages:

- Simple approach
- Provides a reliable assessment of the risk of financial leverage

Disadvantages:

- Not used by companies to set an exit price
- Liquidity may not be reflected
- May not reflect company's credit risk

8. Learning Objectives:

5. The candidate will understand the Risk Based Capital (RBC) regulatory framework and the principles underlying the determination of Regulatory RBC and Economic Capital.

Learning Outcomes:

(5a) Compute RBC for a life insurance company, including:
- (i) Identification of significant risk components
- (ii) Identification of specialized product RBC requirements
- (iii) Interpreting results from a regulatory perspective

(5c) Explain and apply the concepts, approaches and methods for determining Economic Capital.

Sources:

Economic Capital: The Controversy at the Watercooler, Financial Reporter, Fall 2006

ILA-C121-08: Economic Capital Modeling: Practical Considerations, Milliman White Paper

Commentary on Question:

Commentary listed underneath question component.

Solution:

(a) Explain common decisions an insurance company must consider when implementing a risk capital methodology.

Commentary on Question:

Many candidates recalled a list of considerations other than the one from the study note listed under Sources. Those who did recall the correct list, often did not include additional details beyond the main bullet points.

- New Business
  - Inclusion can increase or decrease the level of capital needed
  - Regulatory calculations often exclude new business
- Tail Definition
  - Popular approaches: Value at Risk and Tail VAR
  - VAR uses a defined value in the tail of the distribution
- Confidence Level
  - Higher rated companies need higher levels of capital
  - The confidence level selected will drive different absolute and relative levels of capital
- Aggregation Techniques and Assumed Risk Correlations
  - Common approaches are correlation matrices and copulas
  - These approaches require the parameterization of the relationship between risks

8. Continued

- Scenario Generation
  - This always presents a problem
  - Scenario calibration will drive different capital results
- Double Counting
  - A recurring implementation issue

- Period-to-Period Reconciliation
  - One way is to roll capital forward from period to period and to reconcile changes over time

(b) Determine the key type of risk for each of the above items.

(i) Uncertainty risk –policyholder behavior risk
(ii) Extreme events risk –claims risk
(iii) Operational risk – people risk
(iv) Credit risk –counter-party risk
(v) Volatility risk –claims risk

(c) During a risk committee meeting, the Chief Risk Officer asserts that the company should consider diversification benefits in calculating economic capital.

(i) Explain the arguments for and against incorporating diversification benefits in an economic capital calculation.

Commentary on Question:
Many candidates simply stated that the benefit of diversification was to lower capital instead of focusing on better reflecting the risks the company was undertaking with its product portfolio.

1. Arguments <u>for</u> incorporating diversification
   - Lots of data exists to support the analysis of correlations between various market risks
   - Significant analysis and modeling has been done on this topic
   - Correlation is supported by well-established economic theory
   - Insurance groups with diverse businesses will benefit by the extent to which their different businesses have non-correlated risks
2. Arguments <u>against</u> incorporating diversification
   - Copula functions are hard to apply in practice because there are multiple methods to assess goodness of fit of copulas to sample data points
   - Rating agencies have been historically skeptical about giving full credit for diversification

8. Continued

- The problem of tail dependencies suggests that a rigorous approach to understanding risk dependencies is necessary in order to take full credit for aggregation benefits

(ii) Recommend whether the company should incorporate diversification in its economic capital calculation.

Commentary on Question:
Many candidates failed to make a recommendation of any kind. Those who did make a recommendation often failed to provide any sort of justification for their recommendation.

The company should use diversification benefits in the EC calculation. The company's two main products (Fixed Annuity and Term Insurance), will benefit due to product diversification (specifically mortality/longevity risk). Geographic diversification should be considered since the company is international. Diversification factors must be applied carefully, since product mixes change over time. Follow the CRO forum's proposal by doing a "Solo Entity Solvency Test" and a "Group Solvency Test."

9. Learning Objectives:

6. The candidate will be able to integrate data from various sources into model office and asset/liability models.

Learning Outcomes:

(6a) 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
- (v) Recommend appropriate strategies

(6b) Apply a model office process and make appropriate recommendations.

(6c) Analyze and explain actual vs. projected differences.

