ILA LFVC Model Solutions
Fall 2013

1. 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:

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

(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:

Life Insurance Products and Finance, Chapter 16 Financial Management, Strategic Management of Life Insurance Company Surplus

Commentary on Question:

The question is testing knowledge of basic analysis of a line of business (profit center) in the overall context of a total company. Whether a profit center is creating or destroying value or generating or consuming free cash flow are basic building blocks of a company's operation.

Solution:

(a)

(i) Determine whether each profit center creates or destroys embedded/economic value. Show all work.

(ii) Determine whether each profit center generates or consumes free cash flow. Show all work.

(iii) Rank the profit centers in the order of capital allocation to maximize the company's performance. Justify your answer.

Commentary on Question:

Candidates performed relatively well on (i). The main issues on (ii) related to not realizing the provided beginning and ending equity amounts were for a 5-year period (rather than one year), therefore an adjustment in the formula is necessary.

1. Continued

A few candidates did not realize free cash flow is a comparison of the ROE ("supply" of earnings each year) to the Equity Growth ("demand" for earnings each year). The answers for (iii) reflected the level of understanding in (i) and (ii) and sometimes did not include a qualitative discussion of the various profit centers and how to manage them for optimal company performance. Some candidates also did not realize there is a clear order of best to worst profit centers.

(i)

If ROE > Cost of Capital then profit center is creating value.
If ROE < Cost of Capital then profit center is destroying value.
ROEs were provided for each profit center A-D.
Cost of Capital = Risk Discount Rate = 12%.
A: 15% > 12%, A is creating value.
B: 13% > 12%, B is creating value.
C: 8% < 12%, C is destroying value.
D: 9% < 12%, D is destroying value.

(ii)

If ROE > Equity Growth then profit center is generating free cash flow.
If ROE < Equity Growth then profit center is consuming free cash flow.
Equity amounts were provided for a 5-year period for each profit center.
Equity Growth = (Ending Equity / Beginning Equity) ^ (1/5) – 1.
A: Equity Growth = (4,300 / 1,000) ^ 0.2 – 1 = 33.9%.
A: 15% < 33.9%, A is consuming free cash flow.
B: Equity Growth = (2,500 / 2,000) ^ 0.2 – 1 = 4.6%.
B: 13% > 4.6%, B is generating free cash flow.
C: Equity Growth = (3,000 / 2,000) ^ 0.2 – 1 = 8.5%.
C: 8% < 8.5%, C is consuming free cash flow.
D: Equity Growth = (800 / 1,000) ^ 0.2 – 1 = -4.4%.
D: 9% > -4.4%, D is generating free cash flow.

(iii)

Most attractive profit center creates value AND generates free cash flow.
Least attractive profit center destroys value AND consumes free cash flow.

A: Creates value, consumes free cash flow. A is the future growth of the company as long as ROE can be maintained and there is enough free cash flow in the company to support the profit center.

B: Creates value, generates free cash flow. B is the most attractive profit center. Recommend taking steps to increase profit center B to enhance company performance.

1. Continued

C: Destroys value, consumes free cash flow. C is the least attractive profit center. Recommend finding ways to increase profitability and decrease growth.

D: Destroys value, generates free cash flow. Recommend finding ways to increase profitability OR decrease growth.

Profit Center	Value	Free Cash Flow
A	Creates	Consumes
B	Creates	Generates
C	Destroys	Consumes
D	Destroys	Generates

Profit center order from best to worst: B, A, D, C

(b)

(i) Explain whether Profit Center E creates or destroys embedded/economic value. Show all work.

(ii) Explain whether Profit Center E generates or consumes free cash flow. Show all work.

(iii) Determine the maximum allowable 2012 overhead expenses to maintain the company's embedded/economic value when Profit Center E is added. Show all work.

Commentary on Question:
Candidates generally could fill out the provided table of values. When an incomplete table is provided it is always to facilitate easy answering. Candidates performed better on (i) than on (ii) and (iii). Some candidates didn't realize an NPV calculation was not necessary for (ii). The adjustment to the overhead expenses in (iii) was the most difficult.

(i)

Year	**2012**	**2013**	**2014**	**2015**	**2016**
Overhead Expenses	-1,446	0	0	0	0
Profits from 2012 Sales	-2,000	1,400	1,400	0	0
Profits from 2013 Sales	0	-6,000	4,200	4,200	0
Annual Profit	-3,446	-4,600	5,600	4,200	0

All these values from multiplying profits per unit sold by expected sales by year in terms of units.

1. Continued

NPV = Present Value of annual profits discounted at 12% Cost of Capital
NPV = -88.73 {= (-3,446)/(1.12)^1 + (-4,600)/(1.12)^2 + (5,600)/(1.12)^3 + (4,200)/(1.12)^4+ (0)/(1.12)^5 }
NPV < 0, therefore ROE < 12%, therefore proposed profit center destroys value.

(ii)

Equity Growth = 0%.
Sum {Annual Profits} > 0 therefore ROE > 0%.
ROE > Equity Growth, propose profit center generates free cash flow.

(iii)

Overhead expenses must be reduced by NPV * (1+CoC).
Expense reduction = -88.73 * (1.12) = -99
Overhead expenses must be 1,347 instead of 1,446.

2. 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.

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

Sources:

Strategic Management of Life Insurance Company Surplus, TSA XXXVIII (pages 105 - 116)

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

Life Insurance Products & Finance, Chapter 16

Commentary on Question:

Commentary listed underneath question component.

Solution:

(a)

(i) Calculate the after-tax U.S. GAAP return on equity (ROE).

(ii) Explain why the U.S. GAAP ROE may not correspond to the internal rate of return used in pricing.

Commentary on Question:

Part (a) is designed to test knowledge of GAAP earnings and was well answered by most candidates. Some candidates were unable to come up with the proper reasons GAAP ROE does not equal IRR.

GAAP ROE = GAAP Earnings/GAAP Surplus
GAAP Surplus = Statutory Surplus +Statutory Reserve – GAAP reserve
+Unamortized GAAP Deferred Acquisition Cost
= 190 + 100 – 97 + 7 = 200
Then GAAP ROE = 22/200 = 11%

GAAP ROE may not equal IRR because:

- Some acquisition costs may not be deferrable
- Differences in investment earnings rates and cost of capital
- Margins for adverse deviation

2. Continued

(b) Describe the components and uses of an actuarial appraisal.

Commentary on Question:
Part (b) was intended to test the candidate's knowledge of how the value of a company might be established along with alternative uses of an appraisal. Candidates did not do as well on this part as the calculation parts. Many did not identify the uses of an appraisal or missed the idea of the components.

