ILA 101 Model Solutions
March 2026

1. Learning Objectives:

2. The candidate will understand different types of actuarial assumptions and how experience studies are designed and used for evaluating past experience and for setting assumptions.

4. The candidate will understand common valuation and capital techniques used in US, Canadian, and international regulatory frameworks.

Learning Outcomes:

(2e) Describe the process and apply techniques for experience studies.

(4b) Describe the US GAAP actuarial framework and calculate term insurance reserves and deferred acquisition cost.

Sources:

US GAAP for Insurers, Freedman, M., and Frasca, R., 3rd Edition, 2024

- Chapter 5: Nonparticipating Traditional Life Insurance

Experience Study Calculations, Society of Actuaries, Ch. 2-4 , 11, 12, 15, 17, 18 (excluding 18.2, 18.8, 18.9)

Commentary on Question:

Commentary listed underneath question component.

Solution:

(a) Calculate the US GAAP net premium ratio at issue for the term cohort.

Commentary on Question:

Most candidates had difficulty calculating the net premium ratio at issue because they were either taking no expense or all expenses instead of considering only the death claims expense. Both of these situations would allow partial credit. However, most candidates were able to demonstrate that the net premium ratio had to be capped at 100%.

See Excel solution.

1. Continued

(b) Calculate the US GAAP reserve at issue for the term cohort.

Commentary on Question:
As with part a), this section of the question was difficult for most candidates. Full credit was given when the formula was known and applied correctly and the candidate was able to show that the net premium ratio had to be capped at 100%. Both scenarios, including all expenses or considering no expenses were situations happening very often but if the situation was the same as in a), candidates were not penalized twice.

See Excel solution.

(c) Calculate the DAC amortization for year 1 for the term cohort.

Commentary on Question:
The majority of candidates struggled with the question. Both the calculation of the amortization schedule and the deferrable commission rate were not well understood. To receive full credit, the amortization calculation as well as knowing which expenses have to be included in the deferrable acquisition expenses (per policy direct acquisition expense and the deferrable commission) were necessary.

In the feedback survey, some candidates indicated that they believed this material was not on the syllabus. However, learning outcome 4(b) on the syllabus states that candidates should be able to calculate deferred acquisition cost. This specific question was developed from the calculation on pages 146-147 of the US GAAP reading.

See Excel solution.

(d)

(i) Describe how often cash flow assumptions for GAAP benefit reserves should be reviewed.

(ii) Describe one potential circumstance where cash flow assumptions might be revised outside of the normal schedule.

Commentary on Question:
The majority of candidates were able to identify that assumptions should be revised at least annually. However, adding to their response that the revision could be as frequent as quarterly also provided some credit. To receive full credit for the example, it had to be linked to a triggering event and not simply a general observation. Most candidates provided a relevant example.

1. Continued

(i) Cash flow assumptions for GAAP benefit reserves must be reviewed at least annually.

(ii) One example of a circumstance where cash flow assumptions might be revised outside of the normal schedule is a pandemic event where the actuary believes mortality in future will be much higher than previously assumed.

2. Learning Objectives:

1. The candidate will understand the designs of the common Life and Annuity products and their associated features and inherent risks, and the methods to design and price these products.

2. The candidate will understand different types of actuarial assumptions and how experience studies are designed and used for evaluating past experience and for setting assumptions.

Learning Outcomes:

(1a) Describe and compare various life insurance and annuity product designs.

(2a) Describe types of actuarial assumptions commonly used for life insurance and annuity actuarial functions.

Sources:

ILA101-100-25: Life Products & Features

ILA101-111-25: Insurance Contracts, First Impressions, 2020 Edition
IFRS 17

Commentary on Question:

Commentary listed underneath question component.

Solution:

(a) Analyze potential impacts of a decline in stock prices on the profitability of the VUL block.

Commentary on Question:

This was a good question to test the candidates' knowledge of actuarial assumptions and their application to VUL products; the assumptions used, common product features and profitability drivers. Overall students did not score well on the question. Candidates were expected to share three ways in which lower stock prices could impact VUL profitability. Many students listed the valid points but failed to describe the impact on profitability which led to partial credit.

Profitability could be expected to decline alongside a decline in the stock prices. A decline in stock prices would result in lower account values for the VUL policies. This would result in lower M&E charges collected by GRL Life. If GRL Life offers a no-lapse guarantee, then this could cause issues where the assets underlying the fund values are declining but the company is keeping them in force anyways. GRL Life could end up paying more in death benefit than expected. Lastly, poor investment performance could lead to higher surrenders, resulting in loss of future income from these policies.