Sources:

ILA-C112-07: ALM for Insurers

ILA-C114-07: Life Insurance Forecasting and Liability Models (excl. appendices)

Commentary on Question:

Part (a) and (b) of the question was memorization.
Part (c) of the question required more comprehension.
Candidates did well on the memorization part of the question, but most did not answer the question thoroughly enough to get full marks. Students had difficulty explaining model validation

Solution:

(a) Explain the modeling approach with respect to:

- Model simplification
- Model validation

Model simplification:
- Model similar policies together
- Ensure the model captures key variables
- Watch that grouping does not distort the results of the modeling
- Trade-offs of modeling simplification:
  - Known and unknown errors
  - Modeling cost is traded off against error

9. Continued

- Model simplification should undergo static and dynamic validation
    - Static validation: model results are compared at the starting point or time zero, but not validated over time
    - Dynamic validation: check how the model progresses through time
        - Check the reliability of the model going forward
        - This can be done by comparing prior year actual results to what model would have produced

Model validation – should be tested to determine that:

- Assets and liabilities have been properly grouped into represented cells
- Data in extract files and plan description files is accurate and being assessed correctly by calculation routines
- Formulas in calculation routines have been programmed correctly

(b) List challenges of cash flow matching as an Asset Liability Management technique.

- Assets are uncertain due to defaults or early prepayments, throwing matching out of balance
- Liability cash flows can deviate significantly from expected
- Policyholder optionality requires re-estimates of cash flows
- Premium paying products generate positive cash flows and future cash flows will be used for future asset purchases (these won't be known until purchased)
- Need to work with investment experts to ensure rebalancing

(c) Identify modeling assumptions that may need to change due to this interest rate change.

Need to consider whether the model reacts appropriately to the change in the interest rate environment:

- Asset optionality: does the model reflect the possibility of bond calls or prepayments on mortgages as rates drop
- Policyholder behavior assumption: are policyholder behavior reflected in the model
- Lapse assumption: as interest rates drop, the guarantee becomes more valuable so policyholders may be less likely to lapse
- Reinvestment rate – may change in a low interest rate environment
- Model should be tested under a significant number of interest rate scenarios to understand model behavior
- If the models do not reflect some of the above, will likely need to revisit and rebuild models
- Ideally, models would already take this all into account, especially if used for regulatory purposes or other management decision making

10. Learning Objectives:

3. The candidate will be able to evaluate various forms of reinsurance, what the financial impact is of each form and describe the circumstances that would make each type of reinsurance appropriate.

Learning Outcomes:

(3b) Describe the considerations and evaluate the appropriate reinsurance form from the ceding and assuming company perspectives.

Sources:

Life and Health Reinsurance, Ch. 6, The Reinsurance Treaty

Commentary on Question:

This question was reasonably well answered by most of the candidates. Candidates who did poorly did not address enough of the issues - particularly the near insolvency of the ceding company or had an incorrect grasp of one or more of the issues.

Solution:

(a) Evaluate the proposed treaty parameters from the perspective of the reinsurer.

Reinsurer's problems with the parameters:

- Ceding company is close to insolvency - they may soon be under regulatory supervision
- All the parameters are slanted in favor of the ceding company
- Funds Withheld Coinsurance means the ceding company will be managing the investments backing the liabilities - can we trust them to do this properly
- 99% Coinsurance limit - what incentive is there for the ceding company to properly underwrite the business without much "skin in the game"
- Automatic basis: we get the risk without being able to assess the business - are the retention and other limits appropriate
- Bulk administered on an annual basis - ceding company is doing the administration
- A year is much too long not to be aware of emerging experience
- Guaranteed Premiums - usually reinsurance premiums are only guaranteed if the policy premiums are guaranteed (and not always even then)

(b) Propose changes and additions to the requested treaty parameters that reduce the risk to the reinsurer of entering into this reinsurance transaction.

- First drop the percentage insured to a more reasonable level - no higher than 90%
- Have treaty preclude reinsurance of the retained portion
- This will encourage proper underwriting on the part of the ceding company
- Consider structuring the deal as straight coinsurance - this would allow us to administer our share of the assets

10. Continued

- Set a coverage limit above which policies would have to be submitted on a facultative basis
- Use strict wording for policies to qualify as automatic
- Consider jumbo limits
- If using bulk administration switch to quarterly or monthly basis particularly since ceding company is so close to insolvency
- Don't guarantee the reinsurance premiums - this is an innovative product with no track record
- Include an insolvency clause in the treaty
- Insist on a right to offset cash flows
- Consider having a trust set up or obtain a letter of credit

11. Learning Objectives:

2. The candidate will be able to understand and apply valuation principles of individual life insurance and annuity products issued by U.S. life insurance companies.

