ILA LFVC Model Solutions
Spring 2015

1.

Learning Objectives:

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

Learning Outcomes:

(2c) Calculate liabilities for life and annuity products and their associated riders.

Sources:

CIA Educational Note: Margins for Adverse Deviations (MfAD)

Final Communication of a Promulgation of Prescribed Mortality Improvement Rates Referenced in the Standards of Practice for the Valuation of Insurance Contract Liabilities: Life and Health (Accident and Sickness) Insurance

Commentary on Question:

This question tests the candidate's knowledge of Canadian valuation principles through a simple liability calculation. Most candidates were able to gain partial credit for their intermediate calculations or application of the required methodology.

Solution:

(a) Calculate the mortality provision for adverse deviation (PfAD) for a new policy issued at age 40, using a 5% annual interest rate as an approximation in the determination of the CALM reserve. Show your work and justify all assumptions used.

Commentary on Question:

Most candidates did not provide sufficient justification for their choice of mortality assumption, both in setting the Future Mortality Improvements and the required MfAD. However, most earned partial credit for their intermediate reserve calculations and choice of assumptions.

Reserve = PV(Benefits) – PV(Premium)
$$= DB_t * [q_{40}/(1+i) + p_{40} q_{41}/(1+i)^2 + p_{40} p_{41} q_{42}/(1+i)^3] + Pr*[p_{40} p_{41} p_{42} / (1+i)^3] - Pr$$

$DB_t = 250{,}000$
$Pr = 10{,}000$
$i = 5\%$

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1.   **Continued**

Best Estimate Reserve:

Future Mortality Improvements:
- Recognize 100% of prescribed FMI in best estimate valuation
- Age 40: 2.00%
- Age 41: 1.95%
- Age 42: 1.90%

$$q_x^{FINAL} = q_x^{BASE} * (1 - FMI_{x,t})^{t-1}$$

Age	t	q_x^{BASE}	$FMI_{x,t}$	q_x^{FINAL}
40	1	.005	2.00%	.0050
41	2	.006	1.95%	.0059
42	3	.007	1.90%	.0067

Best Estimate Reserve = 12,444 – 10,000 = **2,444**

Reserve Including PfAD:

Future Mortality Improvements:
- Recognize 50% of prescribed FMI in padded valuation

Mortality Margin for Adverse Deviation:
- The low and high margins for adverse deviations for the mortality rate per 1,000 are respectively an addition of 3.75 and 15, each divided by the best estimate curtate expectation of life at the life insured's projected attained age
- The margin for adverse deviations would be at least the average of the applicable high and low margin whenever at least one 'significant consideration' exists, or at least one other consideration is significant in the context of the valuation.
- *XYZ Life is new to the term life market and does not have credible mortality experience for this product*
  - There is a new benefit which could lead to a change in experience
  - the credibility of the company's experience is too low to be the primary source of data
  - future experience is difficult to estimate
  - Could lead to error of estimation of the mortality assumption

1. Continued

As the company has no experience in the market, no credible experience, no previous data, there is a significant risk of misestimating the mortality assumptions. As multiple "significant considerations" exist, a mortality MfAD of **15/e$_x$ per thousand** is recommended.

$q_x^{PAD} = q_x^{BASE} * (1 - 0.5 * FMI_{x,t})^{t-1} + MfAD_x / e_x$

Age	t	e$_x$	q$_x$^{BASE}	FMI$_{x,t}$	q$_x$^{PAD}
40	1	20	.005	2.00%	.0058
41	2	15	.006	1.95%	.0069
42	3	10	.007	1.90%	.0084

Padded Reserve = 13,176 – 10,000 = **3,176**

Mortality PfAD

= Padded Reserve – Best Estimate Reserve

=3,176 – 2,444 = **732**

(b) State the guidelines for selecting mortality improvement assumptions if the business is sold outside of Canada.

Commentary on Question:
Candidates either knew the requirement and got most points, or received no credit for providing a response not directly answering the question.

The actuary would select appropriate mortality improvement rates that are inclusive of margin. These improvement rates would produce a total liability that is at least as large as what would be produced using the prescribed rates used in Canada, unless experience indicates otherwise.

2. **Learning Objectives:**
2.   The candidate will be able to understand and apply valuation principles of individual life insurance and annuity products issued by Canadian life insurance companies.

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:
(2b)   Recommend appropriate valuation assumptions.

(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 form a regulatory perspective

Sources:
LFV-634-14 : CIA Standards of Practice: Practice-Specific Standards for Insurers (Section 2100, 2300, 2500) (January 1, 2014)

LFV-606-13: OSFI: Guideline Minimum Continuing Capital and Surplus Requirements for Life Insurance Companies 1-5, 8-9 (2014)

Commentary on Question:
This question tested the candidate's understanding of factors affecting valuation assumptions and their ability to evaluate appropriate valuation assumptions. It also tested their understanding of valuation principles and the calculation of MCCSR.

Solution:
(a)   Assess the appropriateness of using the existing 10-year renewable term product's valuation assumptions for setting each of the following valuation assumptions for IMC:

      (i)   Mortality

      (ii)   Lapse

      (iii)   Expense

      Commentary on Question:
      Most candidates identified that different valuation assumptions should be used. To receive full credit, candidates also needed to explain why the existing assumptions may not be valid.

2. **Continued**

        (i)   Not appropriate to use existing mortality assumptions
            a. Absent of underwriting, assumption depends on the life insured's age, sex, duration since issue of policy, and the size of benefits.

        (ii)   Not appropriate to use existing lapse assumptions
            a. Lapse assumption depend on the life insured's attained age, duration since issue of the policy, method of payment and frequency of premiums and policy size.
            b. Policies with healthy life insureds may be more likely to lapse due to premium increase when they move to the next 5-year age band.

        (iii)   Not appropriate to use all existing expense assumptions
            a. Lower underwriting expenses and commissions
            b. On-going administrative expenses are similar

(b)   Explain how each investment strategy will affect:

        (i)   CALM reserves

        (ii)   MCCSR

Commentary on Question:
Most candidates were able to identify the impact on CALM reserves and the MCCSR C1 component. Fewer candidates identified the additional impacts to Lapse and C3 components.

        (i)   The amount of insurance contract liabilities using the CALM is equal to the amount of supporting assets under the worst scenario at the balance sheet date.
            a. All else being the same, in CALM testing, liability cash flows will be the same regardless of investment strategy. However, since the government bond portfolio generates lower return than corporate bonds, the CALM liability will be higher under strategy 1 compared to strategy 2.

