CSP-IC Complete Illustrative Solutions
Spring 2011

1.

Learning Objectives:

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

Learning Outcomes:

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

Sources:

Life Insurance products and Finance, Ch. 14, Financial Modeling

ILA-C114-07: Life Insurance Forecasting and Liability Models

Commentary on Question:

Solution:

(a) List the positive effects of testing interest rate scenarios using asset/liability modeling (ALM).

- Make the company more aware of any significant risk it is taking.
- The company may change its investment strategies to reduce its exposure to certain risks.
- The company may change the products it offers to reduce its exposure to certain risks.
- The company may limit the total amount of certain kinds of business it will accept, in order to limit the aggregate risk.
- The company may increase certain kinds of business in order to better balance and diversify its risks.
- By knowing the risk up front, the company can educate stakeholders and minimize any collateral damage.
- Help to predict investment income and test crediting strategy.
- Help risk management and decision making.

1. Continued

(b) Evaluate the approach used by a life insurance company in validating ALM models.

- The current validation is static validation which compares the model results to actual values at one point of time.
- Validating modeled results on a static validation approach does not guarantee a perfect model since it only compares one point in time.
- Also static validation only looks at one variable and fails to capture the effect of interaction among variables.
- Dynamic validation can be used to check the reasonability of the model going forward since it validates values over a period of time.
- Dynamic validation looks at many assumptions at once and measures accuracy of their interaction.
- Prospective dynamic validation can be used to compare the trend in actual historical results with the model's projected results.
- Retrospective validation or back-testing is another type of dynamic validation which starts with the current portfolio of business and runs the model backwards through time.
- Back-testing is more robust than prospective validation, the back-test result is directly compared to the actual historical data.
- The company could improve its model validation approach by using static validation for the start point of the model and use the dynamic validation in checking the projected modeled results over a period of time.

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:

(4g) Explain and apply the methods and principles of embedded value.

Sources:

Life Insurance Products and Finance, Chapter 16

Commentary on Question:

The question was trying to test considerations for the purchase of a block of business and how to calculate the Embedded Value for a block of business. The students both did well and had trouble calculating the Embedded Value.

Solution:

(a) List prerequisites Settlers Life should consider before entering into the sale.

The seller must have a use for the capital from the sale and the sale must be likely to improve the seller's earnings.

(b) Calculate the embedded value of this block of business. Show all work.

Assume Assets = 30
Purchase Value (PV) = Solvency Reserve (0) – Assets (0) = 40 – 30 = 10

Tax (0) = (SolvRes(0) – TaxRes(0) – PV – Transactions Costs) * Tax Rate
= (40 – 40 – 10 – 2) * .35 = -4.2

Embedded Value (EV) = PV + Tax(0) + TransCosts + Required Capital (0)
= 10 – 4.2 + 2 + 3 = 10.8

Candidates could also assume assets = 45

Purchase Value (PV) = Solvency Reserve (0) – Assets (0) = 40 – 45 = -5

Tax (0) = (SolvRes(0) – TaxRes(0) – PV – Transactions Costs) * Tax Rate
= (40 – 40 – (-5) – 2) * .35 = 1.05

Embedded Value (EV) = PV + Tax(0) + TransCosts + Required Capital (0)
= -5 + 1.05 + 2 + 3 = 1.05

2. Continued

(c) Recommend whether Beaumont Life should proceed with the purchase.

The recommendation is to go ahead with the purchase as the Embedded Value is greater than zero and therefore will add value to the company.

3. 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:

(1d) Explain fair value accounting principles.

Sources:

An Approach to Fair Valuation of Insurance Liabilities Using the Firm's Cost of Capital

Commentary on Question:

Parts (a) and (b) tested the candidate's understanding of fair value calculation under two different approaches: direct and indirect methods. Overall, candidates did a fair job of answering part (a) but did a poor job in part (b). Many candidate left part (b) blank.

Part (c) tested the candidate's application of the direct method of calculating fair value liability. Most candidates did very well in calculations. Some were able to answer the question without knowing the direct method formula but by using first principles. Common errors were missing the premium and commission, assuming annual premiums, assuming premium and commission at end of first year instead of beginning, and forgetting 1% credit risk premium.

Part (d) tested the candidate's understanding of the sensitivities to the fair value liabilities. Most candidates did very well in answering (i) and (ii) since they were able to determine the direction of the fair value liability changes based on first principles. Many candidates had trouble answering (iii) since they could not relate the cost of equity capital change to the risk premium.

Solution:

(a) Explain the following approaches to Fair Value Liability valuation:

(i) Direct Method

- Discount liability cash flows using the risk-free interest rate with mechanism to adjust risk: $FVLt\text{-}1 = (FVLt + Lt + Et)/(1+rt+\theta)$
- More reliable assessment of risk of financial leverage
- Insurance risks (mortality or morbidity) can be accommodated by adjusting either the discount rate or the expected future cash flow
- Not used to set exit prices
- More simplistic, straightforward method

3. Continued

(ii) Indirect Method

- Discounts future free cash flows at appropriate risk-adjusted cost of capital
- Deducts discounted distributable earnings and an amount for the deferred tax liability from the market value of the assets of the firm: FVLt = MVAt - DTLt – DDEt; MVA = Market value of the assets, DDE = Discounted Distributable Earnings, DTL = Deferred tax liability
- DDEt-1 = ((DDEt + DEt)/(1+r+θ); DE = distributable earnings
- DTLt =T[(MVAt - TVAt) - (FVLt - TVLt)]; TVA = Tax value of the asset, TVL = Tax value of the liability
- (r+θ) is the cost of capital expressed as the risk-free rate plus a risk premium
- More easily related to exit prices
- Methodology can become excessively complex

(b) Identify the conditions under which the Fair Value Liability using the Indirect Method will equal the Fair Value Liability using the Direct Method.

- Assumptions need to be set so they are consistent between the two methods
- Introduce a new term Required Profit which is the profit required from the product that will result in the firm earning exactly its cost of capital
- Direct method's liability risk premium (expected excess return) must be based on asset portfolio earned rate and a charge for required profit on capital
- The liability spread is equal to the asset risk premium minus ratio of required profit over the fair value of liabilities

(c) Calculate the Fair Value Liability at policy issue using the Direct Method.

FVLt-1 = (FVLt + Lt + Et)/(1+rt+θ)

Premium = 600
Commission and other acquisition expenses = Premium * .4 = 600 * .4 = 240
Et = 0 for t = 1,2,3

Death Benefit cash flow: Face amount * tPx * Qx
L1 = 100000*(.01) = 1000
L2 = 100000*(1-.01)*(.02) = 1980
L3 = 100000*(1-.01)*(1-.02)*(.03) = 2910.6

rt+θ = .05 + .01 = .06

3. Continued

FVL3 = 0
FVL2 = (0 + 2910.6)/1.06 = 2746
FVL1 = (2746 + 1980)/1.06 = 4458
FVL0 = (4458 + 1000)/1.06 – 600 + 240 = 4789

Fair value liability at policy issue is 4789.

(d) Predict whether the Fair Value Liability increases or decreases for each of the following scenarios.

(i) The credit risk premium increases.

- An increase in credit risk premium will cause an increase in the discount rate
- Therefore, fair value liability will decrease from an increase in the discount rate

(ii) An epidemic increases the mortality rate in policy year three.

- An increase in the mortality rate will cause an increase in the benefit
- Therefore, fair value liability will increase because of an increase in the benefit

(iii) The cost of equity capital increases.