Learning Outcomes:

(2c) Calculate liabilities under U.S. GAAP, and DAC assets under U.S. GAAP for the following products:
- (i) Variable annuity with guaranteed minimum death benefits
- (ii) Variable annuity with guaranteed living benefits

Sources:

US GAAP For Life Insurers, Second Edition, Ch 8 Variable and Equity-Based Products

Commentary on Question:

The intent of this question is to test the candidate's ability to calculate the SOP 03-1 reserve liability, the DAC asset and know how they are interrelated. The question also tested the candidate's ability to predict the qualitative effect of a change to gross assessments. In general candidates did very well on this question.

In part (a)(i) candidates needed to explicitly show formulas and their calculations for the *increase* of the liability, not just the liability value. For part (a)(ii) candidates needed to calculate the DAC balance for year 2. A common error was to not reflect the change in the SOP 03-1 liability in the calculation of estimated gross profits. Another common error was using gross assessments instead of estimated gross profits in the calculation of both the DAC amortization K and the DAC.

In part (b) the candidate needed to state the predicted effect and explain why. A common problem was not explaining the predication. In part (b)(ii) many people did not recognize that there were the opposite effect which made it not possible to predict an increase or decrease.

Solution:

(a) Calculate the following items for end of policy year 2.

(i) Benefit Liability Increase

SOP 03-1 Liability(t) = SOP 03-1 Liability(t-1)*(1+ i) + K*Gross Assessments(t) – Benefit(t)

SOP(1) = 0*1.06 + .115*1561 – 0 = 179.52
SOP(2) = 179.52*1.06 + .115*1424 – 127 = 227.05

Liability Increase = Liability(t) - Liability(t-1)
Liability Increase(1) = 179.52 – 0 = 179.52
Liability Increase(2) = 227.05 – 179.52 = **47.53**

11. Continued

(ii) DAC Balance

Unadjusted Estimated Gross Profits (EGP): Gross Assessments – Maintenance Expenses – Benefits
Unadj EGP(1) = 1561 – 30 = 1531
Unadj EGP(2) = 1424 – 26 – 127 = 1271

Estimated Gross Profits = Unadjusted Estimated Gross Profits – SOP 03-1 Liability Increase
EGP(1) = 1531 – 179.52 = 1351.49
EGP(2) = 1271 – 47.53 = 1223.47

$PV(EGP) = 1351.49/1.06 + 1223.47/1.06^2 + 1011.22/1.06^3 = 3212.91$

DAC Amortization Ratio K = PV(Capitalized Expenses)/PV(EGP)
DAC K = 1606.46 / 3212.91 = 50%

DAC(t) = (DAC(t-1) + Capitalized Expenses)*(1+i) – K*EGP(t)
DAC(0) = Capitalized Expenses = 1606.46
DAC(1) = (0 + 1606.46) * (1.06) - .5 * 1351.49 = 1027.10
DAC(2) = (1027.10 + 0) * (1.06) - .5 * 1223.47 = **476.99**

(b) Explain the qualitative effect of this change on the following items at the end of policy year 2:

(i) Benefit Ratio

- If general assessments increase and benefits stay the same, then the benefit ratio **decreases**.
- Benefit Ratio = PV(Benefits) / PV(Gross Assessments)
- Denominator increases, Numerator stays the same, therefore ratio decreases.

(ii) Benefit Liability

- If general assessments increases and benefits stay the same then benefit liability **may increase or decrease**.
- Benefit Liability depends on both the gross assessments and benefit ratio so the relative change in each opposing factor is important.

11. Continued

(iii) DAC Amortization Ratio

- If gross assessments increase and benefits stay the same, then DAC Amortization Ratio **decreases**.
- DAC Amortization Ratio = PV(Capitalized Expenses) / PV(Estimated Gross Profits).
- Denominator increases (increase in gross assessments will increase gross profit), numerator stays the same, therefore ratio decreases.