        (ii)   The MCCSR calculation for IMC includes different components (C1 risk, Mortality risk, Lapse risk and C3 risk)
            a. C1 risk: Asset default risk covers losses resulting from asset defaults. Gov't bond has capital factor of 0%, whereas Corporate Bond has a higher capital factor. Strategy 1 will have a lower C1 capital than strategy 2.

2. **Continued**

      b. Mortality risk: The same regardless of investment strategy.

      c. Lapse risk: As the reserves would be different under different investment strategy, the reserve impact due to lapse shock will be different.

      d. C3 risk: To compute the changes in interest rate environment component, factors are applied to policy liability amounts. Factors apply is the same regardless of investment strategy but the policy liability amounts are different, thus C3 is higher under strategy 1 as the policy liability is higher.

3. **Learning Objectives:**
3. The candidate will be able to understand and analyze the implications of emerging financial and valuation standards.

Learning Outcomes:
(3a) Describe emerging developments impacting Canadian valuation and International Financial Reporting frameworks, and assess their impact on the valuation of reserves and financial statements.

Sources:
IASB Staff Paper, Effect of Board Deliberations on the 2013 Exposure Draft Insurance Contracts (April 2014)

Practical Guide to IFRS, PwC (July 2013)

Commentary on Question:
This question tested the candidates' knowledge of emerging developments with IFRS 4 Phase II and assesses their impact on financial statements. Candidates were expected to evaluate each statement below and either confirm or reject validity, while providing support from the stated sources.

Solution:
Critique the following statements made by the actuary for JJB Life, a Canadian insurance company, with respect to the IFRS 4 Phase II exposure draft on insurance contracts:

A. *"IFRS may have an impact on the reporting for our SuperUL Universal Life product that has a segregated fund investment option guaranteeing 95% return of deposits on death."*

B. *"The profitability of our SuperTerm, a term life insurance product, won't be affected. New SuperTerm sales will continue to add to our bottom line at issue. For instance, take a hypothetical SuperTerm policy with a present value of cash inflow of 20,000, a present value of cash outflow of 12,000 and a total margin for uncertainty of 5,000. This policy will produce a 3,000 gain at issue since there is a liability at initial recognition of -3,000. This will allow the SuperTerm business to continue to offset the loss at issue from our disability income business."*

C. *"There are similarities to CALM. The discount rate for both CALM and IFRS used to discount the fulfillment cash flows should reflect the characteristics of the supporting assets, and we should be adding risk margins to reflect uncertainties in cash flows."*

D. *"We should consider the following when estimating the cash flows from our in-force insurance contracts:*

3. **Continued**

- *Investment returns on underlying items*
- *Directly attributable acquisition costs*
- *Premium taxes*
- *Reinsurance premiums, but not reinsurance benefits."*

E.   *"Updates for current estimates and for current market rates will flow through our financial reporting in the same way."*

F.   *"Disclosure requirements have not changed. The focus remains on the amounts recognized in the financial statements, and the nature and extent of the risks."*

A.   Solution: this statement is correct.
      A rider or option must be reported separately or unbundled from the host contract under IFRS if both of the following apply:
      (i) The economic characteristics and risks of the Embedded Derivative (ED) are not closely related to those of the host contract;
      (ii) The separate financial instrument with the same terms as the ED would meet the definition of a derivative under IFRS 9
      Based on the definition of IFRS 9, the guarantees 95% return of deposits on death is an embedded derivative and the separate account investment option is not closely related to the host contract. IFRS will require this option be reported separately and the remaining components be treated as an insurance contract.

B.   Solution: this statement is incorrect.
      There will not be any gain at issue for this hypothetical SuperTerm policy since IFRS does not allow front-ending of profit. A Contractual Services Margin (CSM) should be included in the measurement of liability and offset the initial gain, which represents the unearned profit of the contract. The CSM will be amortized into earnings over the coverage period.
      - PV fulfilment cashflows = PV of cash outflow - PV of cash inflow + risk adjustment
      - PV fulfilment cashflows = 12,000-20,000+5,000 = -3,000
      - Contractual service margin = max (0, - PV fulfilment cashflows)
      - Contractual service margin = 3,000
      - Liability at initial recognition = PV of fulfilment cashflows + contractual service margin = 0
      Businesses may be managed together if the provided coverages are similar. The contractual service margin and the onerous contract test are calculated at the portfolio level, not policy level. Therefore the SuperTerm cannot be combined with disability income business.
      The service margin cannot be negative, so the loss of the DI business results at issue must be immediately recognized in earnings.

3.   Continued

C.   Solution: this statement is mostly incorrect.
The discount rate used under IFRS Phase II is not similar to the ones used in CALM. The discount rate should be consistent with observable current market prices for similar instruments, in terms of timing, currency and liquidity and exclude the effect of any factors not present in the cash flows of the insurance contract.
A risk adjustment should be included in the measurement of contract liability.
It is correct to say that the uncertainty about the amount and timing of the cash flows should be included in the measurement of contract liability

D.   Investment returns on underlying items should not be included. The investments are recognized, measured and presented separately.
It is correct that directly attributable acquisition costs should be included.
Is is correct to include premium taxes to the extent they are chargeable to the policyholder.
All reinsurance cash flows (payments or receipts) are recognized, measured and presented separately.

E.   Solution: this statement is incorrect.
The updates for current estimates flow through to the income statement, while the updates for current market rates flow through to Other Comprehensive income (OCI).

F.   Solution: this statement is incorrect.
Disclosure requirements are more detailed than currently required and may result in additional system and data requirements.
Will need to disclose significant judgements.
Entities will have to disclose the appropriate level of information to meet the requirements.

4.

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 MCCSR/RBC regulatory framework and the principles underlying the determination of Regulatory RBC.

(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 form a regulatory perspective

(5c)   Explain and apply the concepts, approaches and method for determining Economic Capital
      (i)   Identification of the significant risk components
      (ii)   Selecting calculation methods appropriate to stakeholder's perspectives
      (iii)   Describing how a company would implement an Economic Capital Program

Sources:
Economic Capital for Life Insurance Companies, SOA Research paper, Ch. 1, 3, 4, 5, 6

LFV-628-10: Framework for a New Standard Approach to Setting Capital Requirements

LFV-121-08: Economic Capital Modeling: Practical Considerations (same as ILA-C121-08)

Commentary on Question:
This question tested the candidates' knowledge on the new standard approach to setting capital requirement, including the rationale in replacing the current capital requirements, the advantages and disadvantages of the new requirement, and how the new capital approach requirements compare to the existing requirements.