An actuarial appraisal establishes the value of a company as the adjusted book value plus the value of in force business plus the value of future business where

- Adjusted book value is statutory assets less statutory liabilities
- Value of in force is the present value of future earnings less an adjustment for cost of capital for business already on the books
- Value of new business is the present value of earnings adjusted for cost of capital for business that is intended to be sold (usually limited to a certain number of years of new business)

An actuarial appraisal is often used to:

- Establish the purchase price of a company or block of business during a merger or acquisition
- Test sensitivities to various risks
- Allocate capital in the most efficient manner
- Monitor business and performance management

(c) Calculate the embedded value for DEF as of the acquisition date assuming ABC will establish the same solvency reserves as DEF. Show all work.

Commentary on Question:
Part (c) was answered well by many candidates. Some candidates lost points for errors in the Tax formula and a few dropped marks by not identifying the parts of an equation before plugging in numbers.

Purchase Value = Solvency Reserves – Assets
= 1950 – 1860 = 90

Tax = (Solvency Reserve – Tax Reserve – Purchase Value – Transaction Costs)*tax rate
= (1950 – 1775 – 90 – 4)*.3 = 81*.3 = 24.3

Embedded Value = Purchase Value + Taxes + Required Capital + Transaction Costs
= 90 + 24.3 + 165 + 4 = 283.3

3. 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 describe the concept and roles of Economic Capital including:
- (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 (Society of Actuaries)

Commentary on Question:

Commentary listed underneath question component.

Solution:

(a) List and define the key aspects of Economic Capital.

Commentary on Question:

Although most candidates were able to list the key aspects, many did not provide sufficient definitions or details to demonstrate knowledge of the subject. For instance, many candidates identified VAR/CTE as risk measures but didn't detail the difference.

Economic Capital is a company specific measure of risk over a defined time period at a certain level of security.

- Time Horizon
  - Liability Runoff Approach
    - Project asset/liability cashflows and balance sheets for 1000+ real world stochastic scenarios to determine asset level to satisfy all obligations through the end of the projection period
  - One Year Marked-to-Market Approach
    - Assets and Liabilities are projected forward one year for a number of scenarios (10000+) to generate an economic balance sheet at the end of the period
- Measure of Risk
  - Value at Risk (VaR)
    - Measure of the probability of ruin
  - Conditional Tail Expectation (CTE)
    - Measure of the cost of ruin or the extent of loss

3. Continued

- Level of Security/Risk Tolerance
  - e.g. 95%, 99%, 99.5%
  - Designed to provide a easily and meaningfully communicated level of protection
- Other key aspects of economic capital include the fact that it is company specific, allowing management to make better decisions on business units, and that it can reflect diversification/correlations when aggregating capital.

(b) Outline considerations for successfully implementing an Economic Capital framework as it pertains to the company's primary risks.

Commentary on Question:
*In general, this was a poorly answered question by candidates. The question addresses implementing an EC framework "**as it pertains to the company's three primary risks**". Most candidates provided high level lists of EC implementation concerns, but few Candidates addressed these risks specifically and/or how those three risks affect the implementation on an EC framework.*

- Common Elements:
  - All 3 risks could be modeled either stochastically or deterministically
  - Both mortality and morbidity include: catastrophe, volatility, miss-estimation or parameter risk, and trend risk
- Equity risk
  - Size of risk depends on asset liability matching, expected return and level of volatility
  - Data availability: Where availability of market data is limited, assumptions and higher confidence levels may be needed
- Mortality risk: Catastrophe data is limited
- Morbidity risk: The nature of risk and impact of various risk factors is highly dependent on the specific type of product sold

(c) Outline the appropriateness of each approach from both a total company and business unit perspective.

Commentary on Question:
This question was answered well by a small sample of candidates. Common mistakes in answering this question include (1) not providing any rationale on the appropriateness of the recommended method at the product level (2) not addressing the approaches at a company level. Alternative solutions were acceptable as long as the candidate provided well thought out reasoning.

3. Continued

Investment Product with Equity Guarantees: CTE99 One-year Stochastic

- The higher confidence level is appropriate for the one-year approach
- The CTE measure is appropriate to reflect the loss distribution in the extreme tail of the distribution
- Stochastic models make sense with products with guarantees, which are scenario dependent and subject to market assumptions.

Life Insurance: VaR98 Lifetime Deterministic

- In general lower confidence levels are appropriate for the lifetime approach. VaR98 is acceptable.
- The lifetime approach is appropriate for long duration contracts

Disability Insurance: CTE95 Lifetime Stochastic

- The lower confidence level is appropriate for the lifetime approach
- CTE takes into account the shape of the risk distribution

Total Company

- VaR is more easily understood
- CTE is a more coherent risk measure, leading to more consistent results when aggregating capital across different business units.
- Using a consistent time horizon would allow for more consistent aggregation of risks and would support calculations measuring diversification benefits

(d)

(i) Calculate the allocated post-diversified EC for each business using both allocation methods.

(ii) Using these results, provide a recommendation that takes into account the factors to consider in developing an EC Program.

Commentary on Question:

(i) Candidates were generally able to get full credit for the pro rata methodology, while the marginal methodology was not as well done.

(ii) Most candidates were able to provide a thought out recommendation. Alternative solutions were accepted as long as the candidate provided well thought out reasoning.

(i)

Pro-rata calculation

Total pre-diversified EC = 950+800+575=2325
Investment Products Allocated Post-Diversified EC
= (950/2325)*1700 = 695
Insurance Products Allocated Post-Diversified EC
= (800/2325)*1700 = 585

3. Continued

Disability Products Allocated Post-Diversified EC
= (575/2325)*1700 = 420

Marginal Contribution calculation
Investment Products Marginal Contribution = 1700-1280=420
Insurance Products Marginal Contribution = 1700-1140=560
Disability Products Marginal Contribution = 1700-1240=460
Total of All Product Lines' Marginal Contribution = 420+560+460=1440

Investment Products Allocated Post-Diversified EC
=(420/1440)*1700 = 496
Insurance Products Allocated Post-Diversified EC
=(560/1440)*1700 = 661
Disability Products Allocated Post-Diversified EC
=(460/1440)*1700 = 543

(ii)

Pro-rata approach recommendation

- Proportionate to stand-alone risk levels
- Aligns with risk management at the business unit level

(OR Alternative Recommendation)
Marginal Contribution allocation recommendation

- Reflects the lower correlation that exists between the equity and insurance risks

4. 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:

LFV-635-13: OSFI Guideline E-16: Participating Account Management and Disclosure to Participating Policyholders and adjustable Policyholders (Pages 13-17)

Commentary on Question:

Commentary listed underneath question component.

Solution:

(a) Explain the structure and rules for handling these accounts as per the OSFI guidelines.

Commentary on Question:

The goal was to test the candidate's knowledge of how to manage participating policies following demutualization. Many candidates were able to identify that these accounts should be separated and setup as a Closed block. Candidates that did well identified that the liabilities set aside for the demutualization should be determined by using best estimate assumptions and that the profit from PfAD releases are accrued to shareholders.