(iv) DAC Balance

- If general assessments increase and benefits stay the same, then DAC Balance **increases**.
- DAC Balance driven by Gross Profits and DAC amortization ratio.

12. Learning Objectives:

5. The candidate will understand the Risk Based Capital (RBC) regulatory framework and the principles underlying the determination of Regulatory RBC and Economic Capital.

Learning Outcomes:

(5a) Describe the US Risk Based Capital (RBC) regulatory framework and the principles underlying the determination of Regulatory RBC

(5c) Explain and apply the concepts, approaches and methods for determining Economic Capital.

Sources:

Economic Capital for Life Insurance Companies, SOA Research Paper, Feb 2008, Chapters 1, 3, 4, 5, and 6

Valuation of Liabilities, Ch. 16, Risk-Based Capital

Transitioning to RBC C3 Phase III, Financial Reporter, March 2010

Commentary on Question:

This question was trying to assess if candidate had a clear understanding of RBC principles and knew the upcoming changes to the principles. Candidate needed also to be able to compare RBC with EC.
In general, candidates were able to list most of the RBC principles, but were not able to fully assess the modification to the framework or to evaluate which aspect of product and investment could cause EC to be higher than RBC.

Solution:

(a) The basic purpose of Risk Based Capital (RBC) as envisioned by regulators is to provide a metric for identifying weakly capitalized companies.

(i) List the guiding principles that were important in the design of the original RBC framework.

Higher level of risk should require higher level of capital
Based on statutory accounting platform
Reserve assumed to be correct
Uses C1, C2, C3 and C4 factors
Factor based approach - Simple
Risk covariance provision allowed for
Confidence level set at 99^{th} percentile - Consistency
RCB is to ensure solvency
Series of capital threshold levels are established to allow regulatory actions

12. Continued

(ii) Assess how the RBC framework might be modified under the NAIC's Solvency Modernization Initiative.

Current RBC factors might be improved, but probably not replaced
Re-evaluate component of formulas and factors
Solvency II may influence future changes
Could move to principle based approach
Recalibrate level and time horizon of RBC
Include more risk
Will evaluate the continued use of statutory accounting, changes to accounting could have major impact

(b) Evaluate which aspects of the product and investments could cause interest rate risk economic capital to be higher than RBC.

Interest rate risk is C3 factor under RBC. For Life insurance, use low risk factor of 0.77%. This may result in inappropriately low level if assets and liabilities not well matched.

Interest rate EC models both assets and liabilities. EC uses 1 year mark-to-market approach. Stochastic scenarios are created and the goal of EC is to provide for the potential adverse change in fair value of assets and liabilities over one year at a given confidence level. For UL products, this will include scenarios where policyholders will surrender at lower rates when market rates are lower than guaranteed rates and scenarios where policyholders will surrender at elevated rates if credited rates cannot keep pace with higher market rates. These scenarios would result in higher EC capital (tail scenario). The scenario would also take into account the optionality embedded in the assets. The level of EC for interest rate risk can be influenced strongly (and elevated) by the assumptions used in the economic scenario generator.

The net result is that the level of EC for interest rate risk is expected to be higher if assets are not well matched.

13. Learning Objectives:

1. The candidate will understand basic financial statements and reports of U.S. life insurance companies and be able to analyze the data in them.

4. The candidate will be able to explain and apply the basic methods, approaches and tools of financial management and value creation in a life insurance company context.

Learning Outcomes:

(1f) Describe emerging developments impacting U.S. GAAP and International Reporting frameworks, and assess their impact on the valuation of reserves.

(4b) Perform basic financial analysis on a product line or company.

Sources:

July 2010 Exposure Draft - Insurance Contracts, IASB, pages 19 to 84

Valuation of Life Insurance Liabilities, Ch. 1, Overview of Valuation Requirements

"Embedded Value: Practice and Theory," Actuarial Practice Forum, March 2009

US GAAP for Life Insurers, Second Edition, Ch 4, Traditional Life Insurance

Commentary on Question:

Commentary listed underneath question component.

Solution:

(a) Determine the most likely financial measurement basis used for each of the three graphs.

Graph A could represent either IFRS with residual margin > =0 or GAAP
Graph B could represent either IFRS with initial contract recognition as an expense equal to the present value of cash flows or STAT
Graph C represents Embedded Value

(b) Explain the aspects of the financial measurement bases that lead to the earnings patterns shown in each graph.