Candidates generally did not demonstrate adequate knowledge of the material.

Solution:
(a)   Explain why Canada is introducing a new standard approach to setting capital requirements to replace Minimum Continuing Capital and Surplus Requirement (MCCSR) and Test of Adequacy of Assets in Canada and Margin Requirements (TAAM).

4. **Continued**

Commentary on Question:
Candidates generally commented on a few of the reasons for introducing new capital requirements. Candidates that did well on this part provided a more comprehensive list of reasons.

The introduction of a new standard approach is due to the following reasons:
1) Incorporate advances in actuarial and economic capital theory;
2) Move to a more modern capital definition in terms of time horizon, risk measure and security level;
3) Be better prepared for more complex and globalized products;
4) Be better align with impending accounting changes (IFRS);
5) Adequately account for risk concentration/diversification;
6) Account for operational risk explicitly;
7) Align with Basel II for credit risk;
8) Capital for credit risk will align with Basel II and other relevant to minimize competitive differences within Canada;
9) Reduce international regulatory arbitrage available due to different capital regimes.

(b) Compare the pros and cons of the new Canadian capital requirement framework with respect to its choice of:

    (i)   Time horizon

    (ii)   Risk measure

    (iii)   Target security level

Commentary on Question:
Candidates who did well on this part provided a comprehensive list of advantages and disadvantages for each of the items.

    (i)   Time Horizon

        Pros:
        1) More common for stress-test approaches than stochastic modelling;
        2) Aligned with banking industry and North American insurers;
        3) Being linked to the market reveals true volatility and helps in assessing risk management options in adverse scenarios;
        4) Explicit assumption that limited management actions are taken during the risk horizon. Such actions would typically be limited to a degree of asset trading or liability trading via reinsurance if aligned with current defined practices;

4. **Continued**

    5) The terminal provision ensures the business can be sold off or closed out at the end of the one year period. This drives the use of the marked to market balance sheet;

    6) Aligned with Solvency II, Australian required capital, Swiss Solvency Test, S&P new RBC insurance capital, UK ICA capital requirements, and/or Fitch Prism Economic Capital.

Cons:

    1) Sensitive to market conditions and prices;

    2) The sensitivity to the market may have undue influence on capital for long term liabilities;

    3) Risk management of long-term risks is not examined directly. Lack of available data to calibrate a distribution of market consistent price for non-hedgeable liabilities such as mortality / morbidity may be regarded as a potential weakness;

    4) Exclude long-term management actions from the calculation;

    5) Use deterministic adverse scenario analysis for long term risk, which is reliant on management's scenario selection (vs stochastic scenario generation process);

    6) Not comparable to U.S. timeframe which is liability run-off.

    (ii)   Risk Measure (CTE)

Pros:

    1) CTE is the prescribed in the U.S. for C-3 capital so it would be comparable;

    2) CTE is a coherent risk measure that allows aggregation across Business Units and risks;

    3) Aligned with the Swiss Solvency Test;

    4) Deal with low-frequency high-severity events better than VaR;

    5) CTE captures the magnitude of loss. Important for regulator because it measures loss to Policyholders and damage to industry/regulator.

Cons:

    1) CTE is more computationally demanding to calculate than VaR;

    2) CTE is harder to calibrate than VaR due to relative lack of data;

    3) Other measures, such as VaR, are relatively simple to understand and use;

    4) CTE requires knowledge of the shape of the risk and loss distributions in the extreme tail of the distribution, which can be difficult to justify;

    5) Not aligned with solvency II (uses VaR) or UK ICA VaR measure.

4. Continued

    (iii)   Target Security Level (CTE99):

Pros:
1) Easier to calibrate to a target security level under a one-year approach due to the significant body of statistics on corporate bond defaults;
2) Aligned with the Swiss Solvency Test which also uses CTE99.

Cons:
1) The choice of security level is difficult to explain using corporate bond default data and accounting measures of insolvency;
2) The security level set by the framework would have been set judgmentally (with guidance from regulators);
3) Not comparable to U.S. target security levels (which are CTE90 and CTE95), Solvency II (99.5% of VaR), UK ICA security level (99.5%), Australian target level (99.5% of VaR).

(c)

    (i)   Identify the areas where ABC's economic capital may be lower, similar or higher than the new Canadian capital requirement.

    (ii)   Identify the areas where the relationship between ABC's economic capital and the new Canadian capital requirement is unknown as that particular aspect is still under consideration in the new Canadian framework.

Commentary on Question:
Candidates who did well on this part identified all areas when capital could be lower, similar or higher.

    (i)   **EC > new Canadian standard approach:**
1) EC has a higher target security level (99.5% > 99%). However, the terminal provision requirement may put the security level higher than 99%.
2) EC may incorporate more risks than the Canadian approach as it attempts to include all exposures.

EC = new Canadian standard approach:
1) Both use one-year mark to market approach;
2) Both use CTE;
3) Both permit negative cumulative surplus during the time horizon.

EC < new Canadian standard approach:
1) EC allows for diversification of risks while it is uncertain if the Canadian approach will allow.

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4. **Continued**

      (ii)   **<u>Unknown Relationship:</u>**
1) Calibration of the security level will be different;
2) Different approaches to calculating the risks;
3) Unknown how much Canadian approach will recognize risk diversification/concentration;
4) 1 year of future new business increases both return and capital required.

5. **Learning Objectives:**
4. The candidate will be able to explain and apply the 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. This includes explaining and applying the methods and principles of embedded value.

Sources:
Embedded Value: Practice and Theory, SOA, Actuarial Practice Forum, March 2009

LFV-106-07: Mergers and Acquisitions, Chapter 4 (Sections 4.1-4.6)

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a) Describe how you would determine the discount rate for each of the following:

   (i) Actuarial Appraisal Value

   (ii) Embedded Value

   Commentary on Question:
   The question makes it clear in part (a) that we are looking for ways to determine the discount rate, not asking the candidate to compare and contrast differences between AAV and EV.

   Actuarial Appraisal Value (AAV)
   - For an appraisal, one would usually show results for a range of interest rates
   - You would most likely used the Capital Asset Pricing Model (CAPM); the weighted average cost of capital (WACC) should be used as the discount rate.
   - Other factors may influence the discount rate, such as: internal company targets (current hurdle rates and long-term targets), cost of funds for transactions, or M&A marketplace discount rates (rates may reflect supply and demand, types of business sold, etc).