- An increase in cost of equity will reduce the firm's credit risk premium which will cause a decrease in discount rate
- Therefore, fair value liability will increase from a decrease in the discount rate

4. 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:

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

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

Sources:

ILA-C125-10: Insurance Risk Management Response to the Financial Crisis, CRO Forum, April 2009, Pgs 7-9

Specialty Guide on ERM Chapter 2

Commentary on Question:

The purpose of this question was test the candidate's understanding of enterprise risk management in practice. As well, the candidates were asked to identify different risk control processes that could be applied to different situations

Part (a) requires the candidate to apply the Enterprise Risk Management principles from the syllabus as they apply to each of the 6 statements. This question was worth 5 points, which required candidates to really give some thought to the statements, and explain why they were appropriate/not appropriate with respect to Enterprise Risk Management. Overall, candidates did not include enough in their responses for this question. It is important that candidates make sure to elaborate on their responses, and really demonstrate that they understand the implication of each statement.

Part (b) requires that the candidates identify which risk control process is being used in each example. Many candidates didn't carefully read the question, or didn't recognize that this was what was being asked of them for this question. The candidates who understood what was being asked were able to do very well on the question.

Solution:

(a) Assess the appropriateness of each of the following statements regarding this program.

(i) The risk management function will be done at the business unit level.

Inappropriate. The risk management function must be comprehensive and done at the enterprise level. Risk management at the business unit level can miss the potential for cumulative risk.

4. Continued

(ii) Risk officers report to the pricing officer of each business unit.

Inappropriate. Risk management should be independent of business unit functions. All risk officers should report to the Chief Risk Officer who holds a seat at the highest level of management.

(iii) A checklist will be developed to help the risk management officers assess product risks.

Inappropriate. Integrated Risk Management should never be a static "check the box exercise." Checklist would need to be dynamic, and should allow companies to identify and asses emerging risks

(iv) The Board of Directors will be advised as risk issues arise.

Inappropriate. The board of directors must take ultimate responsibility for supervising a company's risk management framework, including the company's overall risk tolerance.

(v) Risk management will be rules-based.

Inappropriate. Rules-based regulation tends to foster a culture of blind compliance rather than risk awareness, principles-based economic regulation is recommended.

(vi) Compensation will continue to reflect the volume of sales.

Inappropriate. Compensation based solely on sales does not take into account risk/return relationships. Incentives should reward risk-adjusted performance.

(b) Determine the parts of the Risk Control Process described in the Society of Actuaries' "Enterprise Risk Management Specialty Guide" that the company should follow for each of these recommendations.

(i) Risk Transferring. Reinsuring the LTC business transfers part of the risk to the reinsurer. Careful analysis is required to determine the level of risk that should be retained, and the significance of the counter-party risk.

(ii) Risk Offsetting. By entering the Fixed Annuity market, the company will be taking on longevity risk, which will offset some of its existing mortality risk. Selling both of these products is a form of mortality hedging.

4. Continued

(iii) Risk Avoidance. Eliminating risky assets from company's investment portfolio is an example of avoiding risk.

(iv) Risk Monitoring. Introducing a CRO and developing a centralized risk reporting process is an example of risk monitoring.

(v) Risk Evaluation. Based on information augmented by the judgment of management, frequency and severity of risks are evaluated, and risks are ranked to determine highest priority.

5. 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

Sources:

ILA-C112-07: ALM for Insurers

Valuation of Life Insurance Liabilities, Ch 13

Life Insurance Products and Finance, Ch 14 Financial Modeling

ILA-C113-07: Life Insurance Accounting, Ch 22 Asset/Liability Management

Commentary on Question:

All commentary is listed below the components of the question.

Solution:

(a) Assess the advantages and disadvantages of using deterministic scenarios in this analysis.

Commentary on Question:

With few exceptions, candidates' answers to this question reflected the material in the second study note only. Because the answer came from various sources, it was difficult for the candidate to express mastery of material.

Advantages

- Easy to describe the scenarios and easy to communicate results
- Less time-consuming and resource-intensive than stochastic projections
- The results of certain pre-defined deterministic scenarios (e.g., NY7) are of interest to regulators

Disadvantages

- Large set of scenarios needed for statistical credibility
- Deterministic scenarios tend to produce more favorable results than would be expected statistically (outliers are omitted)
- Disagreement over probability of given scenario

5. Continued

Disadvantages

- Deterministic scenarios do not capture tail risk
- Companies have discretion to make assumptions that reduce rigor of testing
- Ability to modify tests to meet regulatory standards compromises usefulness as check & balance (easily manipulated)

(b) Compare the use of immunization versus cash flow matching.

Commentary on Question:
In general, candidates were able to retrieve the requested material.

Cash Flow Matching – Beginning with the final liability cash flow, purchase assets whose cash flows will exactly offset the liability and work back to present time so that all cash flows are exactly offset for the length of the projection.

Pros

- Completely eliminates interest rate risk

Cons

- Uncertainty of liability cash flows (due to policyholder behavior or timing of mortality) and asset cash flows (due to defaults or prepayments) make cash flow matching difficult to achieve in practice and may lead to rebalancing.
- Cash flow matching reduces the insurer's flexibility to invest in assets that earn higher yields than those needed for exact matching.
- Exact matching of cash flows can only be done in rare instances.

Immunization – Protects against interest rate risk by matching the durations of assets and liabilities.

Pros

- Can eliminate interest rate risk for small, parallel changes in the yield curve

Cons

- Requires constant monitoring and periodic rebalancing, which can be impractical and expensive
- Duration matching is not accurate for large or non-parallel changes in interest rates
  - Can be remedied by matching convexity, which helps cover a wider range of interest rate movements
- Can be perfectly immunized but have big discrepancies in the timing of asset and liability cash flows

5. Continued

(c) Calculate the present value of cash flows using a Modified Duration approach and a discount rate of 6.5%.

Commentary on Question:
Candidates were able to get most of the points in this section. This section of the entire question was where the candidates received the majority of their points.

Modified Duration = Macaulay Duration / 1+i
Mod Duration = 9.86/1.06 = 9.3019
Change in %PV = - Mod Duration * Change in i
= 9.3019 * (6.5 – 6) % = -.0465
New PV = PVCF * (1+ Change in %PV)
= 1450 * (1-.0465) = 1382.561

(d)

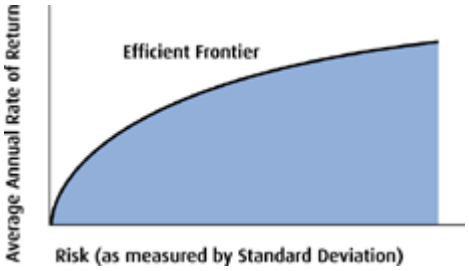
(i) Explain efficient frontier analysis.

Commentary on Question:
Most students had very little to say about the Efficient Frontier. Looking at the study note, it was a very small section in a much larger paper. Even if they didn't have too many points on section (i), some were able to answer part (ii), possibly from study material from this exam or other exams.

- Efficient Frontier analysis provides the framework to pick investment strategy
- Seeks to maximize expected returns subject to risk tolerance
- Represents a continuum of portfolio choices
- Represents most favorable tradeoff between risk and reward
- Can move onto frontier by reallocating without penalty
  - Same return but lower risk
  - Same risk but higher return
- Risk measured by standard deviation
- Return measured by Expected Economic Value

5. Continued

- The graph of efficient frontier would be:



(ii) Construct a portfolio that will achieve a 12.5% GAAP equity growth target with a 90% likelihood of compliance using the Change in Surplus Test.