Commentary on Question:

Answers to part (b) are dependent on answers to part (a) so if candidates got part (a) wrong, they also got most of (b) wrong as well.

13. Continued

Graph A:
IFRS

(i) The initial value of contracts should either be zero (for profitable at time 0 contract) or be recognized as an expense (for unprofitable at time 0 contract).
(ii) The graph in this case illustrates the present value fulfillment cash flows is less than zero and a residual margin is added to eliminate any gain at inception. The initial recognition is zero.
(iii) Profit will emerge overtime: an insurer shall recognize the residual margin determined at initial recognition as income in profit.

GAAP

(i) Non deferrable acquisition costs lead to first year drag on earnings.
(ii) Remaining profits emerge over the life of the business.
(iii) Earnings are a percentage of premium profit, release of PADs.
(iv) Declining earnings as in-force declines.

Graph B
IFRS

(i) The initial value of contracts should either be zero (for profitable at time 0 contract) or be recognized as an expense (for unprofitable at time 0 contract).
(ii) The graph in this case represents the present value of fulfillment cash flows is greater than zero, that amount will be recognized as an expense immediately.
(iii) Profit will emerge over time.

STAT

(i) Large first year loss is due to limited realization under US statutory accounting of initial acquisition expenses.
(ii) Gains slowly emerge after large increases in statutory reserves in early issue years.
(iii) Increasing level of profits emerge as conservatism in statutory reserve is slowly released over time.

Graph C

(i) At issue, present value of all profits is realized in income.
(ii) In subsequent periods, profits are all zero at total gain that was released at issue (as long as actual = expected).

14. Learning Objectives:

2. The candidate will be able to understand and apply valuation principles of individual life insurance and annuity products issued by U.S. life insurance companies.

Learning Outcomes:

(2c) Calculate liabilities under U.S. statutory, U.S. tax, U.S. GAAP, and DAC assets under U.S. GAAP for the following products:
- (i) Traditional life insurance
- (ii) Term life insurance
- (iii) Universal life insurance
- (iv) Universal life insurance with secondary guarantees
- (v) Deferred annuity
- (vi) Payout annuity
- (vii) Variable annuity with guaranteed minimum death benefits
- (viii) Variable annuity with guaranteed living benefits
- (ix) Equity-indexed annuities
- (x) Equity-indexed life insurance
- (xi) Variable life insurance with guaranteed minimum death benefits
- (xii) Riders

Sources:

US GAAP For Life Insurers, Second Edition, Ch .9, Annuities in Payment Status

US GAAP For Life Insurers, Second Edition, Ch. 3, Expenses and Capitalization (excl. 3.11)

Commentary on Question:

The question tested the candidate's knowledge of the concept of loss recognition under US GAAP, as well as the setting of assumptions.
The questions required the candidate to explain general concepts and to apply them to a particular situation.

Solution:

(a) Identify the margins that Lifelong has built into its benefit reserves and the risks that might prevent Lifelong from fully realizing those margins, relative to best estimate assumptions in effect at the time of pricing.

Commentary on Question:

To get maximum points, candidates had to identify the margins applicable to the product described and the changes that would erode those margins. Most candidates were able to identify the interest and the mortality margin, but more had trouble with the expense margin.

14. Continued

LifeLong has built the following margins into its benefit reserves:

- Interest: LifeLong has assumed the annual earned interest rate will be 2% less than expected.
- Mortality: LifeLong has assumed that experience mortality rates will be 10% lower than expected.
- Expense: LifeLong has assumed that the annual maintenance expense per policy will be $5 higher than expected.

These margins may not be fully realized if one or more of the following occurs:

- Interest: annual earned rate is less than 6%
- Mortality: experience mortality rates are lower than the Annuity 2000 Table.
- Expense: annual maintenance expenses exceed $50 per policy.

(b) Explain, using U.S. GAAP:

(i) How the concept of loss recognition applies to Lifelong.

Commentary on Question:
To get maximum points, candidates had to explain the loss recognition concept under US GAAP. Most candidates confused loss recognition, which occurs on a regular basis to test reserve adequacy, with DAC recoverability testing, which is done at issue to ensure that deferred acquisition expenses can be recovered in the future.

