

ILA LFMU Model Solutions

Fall 2021

1. Learning Objectives:

6. The candidate will understand important insurance company issues, concerns and financial management tools.

Learning Outcomes:

- (6a) The candidate will be able to describe, apply and evaluate considerations and matters related to:
- Insurance company mergers and acquisitions
 - Management of variable deferred annuities
 - Embedded Value determinations
 - VM-20 financial impacts
 - Rating agency considerations

Sources:

LFM-147-20 Compendium of A.M. Best's Publications

LFM-106-07 Insurance Industry Mergers and Acquisitions, Chapter 4 (Sections 4.1-4.6)

Commentary on Question:

Commentary listed underneath question component.

Solution:

- (a) Describe the three A.M. Best Opinion Outlooks.

Commentary on Question:

This part of the question tested candidates' knowledge on rating agency outlooks and their corresponding results. Candidates generally provided the definitions of the three outlooks without stating the possible outcome. Full credit was received for providing both the definitions and outcomes.

Positive Outlook

- Indicates entity/Issuer/security is experiencing favorable financial/market trends relative to its current BCR
- If trends continue, entity/issuer/security has a good possibility of having its BCR upgraded

1. Continued

Negative Outlook

- Indicates entity/Issuer/security is experiencing unfavorable financial/market trends relative to its current BCR
- If trends continue, entity/issuer/security has a good possibility of having its BCR downgraded

Stable Outlook

- Indicates entity/Issuer/security is experiencing stable financial/market trends relative to its current BCR
- Entity/issuer/security has a low likelihood of having its BCR changed over an intermediate period

- (b) Critique each of the following statements regarding AM Best's Credit Rating process for an insurance company:
- A. *A recommended rating is developed by a Rating Analyst whose interactions with the insurance company's management are restricted to ensure an independent and unbiased rating.*
 - B. *The Rating Analyst's recommendation is reviewed and modified, as appropriate, by a rating review committee before it is voted on and approved by the committee.*
 - C. *The process relies almost entirely on quantitative measures including analysis of accounting ratios, balance sheet strength and key management performance indicators.*
 - D. *The process only considers information available from public sources. AM Best assumes the information is reliable and does not audit it.*
 - E. *Upon reaching a rating decision, if the insurance company does not agree with the rating, AM Best will give the company 30 days to provide additional information that could reasonably be expected to influence the decision. If the company is able to provide such information, AM Best will reevaluate its decision; otherwise, the rating will be released to the public at the end of the 30 days.*

Commentary on Question:

This part of the question tested the candidates' knowledge of the credit rating process for an insurance company. Full credit was received for correctly stating if the statement was correct as well as providing explanations on why the statement is incorrect. Candidates generally did well on this part of the question.

1. Continued

- A. False. Rating Analyst will be in discussion with management throughout the development process
 - B. True
 - C. False. The process incorporates both quantitative and qualitative measures
 - D. False. The process considers private information in addition to public information. However, it is true that AM Best assumes all public information is reliable and does not audit it.
 - E. False. AM Best may grant an appeal if company provides additional information that could reasonably be expected to influence the decision. Once AM Best grants an appeal, the terms are totally at their discretion. Company can also withdraw the rating analysis if they do not agree with the result.
- (c) Insurance company stakeholders include the following:
- Bondholders
 - Stockholders
 - Regulators
 - Policyholders

Describe the relevance of the following ratings to each of the four stakeholders:

- (i) AM Best's Issuer Credit Rating
- (ii) AM Best's Financial Strength Rating

Commentary on Question:

This part of the question tested the candidates' knowledge the Credit Rating and the Financial Strength Rating. Candidates generally did well on this part of the question. Full credit was received if candidates indicated the order of relevance for the stakeholders.

- (i) AM Best's Issuer Credit Rating
 - Most relevant to Bondholders because the rating focuses on the company's credit risk
 - Relevant to Stockholders since the rating is one indication of how safe the company is to invest in
 - Relevant to Policyholders since the rating is one indication of how safe the company is to provide insurance coverage
 - One of many indicators used by Regulators to monitor the company's solvency

1. Continued

- (ii) AM Best's Financial Strength Rating
 - Most relevant to Policyholders because the rating focuses on the company's ability to meet its ongoing obligation
 - Also relevant to Bondholders and Stockholders since the rating is one indication of how safe the company is to invest in
 - One of many indicators used by Regulators to monitor the company's solvency

- (d) Identify four differences between the inputs to an actuarial appraisal and the inputs to an AM Best Issuer Credit Rating.