According to OSFI's Guideline E-16, the structure and rules for demutualization include the following features:

- Upon demutualization all inforce participating policies are placed into a distinct sub account called a closed block;
- The closed blocks should be separated for each country of operation (if the parent operates internationally);
- Closed block policy liabilities are based on the best estimate assumptions of future experience at the time of demutualization;
- The best estimate assumptions should include policyholders' reasonable expectations of future dividends payments;
- Upon demutualization, assets are earmarked to the closed block such that their future earnings are sufficient to cover the best estimate future liabilities;
- Subsequent changes in experience of the closed block should be passed to the policyholders through the dividend rate calculation;
- PfADs are held in a separate ancillary sub-account;
- As the PfADs are released, the profits accrue to the shareholders and not the policyholders;

4. Continued

- Small sub-segments of policies can be included in these ancillary sub-accounts (i.e. riders, policies with no or fixed dividends);
- New participating policies issued after demutualization should be in an open participating account;
- Comingling of assets backing the closed blocks and the open par account is permitted for practical reasons if separate asset blocks for open par accounts are not warranted.

(b) Describe the mechanism and regulatory requirements for how the company will deal with gains and losses in these accounts after demutalization.

Commentary on Question:
Some candidates described the Dividend Stabilization Reserve (DSR) and that it must be managed so that it does not get too large or too small. Most students did not describe the rest of the regulatory requirements such as the maximum size limit.

Closed block accumulated gains and losses are tracked in what OSFI calls a Dividend Stabilization Reserve (DSR). The DSR is treated as an additional policy liability. The newly demutualized company should manage the closed block so that any material excess or deficit is avoided in the DSR and that these excesses/deficits are distributed over time to policyholders through changes in the dividend scale.

OSFI expects the company to avoid the creation of a tontine. This can happen by allowing the DSR to grow for an extended period. To prevent this, each company should have a policy with respect to the maximum size of the DSR for each closed par account. As a rule, at least the amounts in excess of this limit should be distributed to policyholders through their dividends.

OSFI expects the company to retain an independent actuary to opine on the distribution of dividends at least every 5 years to ensure distribution is fair and orderly. The independent actuary should also opine on whether the maximum size limit on the DSR is appropriate and fair to avoid the creation of a tontine. OSFI requires the first review to be completed as of the first financial year-end after January 1, 2012.

These mechanisms and regulatory requirements apply to all closed blocks from demutualization, even if transferred from subsidiaries.

(c) Outline the requirements of the annual report which must be sent to OSFI on these accounts on a going forward basis.

4. Continued

Commentary on Question:
Most candidates were not aware of the annual report requirements on these accounts.

The annual report sent to OSFI for each closed block must, at a minimum, contain the following disclosures:

Summary of operating rules, including:

- Description of investment income, expense and tax allocation;
- Comparison of current best estimate valuation assumptions and dividend assumptions to past year experience on investment income, expenses, mortality and other key assumptions.;
- Financial analysis of the experience in the past year;
- Material changes in practice with respect to managing risks within the closed block;
- Assets and liability amounts;
- The Appointed Actuary's dividend recommendations and a discussion of the factors that led to material changes in these recommendations;
- Statement of change in the prior year's "Excess" of the closed participation account;
- Maximum negative and positive target DSR and a comparison to the actual DSR at year end;
- PfAD released from associated ancillary sub-accounts to the shareholders
- Analysis of the corresponding PfADs in the associated ancillary sub-account;
- 5-year projections of future gains, losses and DSR accumulations if emerging experience is according to the Appointed Actuary's current best-estimate valuation assumptions.

Professional opinion stating:

- That the closed block is being maintained in accordance with the commitments made at demutualization;
- Assets backing liabilities are sufficient and asset mix is appropriate;
- DSR being managed such that policyholder's reasonable expectations are met and that a tontine is avoided;
- Allocation of investment income, expenses and taxes is fair and is consistent with the operating rules;
- Policyholder communication is accurate and complete;
- All closed participating blocks are included in the report.

5. 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.

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.

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

Learning Outcomes:

(2a) Describe valuation methods.

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

(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:

CIA Educational Note: Valuation of Gross Policy Liabilities and Reinsurance Recoverables, December 2010

Classification of Contracts under IFRS

Conversion to International Financial Reporting Standards (IFRSs) by Federally Regulated Entities (FREs)

ILA-C127-11: July 2010 Exposure Draft – Insurance Contracts, IASB

Commentary on Question:

This question tested the candidates' ability to apply their knowledge of IFRS 4 and its application to reinsurance, annuities with investment component, and business acquisitions.

Solution:

(a) List the considerations under IFRS 4, according to Committee on Life Insurance Financial Reporting (CLIFR), pertaining to the statement of gross liabilities and reinsurance recoverables.

Commentary on Question:

This part of the question tested the candidates' knowledge of the impact of IFRS 4 on financial statements with respect to reinsurance. Generally, candidates were able to identify some of the considerations to earn partial but not full credit for the question.

5. Continued

- IFRS 4 states that an insurer shall not offset reinsurance recoverables against the related gross liabilities.
- Allocation of net liability into gross liability and reinsurance recoverable would be based on underlying cash flows together with a reasonable assumption about the nature of the related assets. One approach is to take the gross cash flows and discount with net CALM vector.

- Under IFRS reinsurance contracts, like the direct written contracts, are to be classified into one of 3 categories: insurance contracts, financial instruments, or service contracts
- IFRS 4 does not address margins in the reinsurance recoverable, and does not prohibit their inclusion
- Using margins in the net liability only and not in the reinsurance recoverable may be in conflict with IFRS 4. Using margins on both produces a measurement that is consistent whether reinsurance has been purchased or not.

- Items where a simple "gross up" of the amount reflected in the net liability may be appropriate include *[Commentary: only need to provide one of the following items]*
  - IBNRs
  - impact of change in fair value of assets backing policy liabilities applied during roll forward of net CALM liability
  - some manual or bulk liabilities, depending on the purpose
  - permanent tax differences related to assets as these would be related to the asset yield.

- Consider the financial condition of the reinsurer in reinsurance recoverable.
- Include an extra provision related to recoverability in the net liability but not the gross liability.

(b)

(i) Determine the appropriate gross liability and reinsurance recoverable values, assuming the reinsurance contracts have been deemed to be insurance contracts according to IFRS 4.

(ii) One of the reinsurers has become impaired and an extra provision for this impairment of 500 has been calculated. Determine the new gross liability and reinsurance recoverable values.

5. Continued

Commentary on Question:
This part of the question tested the candidates' ability to apply their knowledge of the impact of IFRS 4 with respect to the calculation of reinsurance recoverables. It was necessary for candidates to use PVs with margins and the scenario that reproduced a net CALM liability in order to achieve full marks. Partial credit was given if calculations were done without margins as long as the net CALM liability of 7,300 was used in calculating the gross liability. Most candidates did well in calculating the net liability and recoverable on the cash flow amount. However, a common omission for many candidates was not calculating the gross IBNR and corresponding reinsurance recoverable.