2. Continued

(b) Explain how GRL Life can determine whether the above contract has a significant possibility of becoming onerous at inception under IFRS 17.

Commentary on Question:
This question was for only 1 point, but the answer needed a lot of detail. The candidates had to know how to differentiate between "onerous" and "could be onerous". Most of the students did not score well on this question because they focused on product features that make the product onerous vs. explaining how to determine whether a product "could be onerous".

Under IFRS 17, we can use the following steps to determine if the contract has significant possibility of becoming onerous:
a) Calculate CSM at inception; if CSM is low at inception chances are that small assumption changes can cause contract to become onerous.
b) Sensitivity analysis should be done on mortality, expenses, and lapses to check impact on CSM.
c) Level of CSM from part a. and sensitivity analysis from part b. will indicate the level of changes in assumptions that could lead the contract to become onerous. Finally, GRL Life will need to exercise judgement to figure out if level of assumption changes have "significant possibility" of becoming onerous.

(c) Assess whether each of the following contracts in GRL's UL portfolio can be considered a direct participating contract under IFRS 17.

(i) UL contracts with a minimum crediting rate of 3%. The Company uses its discretion to pay more than the minimum rate. The final crediting rate is expected to reflect overall investment performance of the Company.

(ii) VUL contracts where account values vary directly with separate account performance. The Company deducts a small management fee from the account value.

(iii) Index-linked UL contracts where returns on account values are tied to a stock index. The Company does not hold a portfolio of assets reflecting the index.

Commentary on Question:
This question tests candidates' knowledge of IFRS principles on how contracts are classified into direct participating contracts vs. not direct participating contracts. Candidates did generally well on this question. Many of the candidates had the correct classification but not the correct rationale; partial credit was given in these situations.

2. Continued

Contracts are considered as direct participating contract (DPC) if they satisfy following 3 conditions at inception:
a) - Policyholder participates in a share of a clearly identified pool of underlying items
b) – GRL Life expects to pay policyholder amount equal to substantial portion of returns on the underlying.
c) – GRL Life expects substantial portion of any change in amount paid to the policyholder to vary with change in return on underlying.

(i) This is not a direct participating contract because it is not directly linked to an underlying and clearly defined pool of assets, and the final crediting rate is at the discretion of the company.

(ii) So long as the pool of assets of the separate account are known (perhaps the policyholder has some choice in how the funds are invested), it would count as a DPC. Since GRL Life is deducting only a small amount of management fee, substantial amount of the returns are being shared with the policyholders.

(iii) This is a DPC. There is a direct link to the stock index, even if the company does not have a portfolio reflecting the index. So long as the account values of the fund are directly linked to the index performance, it would count as directly participating. Whether or not the company is earning from this same stock index is irrelevant.

3. Learning Objectives:

3. The candidate will understand common issues and practices related to Product Management.

Learning Outcomes:

(3b) Describe and apply the significant US tax regulations relating to the taxation of individual life and annuity insurance products.

Sources:

ILA101-108-25: Chapters 1 and 2 of Life Insurance and Modified Endowments Under IRC §7702 and §7702A, Desrochers, 2nd Edition

Commentary on Question:

For part a, complete credit was given for identifying all false statements and correctly explaining why they are false and what would make them true. Many candidates missed that IRC section 101(f) applied only to flexible premium life insurance. Most candidates only received partial credit for part b.

Solution:

(a) Critique the following statements related to the taxation of US life insurance policies.

A. The tax status of life insurance policies issued prior to January 1, 1985 is defined by IRC section 101(f), while policies after this date are defined by IRC section 7702. In both cases, policies must pass the Guideline Premium Test in order for death benefits to be nontaxable.

B. IRC Section 7702A determines whether a policy is a Modified Endowment Contract (MEC). If a policy is a MEC, then the full amount of any surrenders and policy loans are taxable as ordinary income.

C. Under IRC Section 7702, death benefits are exempt from treatment as income for the purpose of income tax, while the inside build-up of the cash value is considered to be taxable income.

D. Policies that qualify under both the Cash Value Accumulation Test of IRC Section 7702(b) and the Guideline Premium Test of IRC section 7702(c) and (d) must guarantee compliance by the terms of the contract. Corridor factors used under both tests are identical.