Commentary on Question:
Three of the most typical solutions are listed below.

Current portfolio fails both return and risk tolerance goals. Need to review the other portfolios to see which two (or more) portfolios achieve the growth target with a 90% likelihood of compliance. Any combination of portfolios that achieve the targets are considered correct.

Solution #1: Exact

- Try using Portfolio B, whose change in equity is lower than 12.5% but probability of failure is less than 10%, and Portfolio C, whose change in equity is higher than 12.5% but probability of failure is greater than 10%.
- Solve for x (Portfolio B %):
  - 12.1% * x + 13.6% * (1-x) = 12.5%
  - x = 73.333% for Portfolio B and 26.667% in Portfolio C.

5. Continued

- Confirm probability of failure compliance :
  - 8% * 73.333% + 14% * 26.667 = 9.6% which is less than 10% of probability of failure.

Solution #2: Estimate

- Try using Portfolio B, whose change in equity is lower than 12.5% but probability of failure is less than 10%, and Portfolio C, whose change in equity is higher than 12.5% but probability of failure is greater than 10%.
- Estimate percentage in Portfolio B using 70%
  - 12.1% * 70% + 13.6% * (1- 70%) = 12.55% which is greater than the target of 12.5%
- Confirm probability of failure compliance :
  - 8% * 70% + 14% * 30 = 9.8% which is less than 10% of probability of failure.

Solution #3: Adjust existing Portfolio

- Portfolio B is closest the 12.5% target with its probability of failure lower than the target of 10%.
- The asset allocation of Portfolio B can be altered to somewhat increase return rates while only increasing ruin risk minimally

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:

(1d) Explain fair value accounting principles.

Sources:

ILA-C100-07: Financial Reporting Developments Accounting for Derivative Instruments and Hedging Activities: A Comprehensive Analysis of FAS 133, Overview and Appendix C only.

Commentary on Question:

Solution:

(a) Explain the general disclosure requirements of SFAS 133 with respect to hedging.

Objectives and strategies for holding or issuing derivatives
Preparation and description of a risk management policy
The amount of gain or loss recognized in earnings during the period due to hedge ineffectiveness

(b) Compare accounting treatment differences between a fair value hedge and a cash flow hedge under SFAS 133.

Fair value hedges require that the gain or loss on the hedging instrument and the offsetting gain or loss on the hedged item be recognized in earnings during the current period.

For cash flow hedges the effective portion of the gain or loss on the derivative instrument is reported as a component of other comprehensive income. It will be reclassified into earnings in the same period the hedged transaction affects earnings.

The difference between the change in value of the derivative and the hedged item is forced through earnings.

(c) Explain the potential impacts of the accountant's proposal.

The accountant wants to use cash flow hedge accounting since the change in the value of the derivative will go through other comprehensive income and not earnings.

6. Continued

However, to the extent that the change in value of the derivative is 300% of the change in fair value of the hedged item the excess change in the derivative's value will likely go through the income statement regardless of whether the hedge is classified as a cash flow hedge or a fair value hedge.

Although some amounts will be accounted through other comprehensive income most of the amounts will likely still go through the income statement. Changing to cash flow hedge accounting will not reduce the large amounts still going through regular income.

The primary issue is that the company is exposed more to the interest rate swap than is necessary to hedge its liabilities. To reduce the impact on the income statement from the interest rate swap, the company should reduce its exposure to the interest rate swap not necessarily change its classification of the hedge as a cash flow or fair value hedge.

7. 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:

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

Sources:

Economic Capital for Life Insurance Companies, Chapter 3, Pros and Cons of Existing EC Methodologies

Commentary on Question:

The question is asking the Candidate to explain and apply the concept, approaches and methods for determining Economic Capital.

The Cognitive level of the question was Retrieval and Analysis.

Solution:

(a) Define the Liability Runoff and the one-year Mark-to-Market approaches for Economic Capital.

Commentary on Question:

For the most part, candidates either knew the definitions or did not. Some candidates talked about the methods, but did not include appropriate definitions.

The Liability Run-off approach: Economic Capital represents the current market value of assets required to pay all future policyholder benefits, and associated expenses at the chosen security level, expressed on a VaR or CTE basis, less the current value of liabilities, typically defined on a mean or best estimate basis.

The One Year Mark to Market approach: Economic Capital represents the current market value of assets required to ensure that the market consistent value of liabilities can be covered in one year's time at the chosen security level, expressed on a VaR or CTE basis, less the current value of liabilities, typically defined on a mean or best estimate basis.

(b) Explain the steps a company would take to calculate Economic Capital using the one-year Mark-to-Market approach.

Commentary on Question:

Most candidates had difficulty explaining all the steps required to calculate Economic Capital. They knew a few of the points, but not many.

7. Continued

The required steps are as follows:
The available capital at t=0 measured on an economic basis is the difference between MCA(0) and MCL(0).
MCA: Market Consistent value of Assets; MCL: Market Consistent value of liabilities.
Assets at time 0 and Liabilities at time 0 are projected one year, at which point MCA(1) and MCL(1) are valued to provide a projected economic capital balance sheet at t=1.
MCL(1) is the average PV of liability cash flows, bases on best estimate assumptions over some number of stochastic scenarios, projected over the life of the contracts.
((MCA(1)-MCL(1)) is then discounted to t=0, using the projected earned investment return over the year.
The steps described above are performed for a large number of stochastic scenarios, perhaps 1,000 or more, given the higher security levels.
This gives a distribution of required assets by scenario, from which the overall level of required assets can be determined, i.e., by calculating VAR(99.5%).
The Economic Capital requirement is then determined by deducting MCL(0) from the required assets calculated in the prior step.

(c) Explain challenges of using the Liability Runoff approach for Economic Capital for this company.

Commentary on Question:
In general, the candidates knew several of the specific challenges for the Liability Runoff approach, but answered more in general terms for UL and VA products.

The challenges of this approach are as follows:
Often only considers those risks relating to the existing portfolio, with a limited number of years' of new business included.
The liability runoff approach can give insufficient recognition to the fact that an organization's principal ability to control risk in the short term is through trading assets and/or liabilities, including through reinsurance and portfolio/business transfer.
The liability runoff approach aims to build longer-term management actions into the stochastic model, although in practice this can be difficult to perform comprehensively.
Stochastic projections of longer-term risk emergence and management thereof can be less clear and more difficult to analyze.
In an environment where management changes can occur fairly frequently, making assumptions as to management actions over the longer term can be considered speculative.
This can result in a timing mismatch with short-term performance being compared with risk and capital assessments based on a longer-term horizon.

7. Continued

Complexities with respect to model assumptions, risk interactions and management actions can make this approach to EC relatively difficult to explain and hence easily misunderstood.
Model complexity can lead to longer implementation timeframes and add to the opaqueness of the process.
Calibrating EC to a target security level under a liability runoff approach to an external data source is more difficult.
The liability runoff approach will implicitly assume that short term losses on one line can be offset against longer term profits on another.
Justifying this, and the consequent diversification benefits, can be challenging.