Commentary on Question:

There are many differences between the inputs to an Actuarial Appraisal and the inputs to an AM Best Issuer Credit Rating. Full credit was received if any four differences were provided with an explanation. A sample of acceptable solutions are provided below.

Items in an actuarial appraisal but not in an AM Best ICR

- Assumptions: an appraisal is heavily dependent upon assumptions, but they do not play a large role in the development of an ICR
- Discounted cash flows: an appraisal is heavily dependent upon discounted cash flows, but they do not impact the development of an ICR

Items in an AM Best ICR but not in an actuarial appraisal

- Internal capital models: in an appraisal, the buyer may impose their own calculations for capital
- Interim management reports: in an appraisal, these reports may influence how major changes or management views are reflected, but they don't have a large impact on the appraisal value

- (e) Describe possible reasons why DEF's appraisal value is higher than ABC's, considering each of the three main components of an actuarial appraisal.

Commentary on Question:

Candidates generally understood the three components that affect the appraisal value. Full credit was received by describing whether the components are different between the two appraisals and why they are different or similar.

Adjusted book value (ABV)

- Should be very similar between the two companies
- ABV is calculated on a statutory basis with minimal room for deviation

1. Continued

Value of in-force business

- Should not be too different
- Assumptions should largely be the same, though life insurer's valuation is likely to be somewhat higher due to administrative synergies resulting in lower expenses

Value of future business capacity

- Could be very different
- Life insurer's valuation could be considerably higher due to more synergies, especially in the areas of distribution channels, underwriting and administration

2. Learning Objectives:

5. The candidate will understand the fundamental purpose of capital, and its determination and stakeholders.

Learning Outcomes:

- (5a) The Candidate will be able to describe and evaluate the theory of capital (including economic capital), and evaluate its applicability for various purposes and its value to different stakeholders.

Sources:

A Multi-Stakeholder Approach to Capital Adequacy, Conning Research

Economic Capital for life Insurance Companies, SOA Research paper, Oct 2016 (exclude sections 5 and 7)

Commentary on Question:

This question tested the candidates' understanding of economic capital and applying the multi-stakeholder, multi-objective approach.

Solution:

- (a) Calculate the amount of RBC and S&P capital available for release for year 1. Show all work.

Commentary on question:

Candidates were generally able to demonstrate knowledge of all the key steps to perform the required calculations. Common errors included using the probability of downgrade or default over 1 year; not apply discounting; and using the ratio of available capital / risk threshold instead of taking the difference.

Please refer to the excel for the model solution

- (b) (2 points) You are given the following additional capital information:

- Capital available for release based on the current economic capital model with VaR 99.5 over 1 year: 400,000
- Capital available for release in year 2

Financial Variable	Year 2
RBC (Default)	-50,000
S&P CAR (Downgrade)	500,000

Contrast the difference between PCLC's results when using the economic capital method versus the multi-objective approach.

2. Continued

Commentary on question:

Candidates who described the capital excess / deficiencies at each time period and how it links to multi-stakeholder generally did well on this question. Full credit was received when discussing the need to balance the objectives of the different capital metrics. Candidates generally identified the capital available for release or shortfall under EC and RBC. Few candidates noted the S&P amount for both year 1 and year 2. Candidates that did well identified that the company would require additional capital of 50K in year 2 under RBC and used that to explain the value of a multi-objective view.

Economic capital model indicates there is an excess capital of 400,000 that can be released. Capital of 379,000 can be released under the RBC model in year 1, but there is a deficit in year 2.

Under S&P, there is excess capital in both year 1 and 2 (284k and 500k).

The different capital models indicate that there is enough capital to be released in year 1 from the different stakeholder viewpoints, but not in year 2 where the challenge is on RBC where capital cannot be released. The company needs to assess their objectives, as well as meeting RBC and S&P requirements by finding the right weightings on each capital requirement and optimize what is best for the company.

- (c) Critique the following statements:

Commentary on question:

Candidates generally did well on statements A and D. For statements B and C, candidates generally only critiqued part of the statement. Candidates need to comment on the full statement to receive full credit.

For statement A, candidates who discussed the policyholder or shareholder perspective received full credit. Candidates had to discuss other uses of economic capital to receive full credit.