Commentary on Question:

Candidates tended to do well on this part of the question. Complete credit was given for identifying all false statements and correctly explaining why they are false and what would make them true. Many candidates missed that IRC section 101(f) applied only to flexible premium life insurance. Candidates were given partial credit if they identified at least 1 false statement.

3. Continued

A. ANSWER: The statement is partially true. The statement is false in claiming that all life insurance policies issued prior to January 1, 1985, are defined by IRC section 101(f). Section 101(f) was a temporary provision that applied only to flexible premium life insurance contracts (such as universal life or adjustable life). Section 7702 began in January 1985, however, according to 7702, a policy must pass either the CVAT or both the GPT and the Cash value Corridor test in order for death benefits to be nontaxable.

B. ANSWER: This statement is partially correct. The first part of the statement is true: 7702A determines whether a policy is an MEC. However, the second part of the statement is false. If a policy is a MEC, then the distributions (including surrenders and policy loans) are taxed on a LIFO basis. This means that the gains from the distribution come out first, which are taxable. Once the gains have been withdrawn, the investment portion of the contract is taken out. The investment portion of the distribution is not taxable.

C. ANSWER: Partially true. The statement is true that death benefits are exempt from treatment as income for the purpose of income tax. The inside build-up of the cash value is nontaxable if it stays inside the contract until death (provided the policy meets the requirements set out in 7702). It is only taxable if the policyholder moves it outside of the contract before death.

D. ANSWER: This statement is false. The policy must guarantee compliance by the terms of the contract only for the cash value accumulation test (CVAT). For CVAT, the test is prospective; therefore, the policy must satisfy the condition at all durations. On the other hand, the guideline premium test is a retrospective test. Under the GPT, the "Premiums Paid" is compared against the guideline single premium and the sum of guideline level premiums at that time. Moreover, the corridor factor test is a separate test from the CVAT and the GPT.

(b) Calculate the following values at issue:

(i) Initial CVAT net single premium

(ii) Initial minimum death benefit under CVAT

(iii) Initial 7-pay annual premium

Commentary on Question:
Candidates did worse on part b than part a. Full credit was given for displaying correct framework and execution by appropriately discounting (accepted either discounting by 6 or 7 years), and by proper treatment of death benefits.

Model solution provided in Excel

4. Learning Objectives:

1. The candidate will understand the designs of the common Life and Annuity products and their associated features and inherent risks, and the methods to design and price these products.

2. The candidate will understand different types of actuarial assumptions and how experience studies are designed and used for evaluating past experience and for setting assumptions.

Learning Outcomes:

(1a) Describe and compare various life insurance and annuity product designs.

(2a) Describe types of actuarial assumptions commonly used for life insurance and annuity actuarial functions.

(2e) Describe the process and apply techniques for experience studies.

Sources:

ILA101-101-25: Annuity Products and Features, ILA Committee, 2019

ILA101-106-25: Experience Assumptions for Individual Life Insurance and Annuities

LO2 - Variable Annuity Guaranteed Living Benefits Utilization, SOA LIMRA Research, 2017, Executive Summary only (pp. 19 – 32)**Commentary on Question**:

Commentary on Question:

Commentary for this question is detailed by subpart.

Solution:

(a) Analyze the impact on profitability of using EAI's life insurance pricing mortality assumptions for pricing an annuity product.

Commentary on Question:

Most candidates received partial credit for this question. Many responses focused on high level commentary regarding life insurance being chosen by those of poor health and annuities being chosen by those in good health (i.e. living longer). Credit was awarded as long as those were correctly tied to product profitability.

4. Continued

- A select and ultimate mortality table typically used for life insurance is not appropriate as annuity contract holders do not go through the underwriting selection process. Using such a table in pricing will result in underestimating the expected mortality of annuitants, which would mean longer duration of payments and less pricing profit. However, actual mortality will be higher resulting in higher actual profits. Also, using select and ultimate table will make pricing of annuity products less competitive and may result in lowers sales, hence lower profits.
- Life insurance mortality tables typically do not consider any mortality improvement as it is conservative to do so in pricing. However, mortality improvement is an important consideration in annuity products. Ignoring mortality improvement in pricing of annuity product will result overstating mortality which would mean shorter duration of payment thereby overestimating pricing profits but actual profits will be lower.

(b) Contrast how the profit margin may differ under the two approaches.