Use PV with margins and scenario that reproduces net CALM liability

(i)

Gross liability = Net Liability + Reinsurance recoverable
= 7,300 + 3,200 = 10,500
Reinsurance recoverable = 3,200 *(i.e., using margins and the scenario that reproduces the net CALM liability)*

IBNR can be approximated grossing up in the same proportion as net and gross

Gross IBNR = 200 × 10,500 / 7,300 = 288
Reinsurance recoverable for IBNR = 288 - 200 = 88

(ii)

Gross liability remains unchanged because it does not reflect reinsurance anyway
Net liability has been increased by the provision of 500 = 7,800
Reinsurance recoverable = 3,200 - 500 = 2,700; OR 10,500 - 7,800 = 2,700

Assume impairment has no impact on IBNR Net value
New Gross IBNR = 200 × (10,500 / 7,800) = 269
IBNR recoverable = 269 - 200 = 69

Alternative solution for full credit if the candidate assumed impairment increases the Net IBNR.

Net IBNR = 200 × 7,800 / 7,300 = 214
New Gross IBNR = 214 × 10,500 / 7,800 = 288
IBNR recoverable = 288 - 214 = 74

5. Continued

(c) Your company is developing a new annuity product with a significant investment component.

(i) Describe key considerations in determining whether the new product qualifies as an insurance contract under IFRS 4.

(ii) Explain any potential implications to company earnings if this product is classified as an investment contract as opposed to insurance contract under the current IFRS 4.

Commentary on Question:
This part of the question tested the candidates' ability to apply their knowledge of the impact on IFRS 4 on annuity products. Most candidates were able to identify the key considerations in part (i), and as a result received many of the marks available.

However, many candidates failed to explain the implications in part (ii) or fully develop their thoughts on this part. Candidates were expected to explain the implications rather than just listing them out. Credit was given if the candidate listed other considerations and clearly explained why.

(i)

At least one insured event must be specified in the contract.
The policy holder needs to transfer non-financial risks to the insurer which they are exposed to regardless of whether the contract exists or not (i.e. a risk created by the contract itself is not insurance risks).

The insured event must adversely affect the policyholder and a benefit be triggered as compensation for its effect.
If proof of adverse effect is not required as part of the contract, the insurer should consider whether it can be assumed that an adverse effect could reasonably be expected to occur.

The insurance risk must be significant that an insured event could cause an insurer to pay significant additional benefits in any scenario, excluding scenarios that lack commercial substance.
The risk can be significant even when the insured event is extremely unlikely (such as with certain catastrophes). This implies that the determination of significance is performed on a basis where the scenarios are not probability-weighted, using instead the range of possible benefits.

5. Continued

(ii)

- Under IFRS 4, the company will be able to continue using CALM to value insurance contract liabilities for financial reporting purpose.
- If the contract is an investment contract, determine if the contract contains a discretionary participation (DPF). If yes, then IFRS 4 and IAS 32 are applicable. If no, then IAS 32 and IAS 39 apply
- ISA 39 allows entities an option to designate a financial asset or financial liability at fair value through profit or loss upon initial recognition, i.e. Fair Value Option. So generally, its earning could be more volatile than being valued under CALM
- Therefore, if a contract is classified as investment contract instead of insurance contract, its earning will likely to be more volatile.
- Contracts classified an investment contracts receive less favorable tax treatment compared to insurance contracts

(d)

(i) Explain the purpose of residual margin according to IFRS 4.

(ii) Evaluate which of the two potential opportunities is more attractive by calculating the initial residual margin for each. Show all work.

(iii) You have prepared a sensitivity run with the following two assumptions:

- The current present value of the fulfillment cash flows has increased by 20% from the time of purchase.
- Fewer contracts are inforce than originally expected.

Assess the impact on the residual margin.

Commentary on Question:
This part of the question tested the candidates' ability to apply their knowledge of the impact of IFRS 4 on the acquisition of a block of business. Most candidates did well in parts (i) and (ii), getting full or near to full credit for those parts.

Part (iii) was more challenging for candidates. Many candidates understood the implication on the residual margin from the 20% increase to fulfillment cash flows, and many candidates received full credit for that part of the solution. However, the solution for the impact of fewer contracts on the in-force was not as fully developed by candidates.

5. Continued

(i)

Residual margin is the amount that eliminates any gain at inception of the contract (initial recognition).
The excess of consideration received or fair value of the portfolio over the present value of the fulfillment cash flows establishes the residual margin at initial recognition. It arises when the PV of Fulfillment CFs at contract issue is less than zero.

(ii)

Small Life Insurance Company:
residual margin = fair value of portfolio - PV of fulfillment CF
= 1.8 - 1.55 = 0.25mn

Portfolio of Life Contracts:
residual margin = considerations - PV of fulfillment CF
= 2.1 - 1.9 = 0.2mn

Residual margin is greater for Small Life Insurance Company and, thus, is the more attractive opportunity.

(iii)

If fewer contracts are in force at the end of a period than was expected, the amount of the residual margin recognized in profit or loss during the period shall include an adjustment to eliminate the residual margin at the end of the reporting period the portion relating to contracts that are no longer in force.

Therefore, residual margin should decrease - amortize more off.

If the fulfillment cash flows had increased 20% from the time of purchase, regardless of which scenario was used, the amount of residual margin would have been wiped out:

- For Small LIC: 1.55 ×120% = 1.86 > 1.8
- For Portfolio: 1.9 × 120% = 2.28 > 2.1

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:

(6a) Describe the considerations and evaluate the appropriate reinsurance form from the ceding and assuming company perspectives.

Sources:

OSFI B-3 Sound Reinsurance Practices and Procedures

Life and Health Reinsurance, Chapters 4 and 5, Advanced Methods of Reinsurance

ILA-C6060-12: OSFI Guideline MCCSR for Life Insurance, Chapter 10

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

Commentary on Question:

The question was testing whether the candidate understood some of the nuances of the types and uses of reinsurance. It looked at the OSFI rules governing Reinsurance, the different types of Reinsurance and their effectiveness in providing capital relief. It asked the candidate to explain the difference between registered and non-registered reinsurance. The concept of an Experience Refund was tested. Specific questions about the uses and appropriateness of Experience Refunds within a Reinsurance agreement were asked along with a calculation for experience refunds.

Solution:

(a) Assess the appropriateness of each of the following statements in accordance with OSFI Guideline B-3 – Sound Reinsurance Practices and Procedures. Recommend any changes:

(i) The Reinsurance and Risk Management Policy (RRMP) must form part of the Federally Regulated Insurer's (FRI) risk management plan and requires the oversight of a member of the FRI's senior management team;

(ii) The RRMP must document the significant elements of the FRI's approach to managing risk including the practices and procedures for managing and controlling its reinsurance risk with any registered reinsurers;

(iii) The terms and conditions included within the binding summary documents must be formally finalized in writing with the reinsurer before the ceding company files its annual return with OSFI;

6. Continued

(iv) As part of its on-going due diligence, the ceding company may rely on external rating agencies to monitor and assess the risk of the reinsurer;

Commentary on Question:
Many candidates commented on the appropriateness of the statement, but did not always provide the change needed to make the statement correct.