8. Learning Objectives:

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

Learning Outcomes:

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

Sources:

ILA-C112-07

ILA-C113-07

Atkinson & Dallas Chapter 14 and 15

Commentary on Question:

- Focus of question:
  - Predict impact of rising interest rates on SPDA contracts
  - Calculate change in value of assets for given change in interest rates
  - Identify embedded options in assets and liabilities
- Most candidates performed very well on part (b); performance for parts (a) and (c) was much weaker

Solution:

(a) Explain the impact this yield curve shift would have on each of the following:

(i) Asset cash flows of the portfolio

Commentary on Question:

- Candidate performance was average.
- Many recognized that calls and prepayments apply only if interest rates fall.
- While not specified in the question, some candidates noted effect on fixed versus variable rate instruments.
- Common errors:
  - Discussion of effect on market value instead of cash flows.
  - Stating that calls and prepayments increase as market rates increase.
  - Not noting effect of increased surrenders on cash outflows.
  - Not noting effect on timing of cash flows.

8. Continued

- Future cash flows may be contingent on future events, so timing/amount can't be predicted with certainty.
- Calls and prepayments apply only if interest rates fall.
- If insurer does not keep rate competitive, large cash outflows will occur.
- Insurer may be forced to liquidate assets at depressed prices to fund surrenders.
- In times of high rates, liquidity restricted and less funds available to reinvest at favorable rates.

(ii) Statutory liability values

Commentary on Question:

- Candidate performance was poor.
- Common errors:
  - Stating that liability value decreases as interest rates rise

- Current statutory liability values do not change when the market interest rate changes.
- Future liabilities will change as lapse rates increase.

(iii) Policyholder behavior

Commentary on Question:

- Candidate performance was average.
- Most recognized that holder has incentive to lapse and reinvest elsewhere.
- Less commonly noted points:
  - Increased use of loans and partial withdrawals
  - Mitigating effects of surrender charges and MVA

- Policyholders will be more likely to lapse.
- Disintermediation will occur.
- Surrender charges and market value adjustments will help protect company.

(b) Determine which of the asset classes above has the largest impact to the market value of the asset portfolio following the yield curve shift.

Commentary on Question:

- Performance of calculations was very good overall.
- Common errors:
  - Not including ½ in convexity term.
  - Omitting convexity term.

8. Continued

- Switching signs on terms in equation.
- Using 1% or 0.2% instead of 2% for change in i.
- Using whole number instead of percentage/decimal for change in i.
- Not squaring change in i in convexity term.

% change = - ModDuration * (change in i) + 0.5 * convexity *(change in i) ^2
in value

Callable bonds	=	10,000,000 * [-3 * 0.02 + 0.5 * 4 * (0.02) ^ 2]
	=	(592,000)
Mortgages	=	10,000,000 * [-10 * 0.02 + 0.5 * 15 * (0.02) ^ 2]
	=	(1,970,000)
Mortgages	=	10,000,000 * [-7 * 0.02 + 0.5 * 25 * (0.02) ^ 2]
	=	(1,350,000)

Mortgages will have the largest impact on the value of the portfolio.

(c) Identify the embedded asset and liability options in this block of business.

Commentary on Question:

- Candidate performance was average.
- Many noted embedded asset options (bond calls and mortgage/MBS prepayments) and minimum guaranteed crediting rate.
- Less commonly noted points:
  - Policyholder can halt or continue at end date.
  - Company can adjust renewal credited rates.
- Common errors:
  - Confusion with respect to option type.
  - Not identifying surrender right as put option.

- Policyholder has put option: The right to surrender contract at any time for account value.
- Minimum guaranteed credited rate is an interest rate floor.
- Company holds option to adjust credited rates at renewal dates.
- Bond issuers hold call options to retire bond principal early.
- Mortgage and MBS issuers have prepayment option that allows mortgagors to pay down principal early.

9. Learning Objectives:

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

Learning Outcomes:

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

Sources:

Study Note: ILA-C102-09

Actuarial Review of Reserves and Other Annual Statement Liabilities, Ed Robbins

Commentary on Question:

The intent of this question was to test the candidate's ability to apply methods used to test the aggregate progress of actuarial reserves from one fiscal period to the next including the use of Spot Checking Techniques in the reserve review process

In general, candidates did reasonably well on this question. To do well, candidates needed to understand the idea of Tabular Cost including the factors that could affect it over time; as well as how it is calculated. Candidates were also expected to recall and outline the spot check techniques used in the review of actuarial reserves.

Solution:

(a)

(i) We need the Tabular Cost in each of 2009 and 2010 expressed as a fraction of the average Net Amount at Risk (NAAR) in each year.

Tabular Cost = $_0M - _1M + P + I - V_D - V_T$

where
$_0M$ and $_1M$ are respectively the opening and ending reserves during the year
P is the valuation net Premium
I is Tabular Interest
V_D and V_T are the reserves released by death and other terminations

Yr 2009; 2,367,000 - 2,578,500 + 1,425,000 + 125,500 - 119,000 - 60,000 = 1,160,000

Yr 2010: 2,578,500 - 2,200,000 + 1,100,000 + 150,000 - 115,000 - 55,000 = 1,458,500

9. Continued

Average NAAR = .5*($NAAR_{t-1}$ + $NAAR_t$)

NAAR Yr 2009: ((52,500,000- 2,367,000) + (55,125,000- 2,578,500))/2 = 51,339,750
NAAR Yr 2010: ((55,125,000- 2,578,500) + (57,000,000- 2,200,000))/2 = 53,673,250

Average Tabular Mortality Rate = Tabular Cost/Average NAAR

Average Tabular Mortality Rate for Yr 2009: 1,160,000/ 51,339,750 = .02259
Average Tabular Mortality Rate for Yr 2010: 1,458,500/ 53,673,250 = .02717

Change in tabular mortality rate in 2010 is over 20%, a sharp increase over prior years.

(ii) Possible Drivers

- Change in mix of business
- Change in Valuation Assumptions
- Corrections to Reserves

(b) Spot Checks

- Tests of calculations including assumptions and methods
- Transactional checks
  - Check for appropriate treatment of policies surrendered near to valuation date
  - Compare direct reserves to ceded reserves
- Policy trace

10. 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.

Sources:

OSFI Guideline E-15

Commentary on Question:

The question was trying to test the candidates' understanding of external reviewers obligations under OSFI Guideline E-15.
To receive maximum points, candidates needed to determine the information necessary to complete an external review.
Candidates were able to highlight the more prominent information that was missing.
Candidates could have improved their answer by providing examples of the types of information required by an external reviewer to complete the audit.

Approximately half the candidates indicated that the memo did not describe the validation methods or data integrity checks used for the new model.

It was important for candidates to question why the lapses were not modeled dynamically. However, less candidates indicated if other policyholder behaviors should be modeled.

Fewer candidates stated that a review of the AAR as well as CIA standards is required.

Solution:

Determine the additional information you need to fulfill your obligations as external reviewer under OSFI Guideline E-15.

The additional information needed to complete the review include:

1. Information on procedures, systems, and work of others.

    a. The memo did not describe the validation methods used for the model or scenario results.

    b. The memo did not indicate what data integrity checks were used to feed the new stochastic system.

10. Continued

2. Information on the appropriateness of assumptions and methods.

    a. What was the reason for not modeling lapses dynamically?

    b. How were the various accounts mapped to the underlying equity returns?

    c. Should other policyholder behavior items be modeled by scenario?

3. The AAR to compare the assumptions in the models versus the ones stated in the report.

4. Review of CIA standards and educational notes to ascertain that the work is within the range of accepted actuarial practice.

11. Learning Objectives:

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

Learning Outcomes:

(2a)

- (i) Describe valuation methods
- (ii) Recommend appropriate valuation assumptions.