At the time of issue, benefit reserve assumptions are locked in and include a margin for adverse deviation.

Under loss recognition, the benefit reserve assumptions are unlocked, and then the benefit reserves are recalculated using current best estimate assumptions.

(ii) How Lifelong could use a gross premium valuation to test for loss recognition.

Commentary on Question:
To get maximum points, candidates had to apply the concepts to LifeLong's particular situation. Many candidates only provided general statements about the gross premium valuation.

14. Continued

A gross premium reserve is the present value of future cash flow disbursements minus future cash flow receipts, calculated using best-estimate assumptions.

In general, if the gross premium reserve is larger than the net GAAP liability, then loss recognition must occur.

For LifeLong:

- Since the payout contracts are all single premium contracts, the only future cash flows are benefit payments and maintenance expenses.
- Since there is no DAC asset or deferred premium liability, the net GAAP liability is simply the benefit reserves.
- LifeLong could therefore test for loss recognition by comparing the present value of future benefits and expenses using best estimate assumptions to the benefit reserves. If the present value is larger, then loss recognition must occur.

(c)

(i) Determine whether or not Lifelong is in loss recognition for the current year.

Commentary on Question:
Most candidates were able to calculate the gross premium reserve and recognized that Lifelong was in loss recognition.

Gross premium reserve = $590 million + $20 million = $610 million

Benefit reserves = $600 million

Since the gross premium reserve exceeds the benefit reserves, LifeLong is in loss recognition.

(ii) Explain any changes that Lifelong would need to make to its benefit reserve for the current year, based on the results above.

Commentary on Question:
Most candidates provided the steps to follow if the DAC recoverability test is failed at issue. A certain number of candidates knew that the revised reserve had to be equal to the gross premium reserve. Few identified that reserves had to be unlocked and set to the best estimate assumptions.

14. Continued

LifeLong would need to unlock its benefit reserve assumptions and recalculate the benefit reserves using current best estimate assumptions.

As a result, LifeLong's benefit reserves would increase and be identical to the gross premium reserve.

(d) Recommend ways that the valuation actuary might alter the assumption to address the chief actuary's concern, including the impact that this alteration would have on the loss recognition test, for the current year.

Commentary on Question:
To get maximum points, candidates had to realize that the best estimate interest assumption should increase, provide a few ways to achieve this result, and comment on the impact on the loss recognition test. Many candidates were able to provide ways to change the interest rate, but a smaller number knew that the chief actuary was looking for an increase. As well, some candidates thought that changing the best estimate assumption would change the benefit reserve, which is not the case.

The chief actuary's concern is that the interest assumption is too low, so it needs to be increased to address his concern.

Possible ways to increase the assumption:

- Grade to an historical average
- Grade to a long term expected return set in consultation with investment professionals

Increasing the assumption would produce a lower gross premium reserve, since future benefits and maintenance expenses would be discounted at a higher interest rate.

For the current year test, if the gross premium reserve drops below the benefit reserves, then LifeLong would not be in loss recognition.

15. Learning Objectives:

1. The candidate will understand basic financial statements and reports of U.S. life insurance companies and be able to analyze the data in them.

Learning Outcomes:

(1d) Explain the appropriate accounting treatments for such items as but not limited to:
- (i) Separate Accounts
- (ii) Embedded Options
- (iii) Derivatives
- (iv) Secondary Guarantees

Sources:

US GAAP For Life Insurers, Second Edition, Ch. 13, Investment Accounting (excl. 13.7)

Commentary on Question:

The intent of this question was to test the candidate's understanding of the scope of FAS 133.

In general, candidates did reasonably well on this question. To do well, candidates needed to understand that FAS 133 was intended to ensure that provisions were made for any Derivatives embedded in contracts. It also tested candidates understanding of the features of selected contracts commonly issued in the US by insurance companies.

Solution:

(a) Explain whether the following types of insurance contracts are subject to SFAS 133. Justify your answer.