(i) The RRMP requires oversight from the Board.
(ii) Needs to include non-registered reinsurers as well.
(iii) Not totally correct. Can have a summary document (letter of intent) if formal agreement not achieved prior to contract effective date.
(iv) Need to do own due diligence as well and not rely solely on external rating agencies.

(b) The following reinsurance arrangements are being considered for an inforce block of Whole Life business to strengthen the company capital position:

- YRT
- Coinsurance
- Modified coinsurance

(i) Comment on the effectiveness of using the above reinsurance arrangements for capital relief.

(ii) For each of the reinsurance arrangements, discuss the appropriateness of having an experience refund feature as part of the terms of the treaty.

(iii) List the advantages and disadvantages of using an unregistered reinsurer.

Commentary on Question:
Part (i) many understood the differences here. More high level answers than detail. Part (ii) was poorly answered. Very few demonstrated an in depth understanding of when or why Experience Refunds are used. Part (iii) generally candidates demonstrated their knowledge of the differences and advantages and disadvantages of using a non-registered reinsurer.

(i) YRT
- Not generally used
- Used mostly for mortality relief
- Does provide limited relief for C2 requirement and limited to 1st year reserve, so amount is small

6. Continued

Coinsurance
- Good for all products
- Provides relief as long as reinsurer is registered
- Have to transfer assets backing reserves to the reinsurer
- Easy to administer
- May run into losses on wind up if have to transfer assets back

Modco
- Similar to coinsurance but ceding company holds reserves
- Reinsurer pays a modco adjustment to the ceding company
- No need to transfer/liquidate assets
- Removes credit issue if non-registered
- More exposed to counterparty credit risk
- More complicated accounting

(ii) Experience Refund only shares in gains not losses
Used to encourage better underwriting and claims control

YRT
- Generally not used – one year time frame only

Coinsurance
- Generally not used – share in gains only
- Premiums will be higher than if no experience refund existed

Modco
- ER used mostly for this format

(iii) Cost of LOC, funds withheld or other form of trust to get around the relief issue

Advantages:
- May offer cheaper rates
- Ability to obtain risk mitigation where otherwise could not
- Can still obtain credit if use modco with funds withheld

Disadvantages:
- May not be able to get capital credit
- Regulators have no authority or control over reinsurer
- Larger counterparty risk exposure

(c) Calculate the ceding company's net income before the experience refund and the amount of experience refund it will receive from the reinsurer in all years. Show all work.

6. Continued

Commentary on Question:
Majority answered this section best. Had a clear understanding of the mathematics behind reinsurance and the fact that if there is a loss, no experience refund. The loss carry forward concept was well understood. The calculation including the loss carry forward was a little tricky to execute. But many were able to get the intricacies of it and receive full marks.

Income = Net Premium – Net Death Benefit – Expenses + Reinsurance Allowance

Expenses = Gross premium * Expense Margin
Allowance = Net Premium * Reinsurance Allowance

	Year 1	Year 2	Year 3
Gross Prem	1000	950	900
Ceded Prem	200	320	400
Net Prem	800	630	500
Gross Benefit	300	420	450
Cede Benefit	150	210	225
Net Benefit	150	210	225
Reinsurance Allowance	100	32	40
Expense	100	95	90
Income Before Refund	650	357	225

Reinsurer Profit = Premium - Benefit - Allowance - Expense

	-50	78	135
Profit Sharing		15.6	27
Loss Carry Forward	-10	-10.4	-
Experience Refund	0	5.2	27

7. 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:

(2b) Recommend appropriate valuation assumptions.

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

Sources:

CIA Educational Note: Valuation of Universal Life Insurance Contract Liabilities

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

Commentary on Question:

This question is testing candidates' understanding of non-economic best estimate valuation assumptions, as well as their ability to apply the knowledge in product-specific situations. Overall they did better with part b, which is more relatable with details of products provided, while part a seems to be more list-y and difficult to provide a thorough answer without having any context and background information to begin with.

Solution:

(a) Describe the special considerations that should be made in determining non-economic best estimate valuation assumptions to be used in the valuation of Universal Life products.

Commentary on Question:

Most candidates got very few points for the general portion of this question with regard to all assumptions: 'policy owner behavior' is the point that a lot of people wrote down, and most other points failed to be mentioned. But candidates did better discussion the specific considerations for each assumptions

The following special considerations should be made:

- Company and industry experience
- Factors that may have created policy holder reasonable expectations
    - Insurer's policy for the adjustment of policy elements
    - Insurer's past practice with respect to adjusting policy elements
    - Representations and communications (e.g. the sales policy illustrations) made to policyholders with respect to the adjustment of those policy elements
    - If insurer makes change altering policyholder's expectations, need to determine if change was appropriately communicated to the policyholders before reflecting it in valuation

7. Continued

- Policy pass-through features
- Policyholder behavior
    - May be reflected implicitly, or explicitly as separate assumption, as addition to existing assumption
    - Choices that are currently available to policyholders would generally be assumed to be available in the future
    - Be careful in assuming that current behavior is indicative of long-term behavior.
    - Assume that policyholders generally act in their best interests unless evidence exists to the contrary, but it is not necessarily the same action or behavior that most negatively impacts the insurer
    - Use best estimate assumption for each aspect of policyholder behavior, revised regularly with any supporting evidence
    - Use historical experience to set assumption, and apply judgment where such experience is not available
    - A reasonable grouping of policies could be made in selecting assumptions affected by policyholder actions.
- Use sensitivity testing to understand which assumptions are most significant and understand the inter-relationship of various assumptions
- Whether the chosen assumptions are each independently reasonable and appropriate in aggregate

Mortality assumption:

- Consider the possibility of anti-selection
    - When policyholders treat the plan as a YRT policy and pay the minimum amount of premium necessary to keep the contract inforce
    - Particularly when this type of activities are combined with high lapse experience
- Assume higher mortality rates for extended term and reduced paid-up options
- Assume higher mortality rates if the policy allows in the face amount without underwriting.
- Can possibly include mortality improvement, especially if this raises liability

Expense Assumption

- Should be different from traditional products for a number of reasons
    - UL is more complex
    - Policyholder has options that must be administered
    - Must consider frequency of options being elected
    - Consider other annual expenses (e.g. exempt testing, statements…)
    - Investment expense may be different

7. Continued

Policy lapse assumption

- Policy design features may influence lapses
  - Surrender charges
  - Persistency bonus
  - Access to cash values without requiring a full policy surrender
- Policyholder behavior may be affected by taxation aspects of the policy
- Policyholder behavior may also vary under different interest rate scenarios
- How the policies are marketed
  - E.g. minimally funded level COI policies may be marketed as term to 100
- Form of agent compensations
  - E.g. if commissions may be payable on funds and premium deposits, would provide incentive to the agent
- Heavy back-ended surrender charges will delay lapse
  - If severe enough it could create a cash surrender value cliff
  - A persistency bonus may create a similar effect
- Level COI with access to cash value without surrendering can lead to partial surrenders and low surrender
- Policyholders are more likely to persist if there's a lot of room for tax deferral
- Characteristics such as Joint last-to-die may result in ultimate lapse rates similar to stand alone T-100 products
  - Actuary should consider using lapse-supported product experience
- Consider anti-selection when heaped lapses occur
- If assumption that all policies lapse when fund reaches zero doesn't produce materially different result, then assume that all policies lapse at that point
- If there's incentive for client to keep in force, then assume he will pay sufficient premium
- Consider relationship of credited rate to external rates:
  - May experience higher lapses if crediting on portfolio basis and new money rates rise
- For registered policies, funds would be withdrawn at latest age.