For statement B, candidates need to critique both sentences to receive full credit. Candidates generally did well critiquing the second sentence, but only received partial credit on the first sentence if they only mentioned that the statement is false without any reasoning related to multi-stakeholder considerations.

2. Continued

For statement C, full credit was received if the candidate critiqued all three parts of the statements. Partial credit was received if a candidate only mentioned both capital metrics have real consequences without substantiating those consequences. Some candidates had difficulty articulating that the RBC and S&P factors are based on industry information applied to company data. There was some confusion that the factors were based on company specific data.

For statement D, candidates generally received full credit. Some candidates gave alternative advantages instead, which received partial credit. Some candidates noted that VAR is not coherent and leads to inconsistent results when aggregating capital. Many candidates responded from the perspective of what CTE is rather than what VAR is not, which received partial credit.

- A. *Economic capital is a key measure of risk from a regulatory perspective and used only for capital adequacy.*

False. Economic capital is a key measure of risk from a company perspective. It is not only used for capital adequacy, but is also used for performance measurement and management, risk-based decision making, business strategic decision making, M&A etc.

- B. *In consideration of all stakeholders' risk and capital adequacy objectives, the economic capital method is an appropriate measure. All current capital approaches apply only to the insurance industry.*

Both sentences in the statement are false. The economic capital method is not an appropriate measure as it only considers one view from a company perspective. It does not consider multiple stakeholder view. Instead, a multi-stakeholder approach should be used since it produces capital indications across various key financial measures, time horizons, and risk tolerances.

Economic capital, as well as multi-stakeholder approach can be applied beyond the insurance industry to any industry where there are multiple stakeholders e.g Banking sector.

- C. *A similarity in the RBC ratio and S&P CAR is that both have a real consequence if you fall below a certain threshold and both have a solvency focus. Risks in RBC ratio are modeled and calibrated based on industry experience, but S&P CAR is based on company experience.*

Partially correct. Both RBC and S&P CAR have real consequences under certain threshold. For RBC, this is a solvency requirement where regulatory intervention such as submission of action plans to a regulatory takeover of the management of the company can happen.

2. Continued

S&P CAR impacts the rating of the company. Having a lower level of capital under the threshold can lead to a rating downgrade, which has implications for the company such as the cost of attracting new capital, perception from policyholders' and agents' on the ability of the company to fulfill its obligations.

Both RBC and S&P CAR are based on industry experience rather than company experience. They are based on formula-based, fairly objective and consistently applied across the industry, making the resulting ratios more straightforward to calculate, decompose and compare. Most of the information to calculate these formulas are publicly available.

D. One of the advantages of VaR, relative to CTE, is that it can lead to consistent results when aggregating capital.

False. VaR does not lead to consistent results when aggregating capital because it not a coherent measure.

3. Learning Objectives:

5. The candidate will understand the fundamental purpose of capital, and its determination and stakeholders.

Learning Outcomes:

- (5a) The Candidate will be able to describe and evaluate the theory of capital (including economic capital), and evaluate its applicability for various purposes and its value to different stakeholders.

Sources:

Statutory Valuation of Individual Life and Annuity Contracts, Claire, D., Lombardi, L. and Summers, S., 5th Edition, 2018 - Chapter 29: Risk-Based Capital

LFM-148-20 The Theory of Risk Capital in Financial Firms

Commentary on Question:

This question tested the candidates' knowledge of capital. Parts (a) and (b) focused on aspects of NAIC RBC capital, part (c) on evaluating a single scenario, and part (d) on creating a risk-capital balance sheet.

Solution:

- (a) Calculate the risk-based capital (RBC) weighted size factor for XBM's bond portfolio. Show all work.

Commentary on Question:

Candidates generally did well on this part of the question. Common errors include counting issues as issuers (issues are not independent from an asset default perspective, issuers are); and calculating the number of weighted issuers but not calculating a weighted size factor or including a doubled charge for the first ten bonds.

For 500 different issuers the weighted size factor is:

$$1.16 = 580 / 500 = (50 * 2.5 + 50 * 1.3 + 300 * 1.0 + 100 * 0.9) / 500$$

- (b) Describe how XBM should evaluate each of the RBC C-3 risks for its GICs.

Commentary on Question:

Common errors or omissions include not discussing the applicability of health risk or market risk; discussing interest rate risk and not defining it; defining low, medium, and high categories without referencing the GICs; mentioning GICs are low risk but not describing the factor; and not discussing the liquidity risk resulting from selling the asset at a loss and the additional risk due to lower investment return than the guaranteed rates.