   Embedded Value (EV)
   - While cost of equity capital is most often used, there are methods for determining cost of debt and so in some cases WACC may be used.
   - For Market-Consistent Embedded Value, which has evolved more recently, the risk discount rate and investment returns are both considered to be equal to the risk-free rate.

5. Continued

(b) Recommend using either Embedded Value or Actuarial Appraisal Value for each of the following circumstances:

(i) Your company wants to determine the value of a company that it is acquiring.

(ii) Your company is valuing some stocks and other assets that it is selling.

(iii) Your company wants to distinguish movements from economic earnings in values.

(iv) You want to determine the value of a company as a "going concern."

Justify your recommendation.

Commentary on Question:
Giving an answer of EV or AAV without any further explanation was not sufficient. Even if the candidate's reasoning was not right in line with the full credit answers, they could still receive partial credit for an answer if they included facts that were pertinent and true.

(i) Actuarial Appraisal Value
- Want to use Actuarial appraisal value as it reflects the value of new business sold whereas EV would not. The ability to sell new business is part of the enterprises value and should be included in the sale price.
- Appraisals commonly use a range of reasonable discount rates; this range of values could be used in negotiating a selling price.
- The appraisal can be used as a basis for ongoing performance measurement after the acquisition.
- AAV uses market based assumptions

(ii) Either method could be used
- EV is a measurement of the value that shareholders own in an insurance enterprise; companies routinely use EV to justify their stock prices.
- EV would use the company's own expense assumptions and own cost of capital in the discount rate; the company would likely use their own company-related assumptions to value their stock.
- However, it may be difficult to directly place a value on the company's stock and assets when selling it; the value is highly subjective and dependent on the assumptions used. For this reason, an actuarial appraisal may be used.

5. **Continued**

       (iii)   Embedded Value
- EV is a financial measurement that is used to measure the value of business at any point in time and to measure the financial performance of business over time.
- EV rollforward of the value of the company from one period to the next would give the detailed movements in earnings that is being sought.

       (iv)   Actuarial Appraisal Value
- If a company is a "going concern", you are assuming its business will continue. An actuarial appraisal would be appropriate to value this business because it includes the value of future new business in its calculation.

(c)   Calculate the Embedded Value and Actuarial Appraisal Value. Show all work.

Commentary on Question:
Most did well on computing the adjusted net worth and value of inforce business but didn't get full credit because AAV and EV were not computed correctly. Many candidates left the TVFOG (time value of Future Options and Guarantees) out of the solution. Some attempted to integrate that component and used the wrong formula. Finally, just knowing that the difference between AAV and EV (given that no assumption differences were cited between the two methods) is the value of new business got many candidates partial credit.

Adjusted net worth = required capital + free surplus = 100 + 150 = 250

Value of inforce business = PV of After-tax Statutory Book Profits - PV of Cost of Capital = 2000 − 500 = 1500

TVFOG = Mean of PV of DE for stochastic scenarios - PV of DE for single deterministic scenarios = 1300 − 900 = 400

EV = ANW + VIF + TVFOG = 250 + 1500 + 400 = 2150

AV = EV + VNB = 2150 + 300 = 2450

6. **Learning Objectives:**

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

Learning Outcomes:

(6b) Explain the consequences and calculate the effect on both ceding and assuming companies with respect to:
   (i) Risk transfer
   (ii) Cash flow
   (iii) Financial statements
   (iv) Reserve credit requirements
   (v) Tax

Sources:

Reinsurance: Chapter 4 Basic Methods of Reinsurance

Report of the CIA Task Force on the Appropriate Treatment of Reinsurance, Oct 2007

LFV-632-12: OSFI B-3 Sound Reinsurance Practices and Procedures

Commentary on Question:

This question tested the candidates' knowledge of effective reinsurance practices and general reserving principles for reinsurance treaties. It also tested their understanding of how reinsurance ceded amounts and cash flows are calculated.

Solution:

(a) Describe how DEF Life would comply with OSFI B-3 Guidelines in selecting a reinsurer.

   Commentary on Question:
   Most candidates identified that DEF Life must perform due diligence on the reinsurer. However, candidates who received full credit identified several specific examples of items that should be considered.

   - ABC Life should perform sufficient due diligence on the reinsurer to ensure that it is aware of its counterparty risk and is able to assess and manage such risk.
   - ABC life should evaluate the ability of the reinsurer to meet its liabilities under exceptional but plausible adverse events on an ongoing basis.
   - The level of due diligence should be commensurate with its level of exposure to that reinsurer, and should not be any less thorough if the reinsurer is a related party of ABC Life.
   - ABC Life should conduct its own due diligence and not rely solely on third parties like rating agencies.

6. Continued

- When performing due diligence, give considerations to the reinsurer's:
  - Claims payment record
  - Expected future claims obligations
  - Balance sheet strength
  - Funding sources
  - Management
  - Retrocession agreements

(b) DEF Life decides to enter into a modified coinsurance (mod-co) contract with XYZ Re, a Canadian reinsurer, on the Critical Illness product. The treaty specifies a mod-co interest rate of 4% for all durations. DEF Life's reserve factors would be used to calculate the increase in reserves for the mod-co reserve adjustment.

(i) Define mirror reserving.

(ii) Explain why it is inappropriate for XYZ Re to use mirroring to set its reserves.

Commentary on Question:
Candidates did well defining mirror reserving. To receive full credit candidates were required to fully explain why mirror reserving is inconsistent with IFRS valuation.

(i) Mirror reserving: when the ceded reinsurance liabilities determined by the cedant are exactly equal to the assumed reinsurance liabilities determined by the reinsurer for the same contract.

(ii) Mirroring is inconsistent with IFRS principle-based accounting and valuation.
  a. Each actuary is responsible for setting assumptions based on his or her own best estimate assumptions
  b. The assumptions should be based on each company's experience and the actuary's view of future experience
  c. XYZ Re would use risk pooling for mortality, morbidity, and lapse experience, while ABC's observed experience is influenced by underwriting, sales, and product characteristics.

(c) Calculate the expected cash flow at the end of year t to DEF Life due to the mod-co reserve adjustment.