(i) Synthetic GIC

(ii) Traditional Variable Annuity without any Guarantees

(iii) Variable Immediate Annuity with a Guaranteed Minimum Payment

(iv) Market Value Annuity

15. Continued

Contracts covered under FAS 60, FAS 97 and FAS 113 are not subject to the requirements of FAS 133. Combining derivative instruments with insurance contracts make those contracts fall under the scope of FAS 133

(i) Synthetic GIC
May or may not fall under 133
Depends on presence of any kind of guarantee, in which case it is
Synthetic GIC simulates performance of traditional GIC through use of financial instruments
Policyholder holds the assets, issuer grants a put option

(ii) Traditional Variable Annuity without any Guarantees
Does not fall under 133
Underlying assets are insulated from the general account obligations of insurer
Policyholder does not face a default risk beyond those embedded in Separate Account
Premiums are invested in Separate Accounts
Account values dependent solely upon the performance of the Separate Accounts

(iii) Variable Immediate Annuity with Guaranteed Minimum Payment
Falls under 133
Period certain also in scope
Life contingent with no guarantees out of scope
If hybrid, not subject to FAS 133

(iv) Market Value Annuity
Generally not subject to FAS 133
Leverage feature could move it into scope
Provides a return of principal plus a fixed rate of return if held to maturity
Market value adjustments made if surrendered prior to maturity

(b) Assess whether this type of insurance contract is subject to SFAS 133.

"Currency Protector" Fixed annuity is clearly subject to FAS 133.
In the absence of the currency guarantee, this contract is just a regular fixed annuity subject to FAS 97. Contracts in scope for FAS 97 are out of scope for FAS 133.

16. Learning Objectives:

1. The candidate will understand basic financial statements and reports of U.S. life insurance companies and be able to analyze the data in them.

Learning Outcomes:

(1a) Construct the basic financial statements for a life insurance company under U.S. GAAP and Statutory accounting methods and principles.

(1f) Describe emerging developments impacting U.S. GAAP and International Reporting frameworks, and assess their impact on the valuation of reserves

Sources:

US GAAP For Life Insurers, Second Edition, Chapter 18 (excl. 18.4) Other Topics

Commentary on Question:

Question 16 tested the candidate's knowledge of the financial reporting under US GAAP and taxation.

Part (a) tested the candidate's knowledge of identifying differences between GAAP income, Statutory income and taxable income. The cognitive level is retrieval. Overall, the candidates did a fair job of answering part (a). Some candidates were given marks for points not in the grading outline but were valid e.g. describing specific differences/assumptions in statutory reserves vs. GAAP reserves.

Part (b) tested the candidate's knowledge on the treatment of specific items on the financial statements under SFAS 109. The cognitive level is comprehension. Overall, the candidates did a fair job of answering part (b). Candidates were required to give a reason why the classification is temporary or permanent difference to receive full marks.

Part (c) tested the candidate's knowledge of net deferred tax liability/asset under SFAS 109. The cognitive level is comprehension. Overall, the candidates did a fair job of answering part (c). Common mistakes were including the statutory income in the calculation when it was not required, excluding the valuation allowance in the calculation, or reversing the sign of the valuation allowance in the calculation.

Solution:

(a) List key differences between:

- GAAP income and statutory income
- Taxable income and statutory income

Differences in GAAP income compared to statutory income:

- GAAP financial accounting differs from that for NAIC statutory purpose.

16. Continued

- GAAP reserves have difference assumptions (e.g. Matching of revenue and expenses, best estimate assumptions with PAD, etc) compared to statutory reserves (e.g. Focus is on solvency, conservative assumptions, etc.).
- For GAAP, acquisition expenses are deferred and amortized against future income referred to as DAC.

- The concept of an interest maintenance reserve, which facilitates the realization of capital gains and losses, does not exist under GAAP.

Differences in tax income compared to statutory income:

- Starting point for taxable income is statutory gain from operation as set forth for NAIC Annual Statement.
- Tax income includes capitalized expenses as "tax DAC."
- A net operating loss carryback or carryforward is allowed in tax income.

(b) Determine whether each of the following are classified as temporary or permanent differences under SFAS 109. Justify your answer.

(i) Bond discount accrual

Temporary – reflects a timing difference since discount or premium is amortized over the life of the asset and will be resolved over the life of the contract.

(ii) Policyholder dividend reserves

Temporary – reflects a timing difference since reserves will runoff to zero over time. Changes in reserves shifts the timing of the earnings but does not change the amount.

(iii) Tax-exempt interest

Permanent – tax-exempt interest is considered an event recognized in the financial statements that does not have tax consequences.