3. Continued

Some candidates either did not discuss C-3 Phase 1 testing or went into detail about how C-3 Phase 1 testing, including exclusion testing, is performed. For C-3 it is a factor applied and some form of C-3 testing for business including GICs. Completed testing will nearly always reduce required capital below full factor amount and, thus, a company will include as much business as possible in C-3 testing.

C-3 is for Interest Rate Risk, Health Credit Risk and Market Risk. For GICs:

- Health credit risk is not relevant because this is not a health product
- Market risk is not relevant because this is not a variable product
- Interest rate risk is relevant as it is risk due to changes in interest rates

Interest rate risk occurs when insurer must 1) reinvest cash flows when the levels of interest rates have fallen below the level guaranteed to policyholders or 2) sell assets at a loss when the level of interest rates have risen above the rates at the time when the assets were purchased.

Given these GICs have no withdrawal prior to maturity, they are Low-Risk. RBC factor is 0.77% if unqualified actuarial opinion based on asset adequacy testing, otherwise 1.15%.

Insurer may have to perform C-3 Phase 1 cash flow testing.

3. Continued

- (c) For a particular scenario for C-3 Cash Flow Testing, you are given annual projected surplus results and the projected one-year Treasury rates for that scenario. Assume a 21% tax rate.

t	Surplus(t)	Treasury(t)
1	-30	2.0%
2	-50	3.0%
3	-30	4.0%
4	0	4.0%
5	30	4.0%
6	60	4.0%
7	90	4.0%
8	120	4.0%
9	140	4.0%
10	130	4.0%
11	120	4.0%
12	110	4.0%
13	100	4.0%
14	80	4.0%
15	60	4.0%
16	30	4.0%
17	0	4.0%
18	-20	3.0%
19	-50	2.0%
20	-80	1.0%

Calculate the scenario-specific C-3 measure. Show all work.

Commentary on Question:

Most candidates adjusted the interest rate by 1.05, but not the tax adjustment (1-0.21) as described in Step 1. Some candidates did not create discount rates that discounted to time 0 in Step 2. In general candidates instead adjusted the tax rate to the PV balances. In discounting, some candidates discounted a rate back by itself alone instead of following rates from the path provided for each prior year. Few candidates created a CTE calculation as if 20 scenario results were provided or summed PV Surplus amounts.

3. Continued

Few candidates correctly realized only years 1-3 & 18-20 might contribute to a min PV Surplus as all other years are $\Rightarrow 0$. More specifically, without calculation, a candidate can realize it is either -50 (year 2) or -80 (year 20) that will control min PV Surplus and it will depend on adjustments and discount rates as to which and to exact value.

Step 1: Adjust rates, multiply by 1.05 and $(1 - 0.21)$ to make it after-tax

Step 2: Discount rates, $1 / (1 + \text{Step 1 adjusted rate})$ & discount to time 0

Step 3: PV Surplus: Multiply Surplus by Step 2 discount rate

Step 4: Find minimum PV Surplus

t	Surplus	Rate	1: Adjust Rates	2: Discount Rates	3: PV Surplus	4: Min PV Surplus
1	-30	2%	.016590	.98368	-29.51	
2	-50	3%	.024885	.95980	-47.99	<Minimum
3	-30	4%	.033180	.92897	-27.87	
4	0	4%	.033180	.89914	0.00	
5	30	4%	.033180	.87026	26.11	
6	60	4%	.033180	.84232	50.54	
7	90	4%	.033180	.81527	73.37	
8	120	4%	.033180	.78908	94.69	
9	140	4%	.033180	.76374	106.92	
10	130	4%	.033180	.73922	96.10	
11	120	4%	.033180	.71548	85.86	
12	110	4%	.033180	.69250	76.17	
13	100	4%	.033180	.67026	67.03	
14	80	4%	.033180	.64873	51.90	
15	60	4%	.033180	.62790	37.67	
16	30	4%	.033180	.60774	18.23	
17	0	4%	.033180	.58822	0.00	
18	-20	3%	.024885	.57394	-11.48	
19	-50	2%	.016590	.56457	-28.23	
20	-80	1%	.008295	.55993	-44.79	

Scenario-specific C-3 measure = -47.99 or 47.99 greatest accumulated deficiency

(d) You are given the following items from XBM's balance sheet:

- The investment portfolio is 2,000
- GIC Liability is 990
- Debt issued is 950
- Total assets are 2,000

3. Continued

You are also given:

- Par amounts for both the GIC liability and the debt issued are 1,000 each
- The risk capital associated with the investment portfolio is 200

Construct the risk-capital balance sheet.