6. Continued

Commentary on Question:
Few candidates received full credit for the calculations. Common mistakes include:
a) *Not applying the first dollar retention amount or maximum retention limits when calculating retained and ceded face amounts*
b) *Not applying the lapse and mortality decrements when calculating end of year reserve*
c) *Not including interest when calculating the expected modco reserve adjustment*
d) *Not dividing face amount by 1000 when applying reserve factors*

Amount Retained:
Policy 1 = min(50,000+(250,000-50,000)*(1-60%), 150,000) = 130,000
Policy 2 = min(50,000+(350,000-50,000)*(1-60%), 150,000) =150,000
Policy 3 = 45,000 b/c it is less than the first dollar retention level

Reinsured Amount: (= face amount less amount retained)
Policy 1 = 250,000 - 130,000 = 120,000
Policy 2 = 350,000 - 150,000 = 200,000
Policy 3 = 0

BOY ceded reserve: (reinsured amount * Vt / 1000)
Policy 1 = 120,000 * 20 / 1000 = 2400
Policy 2 = 200,000 * 33 / 1000 = 6600

EOY expected ceded reserve: (reinsured amt * (1 - qx) * (1 - wx) * Vt+1 / 1000)
Policy 1 = 120,000 * (1-0.005) * (1-0.025) * 22 / 1000 = 2561.13
Policy 2 = 200,000 * (1-0.003) * (1-0.020) * 35 / 1000 = 6839.42

Interest
Policy 1 = 4% * 2400 = 96
Policy 2 = 4% * 6600 = 264

Expected modco reserve adjustment: = ending rsv - beginning rsv – interest
Policy 1 = 2561.13 - 2400 - 96 = 65.13
Policy 2 = 6839.42 - 6600 - 264 = -24.58
Total = 40.55

Expected adjustment is $40.55 from XYZ Re to ABC Life since positive

7. **Learning Objectives:**
7.   The candidate will understand the professional standards addressing financial reporting and valuation

Learning Outcomes:
(7a)   Explain the role and responsibilities of the appointed/valuation actuary.

Sources:
OSFI Guideline E15: Appointed Actuary – Legal Requirements, Qualifications and External Review (September 2012)

Commentary on Question:
This question tested the candidates' knowledge of OSFI's expectations with respect to the peer review of the Appointed Actuary's work and reports.

Solution:
(a)
(i)   Identify which of these characteristics are not suitable for a peer reviewer.

(ii)   Recommend remedies to allow this candidate to peer review the Appointed Actuary's work.

Commentary on Question:
Candidates generally showed a good understanding of the requirements of a peer reviewer and were able to identify the remedies required to address the deficiencies. However, only a few candidates demonstrated a complete understanding to order to receive full credit.

(i)
- Of the three years of Canadian experience, the peer reviewer is required to perform valuation of Canadian actuarial liabilities of an insurance company for at least one year. The candidate only has 6 months of valuation experience.
- The candidate has only worked at one insurance company. He does not have sufficient experience. The reviewer's prior experience should include exposure to two or more insurance companies.
- The candidate is a shareholder of KLM Life.

(ii)
- The candidate would need to gain 6 more months of valuation experience before qualifying as a peer reviewer.

7. Continued

- The candidate would need to work at least one other insurance company to be familiar with the range of practices and assumptions used by the actuaries in Canada.
- The candidate would need to divest his KLM shares prior to taking on the role of peer reviewer.

(b)   Describe the work the peer reviewer is expected to perform.

Commentary on Question:
Candidates generally did fair on this question. Candidates were generally able to describe some of the work the peer reviewer expected to perform. Candidates who received full marks provided a more complete description of the work a peer reviewer.

- Ascertain that Appointed Actuary (AA)'s work for the valuation of policy liabilities and ceded reinsurance assets is within accepted actuarial practice.
- Review the appropriateness and extent of internal and external material changes affecting the valuation of policy liabilities and ceded reinsurance assets.
- Review the adequacy of procedures, systems and the work of others relied on by the AA, to the extent that these are not reviewed by the external auditor.
- Discuss with the AA the appropriateness of each of the assumptions used and the methods employed in the valuation of actuarial policy liabilities.
- Determine whether the Appointed Actuary's Report sufficiently describes the valuation assumptions and methodology employed by the AA.
- Review AA's work for MCCSR/TAAM to ensure consistent with report accompanying filings.
- Review and discuss with the AA the methodology, assumptions and scenarios used for future financial condition reporting, usually based on DCAT.
- Produce a written report(s) documenting the findings of the peer review.

(c)   KLM Life wishes to use the peer reviewer's work in place of an external audit. Critique this decision.

Commentary on Question:
Most candidates were able to conclude that the decision is not appropriate. However, very few candidates provided valid reasons why the peer reviewer's work could not replace the work of an external audit.

7.   Continued

- It is not appropriate to use the peer review report in place of an audit report.
- The objective of an external audit is to obtain reasonable assurance that financial statements are free from material errors.
- The peer review is not required to perform detailed recalculations and is not required to verify data or controls.
- The objective of the peer review is to express opinion on appropriateness of liabilities at a more granular level.

8. **Learning Objectives:**
1.   The candidate will understand financial statements and reports of Canada life insurance companies and be able to analyze the data in them.

Learning Outcomes:
(1c)   Describe how to compute the taxable income of a life insurance company.

Sources:
Future Income and Alternative Taxes, CIA Educational Note,

Canadian Insurance Taxation, Borgmann et. Al., 3rd Edition, Ch. 1-11, 26, 27. Note: Chapters 1, 2, 7-10, and 26 are for background reading only.

Commentary on Question:
This question tested the candidate's understanding of Canadian Taxation concepts.

Solution:
(a)   Calculate the investment income tax. Show all work.

Commentary on Question:
Most candidates were able to earn partial credit for their calculation of IIT but most incorrectly calculated the Experience Rating Reserve Refund.

Life Investment Income

= Profit Factor * Bond Yield * Average Life Reserves for Taxable Life Insurance Policies

= 55% * 2.0% * 6,000,000 = 66,000

Experience Rating Reserve Refund

= Average Interest Rate of Cdn Govt. Bonds * Average Experience Rating Refund Reserve – Reduction for Changes in Experience Rating Refund Reserve

= 2.0% * 300,000 – 1,000 = 5,000

Life Investment Income	66,000
Experience Rating Reserve Refund	5,000
Amount Reported to Policyholders	(15,000)
Sum: Canadian Life Investment Income	**56,000**
Canadian Life Investment Loss Carry forward	(2,000)
Sum: Taxable Canadian Life Investment Income	**54,000**
IIT = Taxable Canadian Life Investment Income * 15%	0.15
IIT	**8**

8. **Continued**

(b)   Calculate the Future Tax Carve-Out using the Discounting Approach for 2016 year-end. Show all work.