(2b) Calculate liabilities for following products:

- (i) Traditional life insurance
- (ii) Term life insurance
- (iii) Universal life insurance
- (iv) Deferred annuity
- (v) Payout annuity
- (vi) Segregated Funds with guaranteed minimum death benefits
- (vii) Segregated Funds with guaranteed living benefits
- (viii) Riders

Sources:

ILA-C807-09: Market value Margins for Insurance Liabilities in Financial Reporting and Solvency Applications, E&Y October 2007 (up to page 65)

CIA Education Note: Expected Mortality: Fully Underwritten Canadian Individual Life Insurance Policies – July 2002

CIA Education Note: Margins for Adverse Deviations (MfAD) – Nov 2006

CIA Consolidated Standards of Practice – Section 2100, 2300, 2500 – Dec 2009

Commentary on Question:

The intent of this question was to test the candidate's understanding of various financial accounting bases and ability to calculate life insurance policies under different reporting bases for life insurance products.

11. Continued

In general, candidates did reasonably well on this question. To do well on this question, candidates needed to know and understand the different formulae used to calculate the policy liabilities under fair value accounting and Canadian GAAP accounting.

Solution:

(a) Calculate the fair value of the insurance liability immediately following the payment of the premium. Show all work.

- Fair Value Liability (FVL) = Best Estimate Liability (BEL) + Market Value Margin (MVM)
- BEL(t) = PV of cashflows at time t
- MVM(t) = Sum of PV of Annual Cost Of Capital.

Calculate BEL(t):

- Amount of benefit paid = # of deaths * Benefit:
  t1 = 30 * 500,000 = 15,000,000,
  t2 = 29.1 * 500,000 = 14,550,000,
  t3 = 28.2 * 500,000 = 14,113,500

- PV of Benefit paid at 6% discount rate = (Benefit paid) * (1 + 6) ^ t
  t1 = 15,000,000/ (1.06) = 14, 150,943
  t2 = 14,550,000 / $(1.06)^{\wedge 2}$ = 12, 949, 448
  t3 = 14,113,500 / $(1.06)^{\wedge 3}$ = 11,849,967

- BEL = PV cash flows discounted to t
  t1 => 38,950,358 = 14,150,943 + 12,948,449 + 11,849,967
  t2 => 26,287,380 = 14,550,000/(1.06) + 14,113,500/$(1.06)^{\wedge 2}$
  t3 => 13,314,623 = 14,113,500/(1.06)

Calculate MVM(t):

- Capital Base = Internal required capital – BEL
  t1 => 48,000,000 - 38,950,358 = 9,049,642
  t2 => 33,000,000 - 26,287,380 = 6,712,620
  t3 => 16,000,000 - 13,314,623 = 2,685,377

- Cost of capital = capital base * cost of capital rate (10 %)
  t1 => 904,964
  t2 => 671,262
  t3 => 268,538

- MVM = sum PV of annual cost of capital at 6%
  = 853,740 + 597,421 + 225,469 = 1,676,630

11. Continued

- Calculate Fair Value Liability:
  FVL = BEL + MVM
  FVL0 = 38,950,358 + 1,676,630 = 40,626,988

(b) Explain the steps, you would take to calculate the insurance liability at the end of Year 1 under:

(i) Fair Value Accounting

Approach under fair value method:

1. Internal economic capital models need to be updated and re-run based on new view of mortality => This will give new required capital values at the beginning of years 2 and 3.

2. Evaluate existing assumptions and see if they are still appropriate under fair value accounting.

3. Recalculate, at the end of year 1, other components of the liability calculation:
   - New death benefit cash flows
   - New BEL values

4. Use the formulae in part (a) to ultimately arrive at MVM.

5. Recalculate FVL: FVL = BEL + MVM

(ii) CALM

- Revise the best estimate mortality assumption to reflect new expected future mortality:
  - If experience is 100% credible, use company data as company's own experience as it is usually the most relevant.

- Revise the mortality MfAD:
  - High margin situation since future experience is less predictable.

- Under CALM, the policy liability is equal to the amount of supporting assets at balance sheet date which are forecasted to reduce to zero at the last liability cash flow in an economic future scenario:
  - Run at least the 7 (9 at the end of 2009) prescribed interest scenarios.
  - In addition, also run other scenarios that are appropriate to the circumstances of the case.
  -
- The aggregate CALM reserve is set equal to the asset amount produced by the most adverse interest rate scenario.

12. 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 evaluate 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:

Discussion Paper on OSFI's Regulatory and Supervisory Approach to Reinsurance

Life and Health and Annuity Reinsurance, Chapter 5

Report of the CIA Task Force on the Appropriate Treatment of Reinsurance

Commentary on Question:

This question tested candidates' ability to understand and explain OSFI's guiding principles with respect to reinsurance, to understand and explain how companies can take reinsurance credit if their treaty is disallowed by the regulator, and to understand and apply the CIA's view on reinsurance risk transfer.

Parts (a) and (b) required knowledge retrieval, while part (c) required candidates to utilize their knowledge of the Report of the CIA Task Force on the Appropriate Treatment of Reinsurance to recommend changes to reinsurance treaties.

Candidates' performance on parts (a) and (b) was stronger than on part (c).

- On part (c), candidates needed to make clear recommendations and justify the reason for the change (using the applicable guideline to support their recommendations.)

Additional points, expanding on/clarifying the five guiding principles, were given credit in part (a).

As instructed, candidates should take care to approach part (b) <u>from the ceding company's point of view</u>.

Alternate responses were accepted for part (c), where the candidate provided a reasonable justification and recommendation.

12. Continued

Solution:

(a) Explain the guiding principles underlying the regulatory and supervisory approach to reinsurance of the Office of the Superintendent of Financial Institutions (OSFI).

Consistent with OSFI's mandate, there are five guiding principles:

1. Policyholders of Federally Regulated Financial Institutions (FRFI) must be adequately protected.
   - FRFI must maintain adequate financial resources that are available to absorb unexpected losses and to cover liabilities in the event of failure.

2. Regulation and supervision should be proportionate to risk.

3. OSFI must have the ability to effectively assess the risks.
   - OSFI must have the right supervisory tools: sound internal controls, reporting, auditing, accounting and actuarial standards.

4. A level playing field among financial sector players should be maintained where appropriate.

5. Effective coordination with other insurance regulators.
   - e.g. provincial and international counterparties

(b) Identify the advantages and disadvantages of each from the ceding company's perspective.

(i) Trust

Advantages

- Assets are separate and identifiable.
- Investment income can be limited to the performance of specific assets.
- If the reinsurer is not licensed or admitted in the ceding company's state of domicile, this allows the ceding company to take credit for the reinsurance.
- In the event of recapture, the assets of the trust or escrow account are used for payment, avoiding disputes on the market value of the assets.
- A trust is a true transfer of assets.
- Upon default, beneficiary may withdraw assets as a secured creditor.

12. Continued

Disadvantages
- Creates additional administrative expenses.
- A trust or escrow can result in restrictions on investment management.
- A trust is transfer of ownership, which may create a capital gains tax.
- The company giving up assets will see reduction is assets under management.
- Depreciation in the market value of assets could create surplus strain, should the need to reverse the asset transfer occur.

(ii) Letter of Credit with the reinsurer

Advantages
- Can be obtained for a nominal fee.
- Requires little administration.
- Ceding company may draw down the letter without warning.

Disadvantages
- Short duration (typically one year); renewal capacity and pricing are uncertain.
- There is concern about ability of the ceding company to withdraw funds when needed.

(c) Recommend any changes to these reinsurance contract features to ensure risk transfer exists.