Commentary on Question:
Most candidates received partial credit for this question. A common fault among responses was not directly addressing the impact due to the bailout provision for the two options. Another was some papers focused on dynamic taking more effort and being a more sophisticated approach. While true, obtaining full credit required a focus on what direct impact there was to profitability in the approaches. Candidates should review the detail and depth in the model solution below for the appropriate level of the "Contrast" verb and two points allocated to this question.

- Bailout provisions waive the surrender charges if declared interest rate is less than the bailout rate.
- Profit margin calculated using best estimate level assumption of earned interest does not capture this scenario since best estimate assumption is typically higher than the bailout rate. Therefore. it does not take into consideration the effects of additional surrenders and loss of surrender charges.
- Whereas profit margin calculated using dynamic interest rate scenario would include a scenario where interest rate is less than bailout rate and therefore able to capture impacts of additional surrenders and loss of surrender charges.
- Therefore, median profit under dynamic interest rate scenario approach is expected to be lower than that under a deterministic profit test approach. The difference between two profits reflects the cost of bailout option.

4. Continued

(c) Critique the following statements.

A. For variable annuities with living benefits, separate account performance is not a significant driver of persistency and therefore does not materially impact profitability.

B. The majority of partial withdrawals on variable annuities with living benefits are taken through systematic withdrawal plans (SWPs). This is because withdrawals through SWPs are typically greater than the annual benefit maximum.

C. Surrender charges and market value adjustments (MVAs) are two effective methods of increasing persistency on variable annuity products.

D. There is a higher risk of withdrawal on non-qualified variable annuity contracts than qualified variable annuity contracts. Owners age 65 and older of non-qualified annuities are more likely to take withdrawals significantly in excess of the maximum withdrawal amount.

Commentary on Question:
Most candidates received partial credit for this question. Candidates receiving full credit gave a proper critique, which required identifying which parts of each statement were true vs. false followed by an accurate explanation. Candidates that merely stated something was true or false without support did not receive credit. Specific to Part C., some candidates didn't connect that MVAs do not generally apply to variable annuities.

A. This statement is not true. VAs with living benefits that experience poor performance will have benefits in the money and be more likely to persist. For backend loaded contracts, the primary source of income is the asset charge which brings in more income in later years as the contract's accumulated value grows. Therefore, persistency is a key driver of profitability on VAs with living benefits.

B. This statement is partially true. The majority of withdrawals on VAs with GLBs are from SWPs; however, withdrawals through SWPs are usually below the annual benefit maximum because they are a pre-scheduled withdrawal amount and the contract holder can plan to keep the withdrawal below the maximum amount.

4. Continued

C. This statement is partially true. Surrender charges are effective in increasing persistency; surrender and withdrawal rates are often lower on contracts within the surrender charge period. MVAs are typically only applied to fixed annuities. An MVA is intended to reflect changes in current interest rate levels during an interest rate guarantee level. Since a VA is tied to market performance, an MVA mechanism wouldn't be needed and wouldn't be effective in increasing persistency.

D. This statement is false. There is more risk of withdrawal on qualified annuities. As qualified owners approach age 70-71, an increasing percentage of them will take withdrawals to meet their required minimum distribution. Younger owners under age 60 are more likely to take withdrawals in excess of their annual maximum, regardless of qual/non-qual status.

(d) Explain how predictive modelling can be used instead of univariate analysis to develop GMWB utilization assumptions.

Commentary on Question:
Candidates did fairly well on this question with many receiving much of the possible credit. Some candidates gave high level points focusing on predictive modeling being more complex than univariate. However, papers receiving full credit tied that point to what it meant for GMWB utilization assumptions.

- Univariate analysis uses one variable at a time. Modern VA products having GMWBs exhibit withdrawal behavior that is affected by multiple factors such as age, gender, source of money, systematic withdrawal plan or not, benefit base, etc. Univariate analysis fails to capture correlation between these factors.
- Predictive analysis is a multivariate approach that can analyze all these factors and untangle separate impacts of these factors. It isolates pure impact of each factor which univariate analysis cannot do. Also, it can provide opportunity to test and introduce new factors in assumptions setting of GMWBs thereby further refining the assumption.

5. Learning Objectives:

5. The candidate will understand various techniques for addressing the mitigation of risk within a life insurance and annuity context.

Learning Outcomes:

(5e) Describe basic terms, concepts, and types of life insurance reinsurance arrangements.