Commentary on Question:
Most candidates struggled on this question, failing to understand the components of the FTCO calculation and not recognizing any difference between Tax and GAAP Income.

The discounting approach is an approximation to CALM, where the DFTP is calculated by discounting the future tax cash flows back to the valuation date at the after-tax GAAP earned rate on the additional assets supporting the future tax cash flows

ICLIFT – Insurance Contract Liability Ignoring Future Taxes
DFTP – Discounted Future Tax Provision
FTCO – Future Tax Carve-Out
T_x = Tax Rate = 30%
Pre-Tax Discount Rate = 5%
Post-Tax Discount Rate = 5% * (1-30%) = 3.5%

1) Calculate the ICLIFT. This is equal to the PV of the liability cashflows and reflects the GAAP assets

$ICLIFT_{2014} = 150/1.05 + 200/1.05^2 + 350/1.05^3 + 500/1.05^4 = 1,038$
$ICLIFT_{2015} = 200/1.05 + 350/1.05^2 + 500/1.05^3 = 940$
$ICLIFT_{2016} = 350/1.05 + 500/1.05^2 = 787$
$ICLIFT_{2017} = 500/1.05 = 476$

2) Calculate the change in the ICLIFT. This is equal to the GAAP Income

GAAP Income$_{2015}$ = ICLIFT$_{2015}$ - ICLIFT$_{2014}$ = 940 – 1,038 = (98)
GAAP Income$_{2016}$ = ICLIFT$_{2016}$ - ICLIFT$_{2015}$ = 787 – 940 = (153)
GAAP Income$_{2017}$ = ICLIFT$_{2017}$ - ICLIFT$_{2016}$ = 476 – 787 = (311)
GAAP Income$_{2018}$ = ICLIFT$_{2018}$ - ICLIFT$_{2017}$ = 0 – 476 = (476)

3) Calculate the change in the MTAR (Tax Reserve = Tax assets). This is equal to your taxable income.

Taxable Income$_{2015}$ = MTAR$_{2015}$ - MTAR$_{2014}$ = 850 – 900 = (50)
Taxable Income$_{2016}$ = MTAR$_{2016}$ - MTAR$_{2015}$ = 720 – 850 = (130)
Taxable Income$_{2017}$ = MTAR$_{2017}$ - MTAR$_{2016}$ = 450 – 720 = (270)
Taxable Income$_{2018}$ = MTAR$_{2018}$ - MTAR$_{2017}$ = 0 – 450 = (450)

8. **Continued**

4) Calculate the Temporary Differences. This is equal to the difference between the Taxable and GAAP Income

$TD_{2015} = Tax\ Inc_{2015} - GAAP\ Inc_{2014} = (50) - (98) = 48$
$TD_{2016} = Tax\ Inc_{2016} - GAAP\ Inc_{2015} = (130) - (153) = 23$
$TD_{2017} = Tax\ Inc_{2017} - GAAP\ Inc_{2016} = (270) - (311) = 41$
$TD_{2018} = Tax\ Inc_{2018} - GAAP\ Inc_{2017} = (450) - (476) = 26$

5) Calculate the Future Tax Cashflows. This is equal to the Temporary Difference multiplied by the tax rate.

$FTCF_{2015} = TD_{2015} * 30\% = 48 * 30\% = 14.4$
$FTCF_{2016} = TD_{2016} * 30\% = 23 * 30\% = 6.9$
$FTCF_{2017} = TD_{2017} * 30\% = 41 * 30\% = 12.3$
$FTCF_{2018} = TD_{2018} * 30\% = 26 * 30\% = 7.8$

6) Calculate the DFTP. This is equal to the present value of the future tax cashflows discounted at the post-tax rate.

$DFTP_{2014} = 14.4/1.035 + 6.9/1.035^2 + 12.3/1.035^3 + 7.8/1.035^4 = 38.2$
$DFTP_{2015} = 6.9/1.035 + 12.3/1.035^2 + 7.8/1.035^3 = 15.2$
$DFTP_{2016} = 12.3/1.035 + 7.8/1.035^2 = 19.2$
$DFTP_{2017} = 7.8/1.035 = 7.5$

7) Calculate the FTCO. This is equal to:

$FTCO_t = T_x * [MTAR_t - (ICLIFT_t + DFTP_t) + (GAAP\_A_t - Tax\_A_t)] / (1 - T_x)$

$FTCO_{2014} = 30\% * [900 - (1,038 + 38.2) + (1,038 - 900)] / (1 - 30\%) = (16.4)$
$FTCO_{2015} = 30\% * [850 - (940 + 25.2) + (940 - 850)] / (1 - 30\%) = (10.8)$
$FTCO_{2016} = 30\% * [720 - (787 + 19.2) + (787 - 720)] / (1 - 30\%) = (8.2)$
$FTCO_{2017} = 30\% * [450 - (476 + 7.5) + (476 - 450)] / (1 - 30\%) = (3.2)$

8. Continued

Year	2014	2015	2016	2017	2018
Liability CF		150	200	350	500
MTAR	900	850	720	450	0

ICLIFT	1,038	940	787	476	-
GAAP Income	-	(98)	(153)	(311)	(476)
Taxable Income	-	(50)	(130)	(270)	(450)
Temporary Differences		48	23	41	26
Future Tax Cashflow		14.4	6.9	12.3	7.8
DFTP	38.2	25.2	19.2	7.5	-
FTCO	(16.4)	(10.8)	**(8.2)**	(3.2)	

The Future Tax Carve-Out for 2016 is = (8.2)

9. **Learning Objectives:**
2. The candidate will be able to understand and apply valuation principles of individual life insurance and annuity products issued by Canadian life insurance companies.

Learning Outcomes:
(2c) Calculate liabilities for life and annuity products and their associated riders.

Sources:
CIA Educational Note: Margins for Adverse Deviations (MfAD)

Final Communication of a Promulgation of Prescribed Mortality Improvement Rates Referenced in the Standards of Practice for the Valuation of Insurance Contract Liabilities: Life and Health (Accident and Sickness) Insurance

CIA Educational Note, Currency Risk in the Valuation of Policy Liabilities for Life & Hlth Insurers, Dec 2009

Commentary on Question:
This question tested the candidate's understanding of Canadian Valuation methodology and liability calculation. Most candidates performed very well on this question, receiving full points or partial credit for their calculations.