(i) The reinsurer may defer claim payments in a year where claims exceed 150% of expected.

Justification for required change:
- Example of pre-set limits to timing of payments may indicate an intention to limit risk transfer.
- No indication on when the defer claim payments will be paid.

Recommended possible changes:
- Remove this feature from the contract.
- Make the defer claim payments feature as part of the profit sharing formula
- Set a much higher threshold (200% or 300% of expected) before claim payments could be deferred, to safeguard against catastrophic risk.

(ii) The ceding company may recapture the reinsurance any time after third policy year upon payment of any negative experience refund balance.

12. Continued

Justification for required change:
- Profit sharing arrangement may limit risk transfer.
- Could be an example of the presence of early recapture option that may limit risk transfer on a permanent basis.

Recommended possible changes:
- Change the recapture payment to be independent of past profitability or pay only a portion of the negative experience refund balance (so the assuming company will be responsible for part of the loss).
- Lengthen the time period, e.g. to 10 years before recapture is allowed.

(iii) Reinsurance premiums are 120% of ceding company gross premiums and will be reviewed only after five years.

Justification for required change:
- Reinsurance premiums significantly exceed premiums collected by the ceding company.
- In the first five years, the assuming company's exposure to loss is small due to the high premiums, therefore this reinsurance arrangement may have insufficient risk transfer.

Recommended possible changes:
- Lower the reinsurance premiums to below 100%.
- Set reinsurance premium to be related to actual loss experience and review more often than every five years.
- Use profit sharing instead.

(iv) The reinsurer may terminate the contract after seven years with 90 days notice.

Justification for required change:
- Presence of early recapture/termination option may limit risk permanent transfer.
- The presence of a specific termination clause on the reinsurer's side, could indicate this is a financial arrangement (e.g. to provide temporary capital relief, rather than risk transfer).

Recommended possible changes:
- Lengthen the time period, e.g. to 10 years before termination is allowed.
- Make termination conditional, e.g. if accumulated loss ratio over the 7-year period exceeds x% then the reinsurer.

13. Learning Objectives:

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

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

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:

(2a)
- (i) Describe valuation methods
- (ii) Recommend appropriate valuation assumptions.

(2b) Calculate liabilities for following products:
- (ix) Traditional life insurance
- (x) Term life insurance
- (xi) Universal life insurance
- (xii) Deferred annuity
- (xiii) Payout annuity
- (xiv) Segregated Funds with guaranteed minimum death benefits
- (xv) Segregated Funds with guaranteed living benefits
- (xvi) Riders

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

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

Sources:

CSOP Sections 2100 and 2300

OSFI guideline MCCSR for LICs, pgs. 43-49, 89-90

Life Insurance Products and Finance, Chapter 16, pgs. 886-890

CIA Ed Note: Expected Mortality: Fully U/W Canada Individual Life Insurance Policies: July 2002, page 23

13. Continued

Commentary on Question:
Part (a) tested candidates' general knowledge around margins for adverse deviations
Part (b) tested candidates' understanding of impact of changes in underwriting on mortality.
Part (c) tested candidates' knowledge of the purchase equation.
This question tested knowledge utilization and analysis.
For part (a), candidates received most points by mentioning that margins for adverse deviations (MfADs) should increase reserves, and by recognizing that both the mortality and lapse MfADs did not and therefore should be changed. In addition, mentioning that CALM is used to set the interest PfAD was also key.
For part (b), knowledge of the formula to calculate the impact of the underwriting change on the mortality was the key element.
For part (c), understanding of the purchase equation was a key element to receive maximum points, as well as using the information given to arrive at the conclusion that the offer is not sufficient, with justification. Simply stating that the offer is not adequate, without proper justification, was not enough.
Parts (a) and (b) were in general better answered than part (c). See below for comments specific to each part.

Solution:

(a) Recommend changes to the margins for adverse deviation for the valuation of this new block of business.

Commentary on Question:
Most candidates recognized that the sign of the mortality and lapse MfAD were wrong as the reserve decreased. Fewer candidates made comments regarding significant considerations which would lead to using a MfAD of at least the average of the low and high margin. Only about half of the candidates commented on the interest MfAD.

The application of a MfAD should increase the reserve.

The MfAD should be at least the average of the low and high margin if at least one significant consideration exists.

13. Continued

The mortality MfAD decreases the reserve due to it being death-supported, so the sign of the MfAD should be changed. In addition, the company is using industry experience, which is a significant consideration, so MfAD must be at least 9.375/ex. I would recommend using a mortality MfAD of $-10/e_x$.

The lapse MfAD decreases the reserve (it is lapse-supported), so the sign of the MfAD should be changed. Also, the low and high lapse margins are 5% and 20%, and the assumption does not fall within this range. In addition, the company is using fully credible company experience, so we may use a margin below the average of low and high margin. I would recommend using a lapse MfAD of -10%.

CALM must be used to determine the interest PfAD. The interest PfAD should be equal to the difference between the reported liability and the base scenario liability.

(b) Determine the percentage increase in expected mortality as a result of this underwriting change.

Commentary on Question:
A fair number of candidates knew the equation to use, but much less candidates used the right values for each variable. Common mistakes were to use 300% or 500% for the additional mortality component, as well as not recognizing that the 'old' and 'new' mortality from the text had to be reversed. A number of students simply failed to invert the formula properly.

Q(current) = Q(revised) * (1 – A – B – C * (A + B)) / (1 – A – B)

where:
A = impairment frequency = 3% of applicants
B = sentinel frequency = 5% of applicants
C = additional mortality = 400%
Q(current) = existing better mortality with extra test
Q(revised) = expected higher mortality without expensive underwriting test

Q(revised) / Q(current) = (1 - 3% - 5%) / (1 - 3% - 5% - 400% * (3% + 5%)) = 153%

The expected mortality will increase by 53%.

13. Continued

(c) Evaluate the adequacy of ZYX's offer.

Commentary on Question:
Many candidates knew the purchase equation and how to calculate the C1 component of MCCSR. However, several candidates did not recognize that they had to also include the other components of MCCSR in the calculation to arrive at the right conclusion.

C1 component for ZYX Life = 0% * 1,000,000 + 1% * 3,000,000 + 4% * 2,000,000
= 110,000

Required capital other than C1 component = 400,000 - 110,000 = 290,000

Should select assets with lower capital requirements to minimize capital:
Government bonds = $1,000,000
Corporate A bonds = $3,000,000
Commercial mortgages = $1,000,000

C1 component for CBA Life = 0% * 1,000,000 + 1% * 3,000,000 + 4% * 1,000,000
= 70,000
Total required capital for CBA Life = 70,000 + 290,000 = 360,000

Minimum assets to transfer = Reserve + Required capital - Embedded Value
= 5,600,000 + 360,000 - 800,000
= 5,160,000

The $5,000,000 of assets proposed by ZYX Life is below the minimum to make the acquisition attractive to CBA Life, which is $5,160,000. The offer is not adequate.

14. 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, Health & Annuity Reinsurance, Third Edition, Chapters 4, 5 and 14
Discussion Paper on OSFI's Regulatory and Supervisory Approach to Reinsurance

Commentary on Question:

The question is trying to test the candidate's understanding of basic reinsurance concepts, the impact of reinsurance on a company's financials, and understanding of basic income statement and balance sheet items.
The cognitive levels expected for this question are retrieval, analysis, and comprehension.

Solution:

(a)

(i) Calculate the Gain from Operations for both ABC and XYZ for Year 1.