(iv) Post-retirement liability benefits

Temporary – reflects differences that will result in future taxable or deductible amounts.

16. Continued

(c) Calculate the net deferred tax asset or liability under SFAS 109 at end of year 2010.

Get temporary difference between the financial statement (GAAP income) and taxable income = 850 - 640 = 210

Temporary difference is taxable since 210 > 0.

Deferred tax liabilty = tax rate * Taxable Temporary difference= 0.2 * 210 = 42

Net deferred tax asset = Deferred tax asset-Deferred tax liability - valuation allowance = 0 - (42 + 280) - 50 = -372

17. Learning Objectives:

1. The candidate will understand basic financial statements and reports of U.S. life insurance companies and be able to analyze the data in them.

2. The candidate will be able to understand and apply valuation principles of individual life insurance and annuity products issued by U.S. life insurance companies.

Learning Outcomes:

(1d) Explain the appropriate accounting treatments for such items as but not limited to:
- (i) Separate Accounts
- (ii) Embedded options
- (iii) Derivatives
- (iv) Secondary guarantees

(1e) Describe emerging developments impacting U.S. GAAP and International Reporting frameworks, and assess their impact on the valuation of reserves

(2a) Describe and differentiate between valuation methods under the following standards:
- (i) U.S. statutory
- (ii) U.S. GAAP
- (iii) U.S. tax
- (iv) Fair value accounting

(2e) Describe and assess the impact of emerging U.S. principle-based reserve regulation on the valuation of reserves.

Sources:

ILA-C100-07: Financial Reporting Developments Accounting for Derivative Instruments and Hedging Activities: A Comprehensive Analysis of FAS 133

US GAAP For Life Insurers, Second Edition, Chapter 8 Variable and Equity-Based Products

SFAS 157 Fair Value Measurements, paragraphs 1-30

"An Approach for Measurement of the Fair Value of Insurance Contracts", Actuarial Practice Forum, May 2007

Commentary on Question:

Commentary listed underneath question component.

17. Continued

Solution:

(a) LNZ purchased derivatives in 2010 to hedge the risk of falling equity markets.

(i) Review the criteria to have these derivatives qualify as hedges and outline the resulting accounting treatment under SFAS 133.

Commentary on Question:
This first part of section (a) is better answered as a list as it asks for the criteria to have the derivatives qualify as hedges. It does not ask for a description of the various types of hedges.

Here is a list of requirements that need to be met for these derivatives to qualify as hedges:

- Formal documentation (including strategy and objective)
- Identify hedging instrument
- Identify item hedge
- How effectiveness will be measured
  - Expected to be highly effective

Also the hedged item is not related to the following:

- An investment accounted for by the equity method
- Minority interest in consolidated subsidiaries
- Equity investment in a consolidated subsidiary
- A future business combination
- An equity investment classified in stockholder's equity

(ii) Distinguish the main differences in reporting for both guaranteed benefits and hedging derivatives under SFAS 133 as modified by SFAS 157.

Commentary on Question:
To answer this question, there needs to be an emphasis on both guaranteed benefits and hedging derivatives. Describing SFAS 133 and SFAS 157 without reference to those elements would not be answering the question.

1. Derivatives: The derivative would always be reported a Fair Value.

2. Guaranteed Benefits:

   First you need to determine if they are Fair Value Hedges or Cash Flow Hedges.

   GMAB would be considered a Fair Value hedge.

17. Continued

If the derivative does not qualify as hedging instrument, the change in Fair Value goes to income. In the other hand, if it qualifies, the gain/loss in the hedging instrument and offsetting loss/gain on hedged item are reported in the same period.

An annuity with GMAB would be bifurcated.

GMDB is carried at Fair Value and there is no bifurcation.

(b) Assess the impact on reserves.

Commentary on Question:
The question is about assessing the impact on reserves. The answer should focus on the impact on reserves, even if the change in credit rating will have other impacts for the company.

The change in LNZ credit rating will need to be reflected in the reserve.

This change in credit rating will cause the company credit spread to be reduced. The reduced credit spread, means that the reserve is calculated using a lower interest rate. This would increase the reserve.

Also, the change in rating could have an impact on the lapses. As policyholders have more confidence in the company, we might see a decrease in lapses. However, as the credit change impacted the whole industry, this might not have a significant impact.