Sources:

LO5 - Tiller, 4th edition, Chapter 1: Basic Terms and Concepts (only pages 3-16 and 22)

LO5 - Tiller, 4th edition, Chapter 4: Basic Methods of Reinsurance

Commentary on Question:

Commentary listed underneath question component.

Solution:

(a) Compare the effectiveness of each type of reinsurance structure to achieve the company's objectives.

Commentary on Question:

The majority of candidates were able to correctly compare the effectiveness of Yearly Renewable Term (YRT) and Coinsurance reinsurance structures when it came to achieving the company's objectives of managing risk and improving the capital position and to state that Coinsurance was effective in meeting both of the company's objectives whereas YRT was good for risk management but weaker for capital position improvement. For candidates to achieve full credit, they were expected to briefly describe both YRT and Coinsurance in terms of how they managed risk and helped to improve the insurer's capital and articulate which structure was better in meeting the company's objectives. Many candidates only discussed mortality risk and didn't mention that Coinsurance helps with other risks. E.g. investment, lapse, etc. or candidates didn't specify which structure was better. Other candidates only explained YRT and Coinsurance and never stated how those reinsurance structures would help the insurer achieve their objective.

Model Solution for part (a)

Coinsurance is a better option to meet the company's objectives.

Both YRT and coinsurance can help manager and transfer risks. However, YRT only transfers mortality/morbidity risks while coinsurance transfers all risks including insurance, lapse and investment risks.

5. Continued

BLR Life also wants to improve their capital position. YRT provides very limited surplus relief while coinsurance provides significantly more surplus relief and improves capital position by proportionally transferring premiums/benefits/reserves/assets.

(b) Construct the year 1 and 2 gain from operations and balance sheet for BLR Life and CBA Re using the following reinsurance structures:

(i) YRT

(ii) Coinsurance

Commentary on Question:
Candidates were expected to correctly calculate both the Year 1 and Year 2 Gain from Operations and Balance Sheet for both YRT and Coinsurance reinsurance structures. Candidates were given full credit even if there were some small errors (e.g. handling of premium taxes, which were missed by most candidates) provided they were able to demonstrate an understating of how to calculate either the YRT premium or Coinsurance premium which included any applicable reinsurance allowances and ceded reserves as well as the correct determination of the calculation of the reinsurers expenses.

The YRT portion of this question was answered quite poorly by candidates in that they didn't understand how YRT functioned. For example, ceded premiums are determined using the face amount less the YRT retention limit plus annual cession fee. They are not determined using the face amount or YRT retention limit only. Most candidates didn't determine the reinsurance allowance correctly and incorrectly calculated the ceded reserve increase in Year 2 by ignoring the net amount at risk.

Other common mistakes included:

- *Using Year 2 Gains from Operations (i.e., reserve changes) as total policy liabilities for Year 2 on the Balance Sheet;*
- *Assets not being equal to Total Liabilities and Total Capital; and*
- *Gross liabilities for reinsurer differing from the ceding company.*

Refer to the Excel file for the Model solution for part b)

(c) Recommend a reinsurance structure for BLR Life based on part b. Justify your answer.

5. Continued

Commentary on Question:
Candidates were expected to use the information they calculated from part b) to correctly recommend a reinsurance structure with clear reasoning. Note: Even if the candidate's numbers were incorrect from part b), they received full credit if they came to a correct recommendation. A correct answer was expected to incorporate managing risk and capital as well as refer to values within the Gain from Operations and Surplus from Years 1 & 2.

Many candidates repeated their answer from part (a) instead of using the part (b) solution as the question asked. Candidates who took this approach did not receive credit for part (c).

Model Solution for part c).

Calculations show that under YRT, surplus is 920 in year 1 and then 2853 in year 2, while for coinsurance, surplus is 1001 and 1685 in years 1 and 2, respectively. Given these outcomes and the fact that YRT shifts mortality/morbidity risks to the reinsurer, I would recommend that BLR Life utilizes YRT. YRT will shift risk and in this particular scenario, increase available surplus thus improving the company's capital position.

6. Learning Objectives:

1. The candidate will understand the designs of the common Life and Annuity products and their associated features and inherent risks, and the methods to design and price these products.

5. The candidate will understand various techniques for addressing the mitigation of risk within a life insurance and annuity context.

Learning Outcomes:

(1a) Describe and compare various life insurance and annuity product designs.

(5c) Describe how common insurance guarantees generate embedded options and calculate the value of these options.