Commentary on Question:

To gain maximum points for this part, the candidate must show all work, including all formulas. If formulas are not shown and the answers are correct, then the candidate receives credits for implied formulas. However, if the answers are incorrect and no formulas are shown, no credits are given.

Most candidates do well on the main calculations. Where candidates make mistakes is the inclusion of policy fee in various calculations, and the treatment of expense allowance.

14. Continued

Gain from Operations	ABC Life	Formulas	XYZ Re
Revenue:			
Premiums:			
Gross	5,025	Premium + Policy Fee	4,000
Ceded	4,000	Premium x Coins %	0
Net	1,025	Gross - Ceded	4,000
Investment Income:			
Surplus	60	Inv Rate of Return x Initial Surplus	60
Reserves	0	Inv Rate of Return x YR0 Net Reserve	0
Total	60	Inv Inc on Surplus + Inv Inc on Res	60
Reinsurance Allowance	4,100	YR1 Expense Allowance % x YR1 Ceded Prem + Prem Tax Rate x YR1 Ceded Prem	0
Total Revenue	5,185	Net Prem + Total Inv Inc + Reinsurance Allowance	4,060
Benefits:			
Claims			
Gross	10,000	Death Benefits	8,000
Ceded	8,000	Death Benefits x Coins %	0
Net	2,000	Gross - Ceded	8,000
Surrenders	0		0
Reserve Increase:			
Gross	400	Mean Reserve - YR1	320
Ceded	320	80% x (Mean Reserve - YR1)	0
Net	80	Gross - Ceded	320
Total Benefits	2,080	Claims + Surrenders + Net Reserve Increase	8,320
Expenses:			
Commissions	4,774	YR1 Comm Rate x (Premium + Annual Pol Fee)	4,000
Acquisition	350		0
Maintenance	25		0
Premium Tax	126	Premium Tax Rate x (Premium + Annual Pol Fee)	100
Total Expenses	5,275	Commissions + Acquision + Maintenance + Premium Tax	4,100
Gain from Operation	-2,170	Total Revenue - Total Benefits - Total Expenses	-8,360

14. Continued

(ii) Determine the amount of surplus relief that ABC receives from this reinsurance agreement at the end of Year 1.

Surplus relief is the difference between ABC Life' Gains from Operation before and after reinsurance.

ABC Life's Gain from Operation before Reins = Gross Prem + Inv Inc - Gross Claims - Surrenders - Gross Increase in Reserve - Commissions - Maint Exp - Acq Exp - Prem Tax

= 5,025 + 60 - 10,000 - 0 - 400 - 4,774 - 25 - 350 - 126 = -10,590

Surplus relief = -2,170 - (-10,590) = 8,420

(b) Recommend an alternative form of reinsurance that would provide surplus relief, including its advantages and disadvantages.

Commentary on Question:
One alternative form with advantages and disadvantages would suffice. Most candidates choose Modified Coinsurance and an alternative form.

YRT
The use of YRT reinsurance helps reduce the C2 component of the RBC calculation.
There's an increase in required surplus due to reins risk, but it's small in comparison.
Advantages:
- Limit the reinsurer's investment & lapse risk.
- Lower cost since risks are limited to mortality or morbidity.

Disadvantages:
- Lower cost results in lower future profit, which means limited ceding commission for the ceding company.

Coinsurance
Typically, the initial reinsurance premium equals the reserve, and the ceding comp receives an allowance which is the initial gain.
RBC reduction also applies here.
Advantages:
- Simplest to administer.
- Cleanest form of reinsurance from a regulatory point of view.

14. Continued

Disadvantages:

- The need to transfer assets.
- Reinsurer has to manage the assets, which some find undesirable.
- If the reinsurere is not credited, the ceding comp may not be able to take reserve credit.
- Subject the ceding company to additional credit risk.

Mod-Co

Ceding company maintains the reserves and the assets supporting the reserves. Typically, the initial reinsurance premium equals the reserve, and the ceding comp receives an allowance which is the initial gain.

Advantages:

- Avoid liquidating and transferring of assets.
- Eliminate the reserve credit problem.
- Reinsurer may prefer not to manage assets.

Disadvantages:

- Complicated to administer.
- Transfer assets back to the reinsurer after termination can create capital loss for ceding comp.
- If the reinsurere has doubt about ceding comp's financial condition, it may prefer coinsurance.

Funds Withheld Coinsurance

In the initial transaction, the reins retains the allowance and the ceding comp retains the initial premium.

No cash change hands except risk charges.

Advantages:

- No cash change hands in the initial transaction and cash flow is minimized thereafter.
- Lessen ceding comp's insolvency risk if the reinsurer becomes insolvent.
- Ceding comp can take reserve credit (if the reinsurer is not credited) up to the amount it holds in the fund.

Disadvantages:

- Complicated to administer.
- Still some reserve credit problems if the funds withheld are with the unregistered reinsurer.

14. Continued

Funds Withheld Mod-Co

In the initial transaction, the reins retains the allowance and set up the accounts payable item.

The ceding comp sets up the accounts receivable for the same amount.

Advantages:

- Reins retains the allowance.

Disadvantages:

- Complicated to administer.
- May be viewed as a violation of the NAIC's Life & Health Reinsurance Agreements Model Regulation.

Part-Co

Initial coinsurance reserves set equal to initial reinsurance allowance.

Remaining reserves are reinsured on a mod-co basis.

Advantages:

- No cash transaction initially.
- Eliminate the need to create paper assets and liabilities.

Disadvantages:

- Complicated to understand and administer.
- It "looks and smells" like the old surplus relief deals that fail to transfer risks.

(c) Recommend an alternative arrangement, if necessary, to ensure ABC Casualty's compliance with the Insurance Company Act.

There's a 25% limit on risks ceded to unregistered reinsurers (for P&C companies).

There's a 75% fronting limit on P&C companies (can't cede out more than 75% of gross premium).

ABC Casualty should reduce the amount ceded out to the Bermuda comp from 30% to 25%.

ABC Casualty should reduce the amount ceded out to XYZ Re from 60% to 50%.

So the total ceded % is 75% (25% + 50%).

15. Learning Objectives:

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

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

Learning Outcomes:

(2a)

(i) Describe valuation methods
(ii) Recommend appropriate valuation assumptions.

(4c) Explain and create a product line "gains by source" analysis.

Sources:

ILA-C603-07: OSFI Guideline D-9: Sources of Earnings Disclosure - December 2004

CIA Educational Note: Margins for Adverse Deviations (Mfad) – November 2006

CIA Educational Note: Best Estimates Assumptions for Expenses – November 2006

CIA Educational Note: Expected Mortality: Fully Underwritten Canadian Individual Life Insurance Policies July 2002

Commentary on Question:

The question was intended to test the Candidate's knowledge of the guidelines around Mfads and their ability to construct a "gains by source" analysis from the income statement.
Candidates who did poorly tended to show the income components in a large formula without a breakout into the proper sources.