Solution:
Calculate the PfAD (in CAD) that a Canadian insurer should hold for the currency risk. Show all work.

$F = S * ((1+i_a) / (1+i_b))^m$ where:

F = Forward Exchange Rate
S = Spot Exchange Rate
i_a, i_b = risk-free interest rates for the respective currencies
m = maturity in years for the forward exchange rate
$\sigma = 0.115$

S = 1.4
$i_a = 2.1\%$
$i_b = 0.9\%$
m = 10

9. **Continued**

Base Scenario

$F_{BASE} = 1.4 * ((1.021) / (1.009))^{10}$
$F_{BASE} = 1.5757$

Value of liability at t=10 in EUR = $100,000/F_{BASE}$ = 63,464
Value of liability at t=0 in EUR = $63,464/(1.009)^{10}$ = 58,025
Value of liability at t=0 in CAD = 58,025 * 1.4 = **81,235**

Adverse Scenario

Exchange rate at t=10 = F_{ADV} = S * (1- σ) = 1.4 * (1-.0115) = 1.239

Value of liability at t=10 in EUR = $100,000/F_{ADV}$ = 80,710
Value of liability at t=0 in EUR = $80,710/(1.009)^{10}$ = 73,793
Value of liability at t=0 in CAD = 73,793 * 1.4 = **103,311**

Minimum Scenario

Exchange rate at t=10 = F_{MIN} = F_{BASE} * 0.95 = 1.5

Value of liability at t=10 in EUR = $100,000/F_{MIN}$ = 66,804
Value of liability at t=0 in EUR = $66,804/(1.009)^{10}$ = 61,079
Value of liability at t=0 in CAD = 61,079 * 1.4 = **85,510**

PfAD

PfAD = Max (Adverse Liability, Minimum Liability) − Base Liability
PfAD = Max (103,311 , 85,510) − 81,235
PfAD = 103,311 − 81,235 = **22,076**

10.

Learning Objectives:

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

Learning Outcomes:

(2a) Describe valuation methods.

(2b) Recommend appropriate valuation assumptions.

Sources:

Report of the Task Force on Segregated Fund Liability and Capital Methodologies (Aug 2010)

CIA Educational Note: Considerations in Valuation of Segregated Fund Products, Nov 2007

Commentary on Question:

For this question, there was a great emphasis on candidates to evaluate validity of assumptions and methods with respect to segregated fund valuation. Overall candidate performance was mixed, with the calculation portion providing the most difficulty.

Solution:

(a) With reference to the CIA Educational Note: Considerations in Valuation of Segregated Fund Products:

(i) Compare the two approaches that can be used to value additional benefits associated with policies for which an Allowance for Acquisition Expense (AAE) is being amortized.

(ii) Assess the appropriateness of each of the following Conditional Tail Expectation (CTE) levels for the purpose of testing the recoverability of the AAE:

- CTE(0)
- CTE(70)
- CTE(95)

Commentary on Question:

This part of question is intended to test candidates' knowledge on SFG valuation and the appropriate CTE levels to be applied for recoverability test. Most candidates performed well on this section.

10. Continued

(i)
- Two approaches: Whole contract approach and Bifurcated approach
- Total liability under WCA will be less than or equal to BA
- WCA will defer writing down acquisition costs because acquisition costs have priority on all revenue
- Liability will be more volatile under WCA once guarantee liability turns positive
- BA more appropriate if hedging program in place

(ii)
- Acceptable range for liabilities is CTE(60)-CTE(80)
- CTE(0) does not include MfAD, so is inappropriate
- CTE(70) is consistent with acceptable range
- CTE(95) is more appropriate for solvency purposes

(b)   Calculate the aggregate liability at time zero using the CIA recommended approach assuming a discount rate of 4%. Show all work.

Commentary on Question:
This part of question is intended to test candidates' analytical skills on SFG policies calculation. Candidates' performance is mixed in this section. Common errors included the following:
- *Not considering both term =2 and term=1*
- *Discounting fees with extra year's interest*
- *Discounting claims with extra year's interest*
- *Incorporating liability without floor as given in table*

Term =2

PV(claims) at time 0	= 2,000/1.04 + 0	= 1,923
PV(fees income) at time 0	= 500 + 300 + 300/1.04	= 1,088
Liability w/o floor at time 0	= 1,923 − 1,088	= 835

Term = 1

PV(claims) at time 0	= 2,000/1.04 + 0	= 1,923
PV(fees income) at time 0	= 500 + 300	= 800
Liability w/o floor at time 0	= 1,923 − 800	= 1,123
Liability at time zero	= max(835, 1,123)	=1,123

10. Continued

(c)   Assess the validity of the above as per the recommendations in the Report of the Task Force on Segregated Fund Liability and Capital Methodologies.

Commentary on Question:
This part of question is intended to test candidates' skills to evaluate the validity of assumptions and methods with respect to segregated fund valuation. Most candidates performed well on this section.

The current valuation methodology does not fully follow current valuation standard of practice

- Should include risk neutral scenarios in order to calculate "greeks" to rebalance hedge portfolio
- CTE(85) is beyond the allowed range of CTE(60)-CTE(80)
- Actuarial assumptions should include MfAD
- No company specific allowed: stochastic models required to satisfy CIA criterion

11.

Learning Objectives:

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

4. The candidate will be able to explain and apply the methods, approaches and tools of financial management and 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:

(4a) Describe and calculate performance measures.

(4b) Perform financial analysis by product line or total company.

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

(4d) Apply methods of valuation to business and asset acquisitions and sales. This includes explaining and applying the methods and principles of embedded value.

(4e) Explain and apply methods and approaches of surplus management and earnings management.

(4f) Describe and apply the principles of how insurance companies create value from a financial economics perspective.

Sources:

LFV-128-13: Life Insurance Products and Finance, Chapter 16 page 888

CIA Educational Note: Margins for Adverse Deviations (Mfad) – November 2006 page 17

LFV-634-14 : CIA Standards of Practice: Practice-Specific Standards for Insurers (Section 2100, 2300, 2500) (January 1, 2014) page 2047

LFV-606-13: OSFI: Guideline Minimum Continuing Capital and Surplus Requirements for Life Insurance Companies 1-5, 8-9 (2014) pages 1, 77, 91

11. Continued

Commentary on Question:
In general, candidate performance was mixed. Candidates were expected to consider why OBI and WAN would arrive at different values for the proposed transaction and what would cause such differences to appear. As well, candidates were expected to make a recommendation to accept or reject the deal and support it with relevant calculations.