Sources:

LO1 – ILA101-101-25: Annuity Products and Features, ILA Committee, 2019

LO5 – ILA101-115-25: Simulation of a Guaranteed Minimum Annuity Benefit, Freedman, 2019

LO5 - Excel Model - Stochastic Simulation of a GMAB Option (Accompanies Simulation of a GMAB)

LO5 - An Introduction to Computational Risk Management of Equity-Linked Insurance, Chapter 4, Pricing and Valuation (excluding Section 4.7)

Commentary on Question:

Commentary on question underneath question component.

Solution:

(a) Calculate the present value of the expected profit to the insurer at time 0. Show all work.

Commentary on Question:

One of the most common errors on this subpart was in deducting acquisition and maintenance expenses from the fund value in the account value accumulation.

Solution provided in Excel

(b) Explain the impact to the insurer's risk profile for the following:

(i) The variable annuity is sold without the GMAB rider.

(ii) The underlying fund return is negative over the GMAB period.

(iii) The insurer purchases a put option at issue.

6. Continued

Commentary on Question:
Candidates generally performed well on this subpart.

(i) The insurer would not be able to collect rider charges without the GMAB rider. These riders are often profitable, so the insurer may lose profitability by not selling the GMAB rider. However, the insurer would not be exposed to equity risk because without the rider the policyholder would bear the entirety of the market risk exposure. The insurer still faces fee income risk, as fees depend on fund value and may be insufficient to cover expenses, especially with poor performance or early withdrawals.

(ii) The risk of the insurer will increase. If the underlying fund return is negative, the GMAB will be active if the policyholder holds the fund through maturity. The insurer will face a significant obligation to pay the guaranteed amount to the policyholder, while the difference between the GMAB and the fund value is the net liability to insurer. As a result, this is an extremely risky position for the company to hold since this investment risk is not diversifiable.

(iii) Hedging can significantly reduce the volatility and risk in the insurer's profit. Since the GMAB is essentially a put option, the insurer can hedge the guarantee by purchasing put options. By hedging, the insurer can purchase a put option that will have a payoff that will offset the payoff of the guarantee. There is an upfront cost to purchase the put option which will diminish potential profits.

(c) Describe the expected change to the no-arbitrage cost of the GMAB for each of the following product design changes:

(i) Increase the rider fee from 1.00% to 2.00%.

(ii) Require 50% allocation to a bond fund which will reduce the implied volatility from 20% to 15%.

Commentary on Question:
Candidates could also describe the change in no-arbitrage cost within the context of the Black Scholes formula for the put option equivalent to the GMAB.

6. Continued

(i) This will make the no-arbitrage cost of the GMAB greater, since the fund value will decrease an extra 1% every year, and the put option used to hedge the GMAB will then be more expensive to make up for this extra 1% drop. Higher fee reduces fund value growth over time, increasing likelihood that GMAB is in the money. As a result, the expected guarantee payout at maturity increases, hence higher cost of the put option needed to hedge the GMAB.

(ii) This will lower the no-arbitrage cost of the GMAB. GMAB behaves like an embedded put option and option cost is highly sensitive to volatility, and the cost of a put option decreases as implied volatility decreases. Thus, decreasing implied volatility decreases the no-arbitrage cost of the GMAB.

7. Learning Objectives:

1. The candidate will understand the designs of the common Life and Annuity products and their associated features and inherent risks, and the methods to design and price these products.

Learning Outcomes:

(1c) Describe and apply the common profit metrics (IRR, Value of New Business, Embedded Value, ROE) used in pricing insurance products.

Sources:

ILA101-103-25: Ch. 9 of Life Insurance Products and Finance, Atkinson and Dallas.

ILA101-104-25: Ch. 11, pp. 499-512 of Life Insurance Products and Finance, Atkinson and Dallas.]

Commentary on Question:

Part a and b of the question evaluated candidates' understanding of the calculation of pre-tax stockholder earnings and ROE, both of which are relevant metrics in insurance product pricing. Full credit was awarded for correct answers, including cases with minor errors but correct wording of formulae, while partial credit was given when several components were correct, but the final result was incorrect. No credit was awarded for blank or fundamentally incorrect responses.

Part c of the question evaluated candidates' conceptual understanding and their ability to recommend an appropriate pricing metric. Full credit was awarded to candidates who correctly explained at least two reasons for the differences between the metrics and provided a well-supported recommendation, while partial credit was awarded when explanations were not as well-supported. No credit was given for blank or fundamentally incorrect responses.