(b) Contrast current best estimate valuation assumptions for mortality, expenses, and lapses between the two blocks. Justify your answer.

Commentary on Question:
For mortality assumption, most candidates stated product A was a younger block given its issue age, but failed to see it was issued 20 years earlier than B and therefore should be an older block; for Expense assumption: most people recognized more investment choices for A will lead to higher expense, but very few candidates touched on other points with correct answer. Many candidates were able to get more points for the lapse assumption.

7. Continued

Mortality

- Product B may experience a cash surrender value cliff at year 20 when the surrender charge scale ends; persistency bonus of product B may create a similar effect. More anti-selection can be expected at that point.
- Product B can expect to have better mortality since it is a younger block (issued in 20 years later than product A)
- Underwriting changes do not always improve mortality, in some cases, certain requirements could be removed to save costs
- However, preferred underwriting would still influence mortality, but would revert over time to standard mortality; effects of preferred underwriting wear off linearly between last duration with reliable experience, and duration at which the effects are expected to completely wear off.
- Selective lapsation is typically modeled as an explicit adjustment to the base/expected mortality, and policies with low ultimate lapse rates such as level COI UL may exhibit 'reverse selective laspation' as more healthy lives than average persist – product B should have better mortality based on this factor
- Product B would have higher selective lapses and worse mortality, since it has higher face amount, and large policies are likely to experience higher selective lapse rates

Expenses

- Would be higher than traditional products for both A and B
- More investment choices for A will lead to higher expense
- Investment switches will depend on economic market conditions
- In higher interest rate scenarios, more switches can be expected on product A
- Less fund build up in product B is expected since it was sold as a T100 replacement

Lapses

- Surrender charges on product A end at duration 10, which will lead to cliff
- 25% of fund for product A is a significant penalty for year 9
- Since there's not much fund build up on product B, it should not be impacted by surrender charge schedule
- Persistency bonus will have cliff effect for product B at years 17-18-19
- There's little access to cash for product A since it must have fund = 10 X COI, and surrenders may increase if policyholders want to get cash
- Easier access to cash will allow policy to stay in force with partial surrenders, and will lead to lower lapse rate
- Product A's YRT COI structure will not penalize early surrender
- Product B's level COI structure leads to lapse support and lower lapses among sophisticated policyholders

7. Continued

- Product B is minimum funded means it should act like T100 and have lower lapse rates
- Product A compensation provides little incentive for the advisors to keep in force
    - 0.1% asset-based compensation after year 5 is too low to provide an incentive
    - Which would lead to higher lapse rates
- Product B has flatter compensation scale and will provide incentive to agent to keep in force
    - Higher asset-based compensation and bonus on 20th year will provide further incentive.

8. 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:

(2b) Recommend appropriate valuation assumptions.

Sources:

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

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

Final Communication of a Promulgation of Prescribed Mortality Improvement Rates, July 2011

Commentary on Question:

Overall, most candidates received partial credit for demonstrating an understanding of mortality improvement and calculating mortality for different underwriting classes. However, to receive full credit, candidate must clearly outline the key features instead of giving vague points. In addition, candidate should provide detailed calculation & explanation and complete with appropriate conclusion.

Solution:

(a) Describe the considerations to take into account when calculating the mortality rates under the new underwriting classes.

Commentary on Question:

Overall, most candidates received partial credit for describing how different factors affecting mortality rate. However, to receive full credit, candidate must clearly outline the key features for the factors driving by new underwriting classes instead of giving vague points. In addition, candidate should provide detailed explanation when they mention assumptions from reinsurance and complete with appropriate conclusion.

1. Mortality rate under new classes need to consider the variations for different issue ages. For example, the quantifying percentage will be different and calculation needs to be split into different groups. We also need to consider the variations for durations. However, it is reasonable to assume the effects of preferred underwriting will wear off over the select period. There is reverse sentinel effect and competitors may have different preferred class criteria so that the company's may lose its gain to its competitors by losing its best risk classes.

8. Continued

2. Mortality rate under new classes is generally difficult to estimate under new classes. Hence, as experience develops, it is important to investigate actual to expected experience if a company's underwriting classes differ considerably from industry, and how much confidence on assumptions the company relies on.
3. Where confidence doesn't exist, the company needs to value all new risk classifications using aggregate mort assumption, or increase MFAD.
4. Reinsurance can be considered, but reinsurer's rates are usually simple multiples of a standard industry table and hence care should be taken in using reinsurer's premium rates as proxy for valuation expected mortality.

(b) Determine the valuation mortality rate in policy year 3, including margins and mortality improvement considerations, to use in the 31 December 2013 valuation for an Elite policy issued to a 35 year old on 1 January 2013, as per the most recent memorandum from the Actuarial Standards Board.

Commentary on Question:
Most candidates can calculate mortality rate without margin or mortality improvement correctly. However, only few can demonstrate the mortality improvement impact on the calculation and hence lost some points by applying wrong formula or incorrect input.

1. Mortality Rate without margin or mortality improvement:
   q37(Elite) = q37(Preferred) * (1 - A + B * A) / (1 - A) = 8 * (1 - .2 + .3 * .2) / (1 - .2) per thousand = 8.6 per thousand
   Where A is proportion in higher class, and B is improved mortality of higher class

2. For Term Insurance, it is apparent that mortality improvement decreases reserves, so the formula for scenario 1 should be used
   q37(Elite) with Margin = q37(Elite) * (1 – Mortality Improvement for Age 37 * Margin for Age Improvement) ^ (years of improvement) + k / e47 = 8.721 / 1000
   Mortality Improvement for Age 37 is .02
   Years of Improvement = 2
   Margin for mortality improvement = .5
   k = 15 / 1000 - Maximum range of suggested Pfad as per the CIA

(c)

(i) Describe instances where the CIA recommends using the high end of the mortality margin assumption.

(ii) Critique the appropriateness of the chief actuary’s recommended mortality margin.

8. Continued

Commentary on Question:
Candidate did fairly well on this question. However, to receive full credit, candidate must go beyond retrieval and show comprehensive knowledge for CIA mortality improvement by providing detailed explanation and appropriate conclusion concerning the situation of the company described in the question.