Solution:

(a) Desirable characteristics of gains by source analysis:

- Produced in a timely manner
- Well documented
- Validated to actual
- Easy to understand
- Reconciles to earnings without a material balancing item
- Consistent from period to period
- Consistent with the way the business is managed
- Comparable with those of other companies
- Can be used by management to understand makeup of earnings

15. Continued

(b) Experience gains and losses
Premium Margin: Actual Premium - Expected Premium =2000 - 1950 = 50
Interest Margin: Interest earned on reserves - required interest on reserves = 3000 - 2750 = 250
Claims Margin: Expected Claims - Actual Claims + Actual Reserve release - expected reserve release
= 480 - 400 +90 - 100 = 70
Surrender Margin: Expected Surrenders - Actual Surrenders + Actual Reserve Release - Expected
Reserve Release = 1300 - 1200 + 400 - 300 = 200
Expense Margin: Expected Renewal Expenses - Actual Renewal Expenses = 1200 - 1400 = -200
Other Items
Expected Profit: Release of PfADs = 255
New Business: - New Business Expense - Reserve on New Business = -1000 - (-800) = -200
Change in Methodology: -100
Assumption Changes: 200
Income on Surplus: Investment Income on Surplus - Debt Service Costs - Surplus Related Expenses
= 500 - 50 - 30 = 420
Total = 50 + 250 + 70 + 200 - 200 + 255 - 200 - 100 + 200 + 420 = 945

(c) Need to review mortality assumptions: will you have to use industry experience with new block?
Need to review expense assumptions in view of recent acquisition
Need to Review MfADs

- Mortality: In view of increased uncertainty and possible anti-selection
- Lapses: Due to increased uncertainty
- Expenses: Term converting to permanent will change the product makeup

16. 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:

(1e) Describe international accounting standards.

Sources:

CIA Educational Note: Classification of Contracts under IFRS
Classification of Contracts under International Financial Reporting Standards

Commentary on Question:

Question was trying to test the ability of student to properly identify and classify a contract under the new International Financial Reporting Standards.
Cognitive level of question was fairly straightforward and involved retrieval and comprehension.
Maximum points in part (a) required explanation rather than simply listing the points.
Maximum points for part (b) required being able to go through the points in part (a) and correctly explaining why a product would or would not fall into a particular class.
Candidates were able to list the headings of each section in part (a), which were worth the most points. Most candidates did not further explain the content within each section.
Part (b) was more hit or miss whether a candidate could analyze a product and classify it correctly. More candidates were able to correctly classify the first product (which was simpler) but the second and third products were less likely to have a correct answer.

Solution:

(a) Identify the general process for classifying contracts under IFRS.

Step 1: Obtain relevant information

- Information about reporting entities
- Characteristics of products and services
- Product design documentation
- Cash flow models

Step 2: Definition of a contract for classification purposes

- IFRS determines a contract based on the economic substance of an agreement between parties.
- Consider whether some parts of an agreement can receive separate accounting treatment.
  - Parts can be transferred or sold separately,
  - Parts are sold on a stand-alone basis.
  - Parts have different counterparties.
- Consider whether two or more legal agreements may be considered one contract for reporting purposes.
  - Is the intent of the reporting entities to create a combined effect.
  - Do they have fully negatively correlated cash flows.

16. Continued

Step 3: Classification as stand-alone service contracts

- It is a service contract if it does not create financial assets/liabilities and does not transfer insurance risk.
- It provides a service for a fee.
- IAS 18 applies if considered a stand-alone service contract.

Step 4: Classification as an insurance contract

- It is an insurance contract if it contains significant insurance risk.
- A contract must specify at least one insured event that could trigger a benefit based on a legal obligation.
- The benefit must be uncertain in its occurance, amount or timing.
- IFRS 4 applies.

Step 5: Classification as an investment contract

- If not insurance, determine if contract is a financial instrument (investment).
- Financial instrument creates financial liabilities, equity instruments, or financial assets.
- Within the scope of IAS 32 or IAS 39 except if it contains a Discretionary Participation Feature (DPF).

Step 6: Determine if investment contract has a DPF

- Insurance and investment contracts may contain DPFs.
- Two approaches allowed:
  - Recognition of DPF as a separate liability or component of equity.
  - Recognition of DPF together with guaranteed element (whole contract is classified as a liability).

Step 7: If IAS 39 is applicable, determine if contract contains a service component

- If yes, then acquisition and other expenses related to the service component and related earnings are accounted for under IAS 18.
- The rest of the contract is accounted for under IAS 39.

Step 8: Determine if contract contains an embedded derivative component

- If yes then determine if that component is measured at Fair Value or if it is closely related to the host contract.
- Some embedded derivatives are subject to specific disclosure requirements under IFRS 4.

16. Continued

Step 9: Determine if unbundling of a component is required or permitted

- If unbundled, the deposit component is accounted for under IAS 39 and the insurance component is accounted for under IFRS 4.
- Unbundling is permitted if the deposit component can be measured without considering any other component.
- Unbundling is required if two criteria are met:
  - Some rights and obligations of the deposit component would otherwise remain unrecognized.
  - The deposit component can be measured without regard to the insurance component.

(b) Recommend the appropriate IFRS classification for each of the following three product lines:

(i) Mutual Funds and Securities

(ii) Fixed Annuities with interest rate and annuitization guarantees

(iii) Variable Annuities with separate account options, general account options with interest rate guarantees, and options to elect minimum death and living benefit guarantees

(i) Mutual Funds and Securities

1. Definition of a contract – not clear but appears to be a single contract
2. The contract creates financial assets/liabilities – so it is a financial instrument
3. Not an insurance contract since it doesn't contain significant insurance risk
4. Classify as an investment contract since it creates financial liabilities without significant insurance risk
5. Does not have Discretionary Participation Features

(ii) Fixed Annuities with interest rate and annuitization guarantees

1. Contract definition – presumably a single contract which should not be separated because parts are not managed separately nor sold on a stand-alone basis
2. Contract creates financial assets/liabilities – so it is a financial instrument
3. Contract contains significant insurance risk so it is an insurance contract

16. Continued

i. Insured event is survivorship, risk is longevity of the policyholder (uncertainty of timing of death)
ii. IFRS 4 applies

4. Unlikely to contain embedded derivative component
5. Interest rate and annuitization guarantees cannot be unbundled because they cannot form a stand-alone contract

(iii) Variable Annuities with separate account options, general account options with interest rate guarantees, and options to elect minimum death and living benefit guarantees.

1. May wish to separate the contract for insurance purposes
   i. General account and separate account options will likely be managed separately, so recommend to separate these
   ii. Guaranteed minimum death and living benefit guarantees can be purchased with separate fees so these should be separated
2. Contract creates financial assets/liabilities – so it is a financial instrument
3. Consider following items separately to determine insurance risk:
   i. VA with separate account – no significant insurance risk
   ii. VA with general account and interest rate guarantees – no significant insurance risk
   iii. Minimum death guarantees – does have insurance risk (timing of death relative to market performance)
   iv. Minimum living benefit guarantees – does have insurance risk (survivorship relative to market performance)
   v. IFRS 4 applies to (iii) and (iv)
4. Items (i) and (ii) are investment contracts
5. Contract does contain DPF – items (iii) and (iv)
   i. Two approaches: (1) can recognize the DPF as a separate liability or separate component of equity; or (2) recognize the DPF together with the guaranteed element so the whole contract is classified as a liability
   ii. IAS 32 and 39 apply to items (i) and (ii)
6. Not clear if the contract contains an embedded derivative component

16. Continued

7. Determine if unbundling of the contract is required or permitted
   i. May be able to unbundle items (iii) and (iv) since they contain specific identifiable features and can form stand-alone contracts
   ii. If unbundled then the deposit components (i) and (ii) are accounted for under IAS 39, and the insurance components (iii) and (iv) are covered under IFRS 4
   iii. Unbundling is permitted since deposit components can be measured without considering any other component
   iv. Unbundling is not required since there are no rights or obligations of the deposit components which would otherwise remain unrecognized