Candidate strengths
- *Recognizing effect of different assumptions in valuation, especially mortality*
- *Stating WAN may have more credible mortality experience*
- *Commenting on WAN A/L mismatch and/or investment policy having effect on C-3 component*
- *Calculating embedded value of distributable earnings*

Candidate weaknesses
- *Implying hurdle rate will directly affect reserve calculation*
- *Ignoring effect of differing MfADs on valuation*
- *Not setting out general formulae for C-2 and C-3 as base for examining possible differences between OBI and WAN*
- *Not commenting on use of reinsurance to lower C-2 and C-3*
- *Confusing indemnity reinsurance with assumption reinsurance*
- *Adding required capital to embedded value, instead of deducting for calculation of maximum purchase value*
- *Making recommendation to proceed on basis of embedded value alone, implied surplus, etc. or incomplete calculation*

Solution:
(a)   Explain why OBI Financial and WAN Life have calculated different values for the Canadian GAAP reserves.

- Company experience
    - WAN using aggregate mortality, which may be better than experience for the block
    - OBI using experience based on data provided for block
- Underlying assumptions
    - Each company will set different assumptions for mortality, lapse, interest, expenses
    - WAN may have more credible experience and use lower mortality rates
- MfAD
    - WAN may use lower MfAD due to higher credibility of mortality data
    - OBI may use higher MfAD due to lower credibility of mortality data

11. Continued

(b) Explain why WAN Life may need to hold more required capital than OBI Financial for C2 and C3 risks.

Capital
- Since WAN is larger than OBI, absolute levels of C-2 and C-3 will be larger
- Factors determined at corporate level, not at block level, so must be approximated for pricing purposes
- WAN may not make as much use of registered reinsurance, which would help reduce both C-2 and C-3

C-2
- C-2 component = factor * net amount at risk
- Since WAN has lower reserves, its net amount at risk will be higher

C-3
- C-3 component = factor * reserves
- Since OBI holds higher reserves, OBI will have higher C-3 for the ART block
- Asset cash flow uncertainty risk: WAN may be using riskier assets or have larger asset/liability mismatch than OBI

(c) Recommend whether these companies should proceed with an assumption reinsurance transaction. Justify your answer.

Maximum purchase value = EV(0) – Taxes(0) – Transaction costs(0) – Required capital(0)
EV(0) = PV(distributable earnings at given hurdle rate)

	OBI's perspective		
Policy Year	distributable earnings	pv factor at 15%	PV
1	0.50	1.15	0.43
2	0.80	1.32	0.60
3	1.25	1.52	0.82
4	2.00	1.75	1.14
		EV (OBI)	3.01
	WAN's perspective		
	distributable earnings	pv factor at 10%	PV
1	0.80	1.10	0.73
2	0.90	1.21	0.74
3	1.00	1.33	0.75
4	1.00	1.46	0.68
		EV (WAN)	2.91

11. Continued

OBI EV(0) = 3.01
WAN EV(0) = 2.91

Substitute Required Capital = Assets(0) – Liabilities(0) into maximum purchase value

WAN purchase value = 2.91 – 0 – 0 - (8 – 6)   = 0.91
OBI purchase value = 3.01 – 0 – 0 – (14 – 10)   = (0.99)

Recommendation
- Transaction would be profitable for WAN, but not for OBI
- Assessments are too far apart, so transaction should not proceed

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 MCCSR/RBC regulatory framework and the principles underlying the determination of Regulatory RBC.

(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 form a regulatory perspective

Sources:
OSFI Guideline – Minimum Continuing Capital and Surplus Requirements (MCCSR) for Life Insurance Companies (January 1, 2014)

Valuation of Liabilities, Lombardi, 4th Edition, Ch. 16 (excl. 16.6)

LFV-636-13 : OSFI Guideline A-4 internal target capital ratio for ins companies

Commentary on Question:
This question tested the candidates' understanding of the RBC and MCCSR capital frameworks and the computation of various capital components.

Solution:
(a) Critique the following methodology used for calculating the required capital under each regime:

    Commentary on Question:
    Most candidates were able to identify some of the incorrect approaches. The elements most commonly missed were the size adjustment for RBC asset default risk, the proper calculation of interest rate risk for MCCSR, and the usage of the low risk category for RBC interest rate risk.

    Asset Default Risk:
    1. MCCSR: Correct approach for bonds. 0% factor should be used for cash.
    2. RBC: Need to add size adjustment to bond factors.

12. Continued

Insurance Risk:
1. MCCSR:
    a. Mortality Risk: Incorrect approach. Mortality risk is the sum of the components for volatility and catastrophe risk.
    b. Lapse Risk: Incorrect approach. Lapse risk capital is calculated by taking the difference in policy liabilities at different lapse mfads, calculated by either increasing or decreasing the lapse assumption for each policy at each duration, depending on which adjustment produces a higher reserve.
2. RBC: Correct approach

Interest Rate Risk:
1. MCCSR: Incorrect approach. The factor is based on guaranteed period remaining on premium rates/credited interest and is applied to policy liability amounts.
2. RBC: The factor for low risk category should be used for whole life policy liabilities, but it is correct to apply it to policy liability amounts.

Business Risk:
1. MCCSR: Incorrect approach. There is no explicit business risk component under MCCSR. It is included in the minimum ratio of 120% set for life insurers.
2. RBC: Correct approach.

(b)   The calculated RBC ratio and MCCSR ratio are both close to 110%. Stellar Life reported its RBC ratio to its U.S. regulator and its MCCSR ratio to OSFI. Describe the supervisory action which would be taken in each jurisdiction.

Commentary on Question:
All candidates identified that the ratios were low and would draw regulatory attention. To receive full marks, candidates needed to reference where the ratio falls relative to supervisory targets or minimums, and what actions the regulator would take.

MCCSR: This falls below both OSFI's minimum MCCSR/TAAM ratio of 120% and OSFI's supervisory level of 150%.

OSFI would be very concerned about the ongoing viability of the insurer. The intensity and nature of supervisory intervention would depend on the circumstances of the particular insurer.

RBC: The company would be under the Regulatory Action level with an RBC ratio of 110%. Regulatory Action level is from 100% to 150%.

12.   Continued

The life insurance company must submit an RBC plan, or, if applicable, a revised RBC plan to the commissioner. After examination or analysis, the commissioner will issue an order specifying corrective actions to take.