(i) CIA recommends using the high end of the mortality margin when there is error in estimation of the best estimate mean, there is low credibility of company's data, future experience is difficult to estimate, there is untested refinements in underwriting criteria, new type of benefit or new way of distributing product, or cohort of risks lacks homogeneity.

In addition, insurer should use the high end of the mortality margin when there is unrefined derivation of the best estimate assumption or there is approximations made to establish joint ages, or not all the necessary information is available to determine mortality. Moreover, when there is error in estimation of the best estimate assumption, there is recent changes in underwriting standards or methods of calculation, there is deterioration of the best estimate assumption, there is anti-selection present from explicit or implicit reentry options, there is unfavorable medical developments have emerged, the persistency rate of the product is low.

(ii) Agree that the top rate should be used, or at least somewhere between the middle of the range and the top. Historically, insurer has been slow to protects itself against changes which adversely affect it, for example, anti-selection on certain options and benefits affects the mortality, policy of internal replacement is favorable to rotation of the old business and premium structure does not recognize mortality differentials as precisely as the rest of the market, anti-selection by the sales force, products written on a preferred basis. Given the recent change to underwriting, where no credible experience exists, margins should at least be the average of high and low as per SOP 2350.03 and 2350.031. Given market proliferation of preferred underwriting policies and a persistency of products offered on a non-preferred basis, the offering might affect other policies sold now and in the past

(d) Assess the appropriateness of using these Canadian term life Standard class valuation mortality rates including margins to calculate Canadian reserves for the following blocks of business:

(i) Payout Annuities sold in Canada

(ii) Non-reinsured term insurance sold in the U.S.

8. Continued

(iii) 100% reinsured term insurance sold in Canada

Commentary on Question:
Candidate did fairly well on the first two bullet points of this question. However, most of them did not receive full credit as they comment on reinsurance.

(i) Generally payout annuity mortality is not underwritten. Not appropriate to use underwritten mortality data, and Increased mortality decreases liability of payout annuity, which is the reverse of term. The mortality improvement PAD should have a different sign (multiply by 1.5 rather than 0.5), the mortality PAD itself is calculated as *(1 - MFAD) rather than +MFAD/ex

(ii) Mortality experience may not be the same for US business and it is not required to use the same mortality improvement assumption as stated in ASB Memorandum. The improvement rates selected should give liability at least as large as using prescribed list, unless experience indicates otherwise.

(iii) Reinsurance will not have an effect on the base mortality assumption, but it may cause mortality improvement to increase reserves rather than decrease. If mortality improvement still causes reserves to decrease, then fine to use the same rates. If mortality Improvement causes reserves to increase, must use "scenario 2" as given in the ASB Memorandum. Calculation is $qx+1(pr) = qx+1 * (1-MImpx+1 * 1.5)$ 1 - k/ex+1.

9. 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:

(1a) Construct the basic financial statement or its components for a life insurance company.

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

Sources:

Canadian Insurance Taxation, Third Edition, 2009, by Price Waterhouse Coopers, Chapter 6, Reserves

Commentary on Question:

This question tested the candidate's knowledge of MTARs and policyholder taxation.

Solution:

(a) Explain the implications for policyholder taxation purposes brought about by the 1996 legislation and regulations.

Commentary on Question:

Candidates were able to identify the fact that the legislation introduced the split. For the pre-1996 the candidates identified that the reserve was based on 1.5FPT, but not much beyond that, e.g. that it is the maximum of the CSV and 1.5FPT. Similarly, for the post 1995 policies, the candidates correctly stated that the reserves were based on the financial statement reserves but few mentioned that the projected income and capital taxes were excluded.

Many candidates commented that the differences were removed in 2007, although this was not in the study material.

- 1996 legislation classified policies as pre-1996 and post-1995.

- Pre-1996
  - Continued to use former rules
  - Max { 1.5 full preliminary term; CSV} less policy loans
  - For non-par policies use mortality and interest used to determine premiums
  - For par policies, use mortality and interest to determine cash values
  - Pre-1996 rules used for calculating Part XII.3 Investment Income Tax and the accumulating fund of the policy
  - In 2007, moved to be consistent with post-1995 policies

9. Continued

- Post-1995
  - MTARs based on amount reported in the financial statements, except that the tax reserve must be determined excluding projected income and capital taxes
  - At time legislation introduced, financial statements used PPM, so they did not match the MTARs
  - This was changed to CALM in 2001
  - Same rules for non-cancellable and guaranteed renewable A&S policies

(b) Using the following year-end 2012 financial information for a particular non-par block of insurance policies, determine:

(i) The total reserve for policyholder taxation purposes

(ii) The maximum tax reserve that may be reported for 2012 for income tax purposes

Commentary on Question:
Performance on this question was not strong. Many candidates confused the calculations for Policyholder Taxation and Income Tax, although even then the details were not always correct, for example the wrong multiple used for the IBNR or the cap on the Experience Rating Refund given that the financial statement was as at 2012, there are two solutions for Policyholder Taxation – one using the pre-1996/post-1995 definition as presented in the study material and the other using the 2007extra curricular definition.

(i)
Policyholder Taxation (from Study Material)

Pre-1996 issues = 1.5 FPT based on premium assumptions – policy loans
= 137,000 – 2000
= 135,000

Post-1995 issues = net regulatory reserves
= 420,000 - 42,000
= 378,000

Total is 135,000 + 378,000 = 513,000

Policyholder Taxation (extra-curricular)
Total = net combined pre- and post-1995 issue regulatory reserves
= 565,000 - 56,500 (net combined regulatory reserves)
= 508,500

9. Continued

(ii)

MTAR = net (positive reserves + negative reserves) - policy loans
+ unearned premium reserves
+ 95% incurred but not reported reserve
+ claims received but not yet paid reserve
+ min (experience rating refund reserve; 25% of premium)

= (565,000 – 56,500) - 8,000
+ 3,000
+ 0.95 x (3,300 – 600)
+ 1,900
+ min (4,200; 0.25 x 10,000)

= 500,500 (this is referred to as 'policy reserve included')
+ 3,000
+ 2,565
+ 1,900
+ 2,500

= 510,465

10. 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:

Economic Capital for Life Insurance Companies (Society of Actuaries)

Commentary on Question:

This question tested the candidate's knowledge of Indexed Linked Products, capital measurements – MCCSR and Economic Capital and investment strategy. The question then looks at what the impact of changes in the economic environment.

Solution:

(a) List the qualifying characteristics and conditions to use the Index Linked Products MCCSR calculation.

Commentary on Question:

This section of the question was poorly done.

Characteristics

- Assets and liabilities are held in the general fund of a life insurance company
- The policyholder is promised a rate of return, based on index
  - Return may be subject to a floor
- The life insurance may invest in assets that are not the same as those that constitute the indices

Conditions

- All supporting assets must be segmented into asset subgroups
- Separate asset subgroups must be maintained for each index referred to in the products
- The returns (on a market basis) of each asset subgroup must be tracked
- Any transfers into or out of the asset subgroup must be done at market

(b) For this block of policies, calculate 100% of the MCCSR C-1 component as at 31 December 2012.