Commentary on the performance of each sub-part is provided below.

Solution:

(a) Calculate after-tax stockholder earnings for years 1 through 6.

Commentary on Question:

Overall, candidates' performance was strong in calculating product cash flows and changes in benefit reserves; however, many candidates struggled with DAC amortization, particularly with using the correct sign and reflecting first-year capitalization of acquisition costs, which increases first-year profits. Additional errors included omission of the deferred tax provision, omission of investment income on required capital, or incorrectly including changes in required capital as part of stockholder earnings.

First, calculate pre-tax stockholder earnings:

PreTaxStockEarn(t) = ProdCashFlow(t) – BenResIncr(t) – DACAmort(t) + InvIncome(t) + InvIncRC(t)
The components are defined as follows:
ProdCashFlow(t) = Prem(t) – Ben(t) – Exp(t)
BenResIncr(t) = BenRes(t) – BenRes(t-1)
DACAmort(t) = DAC(t-1) – DAC(t)

Alternatively, candidates could begin with the calculation of pre-tax solvency earnings:
PreTaxSolvEarn(t) = ProductCashFlow(t) + InvIncome(t) – SolvResIncr(t)

And then make the appropriate adjustments to arrive at pre-tax stockholder earnings:
PreTaxStockEarn(t) = PreTaxSolvEarn(t) + SolvResIncr(t) – BenResIncr(t) – DACAmort(t) + InvIncRC(t).

Next, calculate after-tax stockholder earnings:
AfterTaxStockEarn(t) = PreTaxStockEarn(t) – Tax(t) – TaxInvIncRC(t) – DefTaxProv(t).
Where Tax, TaxInvIncRC and DefTaxProv are provided in the question.

(b) Calculate return on equity for years 1 through 6, where equity is defined as the average of stockholder equity at the beginning and end of the year.

Commentary on Question:
Candidates were expected to use the after-tax stockholder earnings calculated in part a; therefore, these amounts were treated as given and correct for the purposes of part b. In addition, EquityBase(t) based on beginning of the year equity or average equity were both equally acceptable. In general, most candidates applied the correct ROE formula; however, a significant number were unable to correctly calculate stockholder equity. For example, some candidates correctly identified most components but made specific omissions, such as failing to include DAC as an asset or DefTaxLiab as a liability. Others demonstrated more fundamental conceptual gaps, such as not recognizing that stockholder equity is derived mostly from balance sheet items.

First, calculate stockholder assets.
StockAssets(t) = SolvRes(t) + ReqCap(t) + DAC(t)

Next, calculate stockholder liabilities.
StockLiabilities(t) = BenRes(t) + DefTaxLiab(t)
Where DefTaxLiab(t) = DefTaxLiab(t-1) + DefTaxProv(t)

Next, calculate the equity and the equity base.

StockEquity(t) = StockAssets(t) – StockLiabilities(t)

If ROE is based on beginning of the year stockholder equity, EquityBase(t) = StockEquity(t-1)

If ROE is based on the average equity of the year, EquityBase(t) = 1/2 × (StockEquity(t-1) + StockEquity(t)), where StockEquity is averaged with zero in the first year.

Finally,
ROE = AfterTaxStockEarn(t) / EquityBase(t)

(c)

(i) Explain how solvency earnings are different than stockholder earnings.

(ii) Recommend the most suitable profit metric based on QWG's objective. Justify your answer.

Commentary on Question:
For part (i), candidates generally performed well in providing at least one explanation for the difference between stockholder and solvency earnings. The most common explanations related to differences in calculation components; however, a meaningful proportion of candidates also discussed differences in purpose and earnings patterns.
For part (ii), most candidates performed well in providing at least one justification supporting the recommendation of either solvency earnings or stockholder earnings. Both recommendations were considered valid when appropriately supported.

(i) There are several reasons:
- Calculation: Solvency earnings resulted from the use of solvency reserves; stockholder earnings resulted from the use of benefit reserves.
- Earnings pattern: While solvency reserves can distort profit by causing significant new business strain, stockholder earnings typically have a smoother earnings pattern.
- Purpose: Solvency earnings represent the amount that can be paid to, or capital contributions from, stockholders. Stockholder earnings represent earnings reported to stockholders.

(ii) Recommend using solvency earnings because
- The company is focused on improving on financial strength rating.
- For a stock insurance company, solvency reserves drive shareholder investments in and return from the business.