10. Continued

Commentary on Question:
Most candidates correctly identified the formula for equities and calculated the 2012 Q4 capital factor correctly. However, few went on the calculate the corresponding capital factors for the preceding three quarters and then even fewer knew to use the minimum of the four quarter in the MCCSR C-1 equity formula

To determine the capital factor applicable to a particular subgroup of assets, a correlation factor (CF) must be calculated. This factor is

CF = A * (B / C)
where
A = historical correlation between earned and credited rates
B = minimum of the standard deviation of earned and credited rates
C = maximum of the standard deviation of earned and credited rates

Equities

2012 Q1
A = 0.987; B = 0.018; C = 0.018
➔ CF = 0.987 * 0.018 / 0.018 = 0.987

2012 Q2
A = 0.99; B = 0.021; C = 0.021
➔ CF = 0.99 * 0.021 / 0.021 = 0.99

2012 Q3
A = 0.981; B = 0.014; C = 0.015
➔ CF = 0.981 * 0.014 / 0.015 = 0.9156

2012 Q4
A = 0.983; B = 0.015; C = 0.015
➔ CF = 0.983 * 0.015 / 0.015 = 0.983

MCCSR Required Capital Factor = 100% - minimum of CF over prior 4 quarters
= 1 – minimum (CF = 0.987; CF = 0.99; CF = 0.9156; CF = 0.983)
= 1 - 0.9156
= 0.0844 = 8.44%

MCCSR for Equities = MCCSR Required Capital Factor * Equity Asset Value
= 8.44% * 120 million
= 10.128

10. Continued

Total MCCSR = MCCSR for Equities + MCCSR for Bonds
= 10.128 *(calculated)* + 5.75 *(given)*
= 15.878

(c) Provide a brief description of each of the following methods for calculating economic capital.

(i) Risk Neutral Basis

(ii) Real World Basis

(iii) Stress Test Basis

(i) Risk Neutral Basis
- process for economic capital similar to derivative price calculation
- calculate the present value of cashflows by discounting the risk-adjusted future cashflow with risk free rates based on multiple scenarios
- assumes no arbitrage
- assumes any derivative instrument can be perfectly reproduced by a combination of securities available in the marketplace
- risk free discount rates and risk adjusted cashflows can be directly derived from the current risk free rates and implied volatility from the current yield curve

(ii) Real World Basis
- calculate the present value of cashflows by discounting projected cashflows with risk discount rates based on multiple scenarios
- projected cashflows are not adjusted for uncertainty risk directly, instead, it is common to set the discount rate higher than the risk-free rates
- because of shortcomings of the risk neutral technique, real world technique is widely used
- management needs to have a clear understanding of the derived economic capital in order to effectively use it in ERM

(iii) Stress Test Basis
- approach is based on determining what the capital strain would be when an instantaneous shock is applied to various risk factors is applied to the economic (realistic) balance sheet
- there is no allowance for possible management actions taken
- the choice of stress tests varies between companies

10. Continued

(d) Calculate the estimated change in capital for:

(i) 200% MCCSR

(ii) Economic Capital on a Risk Neutral Basis

(iii) Economic Capital on a Real World Basis

(iv) Economic Capital on a Stress Test Basis

Commentary on Question:
Candidates seemed to struggle with this section with using the information provided. For example, although the question stated that the Change in Capital factors were 'as a percentage of starting asset value', many candidates used them on the ending asset values.
In addition, I don't think there were any correct answers to (iv) Stressed Test

(i) 200% MCCSR
= 200% * (Starting MV Equities * Change in Equity Return * Change in Capital
+ Starting MV Bonds * Change in Bond Return * Change in Capital)
= 200% * (120 * 2* -2%+ 50 *1* 2%)
= -7.6

(ii) Economic Capital on a Risk Neutral Basis
=Starting MV Equities * Change in Equity Return * Change in Capital
+ Starting MV Bonds * Change in Bond Return * Change in Capital
= 120 * 2* 7%+ 50 *1* -5%
= 14.3

(iii) Economic Capital on a Real World Basis
=Starting MV Equities * Change in Equity Return * Change in Capital
+ Starting MV Bonds * Change in Bond Return * Change in Capital
= 120 * 2* 3%+ 50 *1* -2%)
= 6.2

10. Continued

(iv) Economic Capital on a Stress Test Basis

Starting Economic Balance Sheet (given)

	Total Liabilities	Total Assets	Equities	Bonds
Unit Reserve	125	125	88	37
Value of Guarantee	5	5	4	1
Capital	40	40	28	12
Total	170	170	120	50

Ending Asset holdings (given)	100	60

Ending / Stressed Economic Balance Sheet

	Total Liabilities	Total Assets (Bonds + Equities)	Equities	Bonds
Unit Reserve	117 = total assets	117 = 73+44	73 = 88*100/120	44 = 37*60/50
Value of Guarantee	35 (given)	5 = 3 +2	3 = 4*100/120	2 = 1*60/50
Capital	8 = 160–117-35	38 = 24 + 14	24 = 28*100/120	14 = 12*60/50
Total	160 = total assets	160 = 117+5+38	100 (as above)	60 (as above)

Change in Capital = Capital in Starting Economic Balance Sheet
- Capital in Stressed Balance Sheet
= 40 – 32
= 8

(e) Given the economic environment changes, management has asked if the current investment strategy should be maintained. Recommend the go-forward investment strategy for this block of UL policies. Justify your answer.

10. Continued

Commentary on Question:
Candidates could receive full credit for this question by either recommending a new investment strategy or recommending not changing the strategy. To receive full credit, the recommendation needed to be clear and well explained. The candidate also had to demonstrate their comprehension by including supporting elements in their explanation that are specific for this situation. The solution below is an example of what might be expected from candidates.

The actual investment strategy of 70% equities and 30% bonds is not in line with the interest credited. The interest credited is 60% equities and 40% bonds. This mismatch increases the volatility in the income statement, balance sheet and the value of the guarantee.

I recommend changing the current investment strategy to 60% equities and 40% bonds for the following reasons:

- This investment strategy would be more in line with the credited rate. As we can see from the spread between the earned rate and credited rate, prior the market downturn the spread was 0.6% and after the market downturn, the spread is 0.3%, the spread is volatile and the recommended investment strategy will reduce this mismatch, hence reducing the volatility on the income statement
- The value of the guarantee is also volatile, as we can see, the value of the guarantee increased from 5 to 35. By having the earned and credited interest rate the same, this will reduce the volatility in the guarantee value.
- This investment strategy will also reduce the MCCSR capital requirements. The bonds in the current investment strategy are less capital intensive than equities.
- However, the more conservative investment strategy will reduce the income earned on the equities during good economic environments, but we believe that having less volatility and risk in the value of the guarantee is more appropriate.