Commentary on Question:

Candidates generally understood the Capital side of the Risk-Capital Balance Sheet more than on the Asset side. Candidates generally understood the Capital side is meant to be default-free, thus par amounts and the risk capital are shown there. Candidates generally identified the asset portfolio of 2,000 and the risk capital of 200 correctly.

Note: The asset insurance items are listed with corresponding capital provider. The order in which they are shown is not important. They are illustrated this way to better illustrate reasoning. Specifically listing the items below is not necessary for full credit.

Risk-Capital Balance Sheet

Assets		Capital	
Asset portfolio	2,000	Cash Capital (Default Free)	
Asset insurance			
Customers (“catastrophe”)	10	Customers (GICs)	1,000
Debtholders (“disaster”)	50	Debtholders	1,000
Equity Holders (“residual”)	140	Equity Holders	0
Total Insurance	200	Total Cash Capital	2,000
		Risk Capital (Equity Holders)	200
Total Assets	2,200	Total Capital	2,200

- Customers provide a small amount as “catastrophe” loss is rare. Customer asset insurance is 10 (= 1,000 – 990), where 990 is GIC liability
- Debtholders provide some amount as “disaster” is unlikely. Debtholder asset insurance is 50 (= 1,000 – 950), where 950 is debt
- Equity holders will have the “residual” of asset insurance. Equity holder asset insurance is 140 (= 200 – 10 – 50)
- Equity factor (70% = 140/ (0+200)) >> debt factor (5% = 50/1000) >> customer factor (1% = 10/1000); As a reasonableness check this holds true ✓
- Asset portfolio matches Total cash capital; Equity holder capital = 0 (= Asset portfolio – Cash capital excluding equity).

4. Learning Objectives:

1. The candidate will understand and apply U.S. GAAP valuation principles and methods applicable to individual life insurance and annuity products issued by U.S. life insurance companies.
3. The candidate will:
 - Understand the significant impact on individual life insurance and annuity product design and management of U.S. insurance product taxation rules.
 - Understand and apply the significant rules of U.S. insurance company taxation as they apply to U.S. life insurers.

Learning Outcomes:

- (1b) Describe and apply the requirements, calculations, and disclosures related to GAAP "Targeted Improvements".
- (3b) Describe, apply and evaluate the valuation methods and techniques for specific insurance products under U.S. taxation rules. Further, evaluate and calculate deferred tax items.

Sources:

LFM-846-20: Company Tax – Introductory Study Note

US GAAP for Life Insurers, Herget et al., 2nd Edition, 2006, Chapter 3 (exclude 3.7.3, 3.11.4.5, and 3.12)

LFM-841-20 A Closer Look at How Insurers Will Have to Change their Accounting and Disclosures for Long-Duration Contracts, E&Y, Nov 2018

Commentary on Question:

This question tested the candidates' knowledge of U.S. GAAP and Tax issues.

Solution:

- (a) You are given the following data for a variable life insurance contract:

	12/31/2019	12/31/2020
Net surrender value	1,180	1,375
Separate account reserve under Section 817 of the Internal Revenue Code	1,200	1,385
Amount determined using the tax reserve method otherwise applicable to the contract	1,380	1,540
Statutory reserve excluding the deficiency reserve	1,370	1,510
Statutory deficiency reserve	120	105

4. Continued

Calculate the deduction for the increase in reserves on the 2020 tax return. Show all work.

Commentary on Question:

Candidates generally used the statutory reserve rather than the amount determined using the tax reserve method otherwise applicable to the contract in the formula. Candidates generally did not cap the tax reserve at the statutory reserve excluding the deficiency reserve. Candidates generally calculated the tax on the deductible, although it did not result in a loss of credit.

The tax reserve is the sum of A and B, but not greater than the statutory reserve excluding the deficiency reserve,
where A = greater of (i) the net surrender value and (ii) the separate account reserve under IRC Section 817,
and B = 92.81% of the excess (if any) of the amount determined using the tax reserve method otherwise applicable to the contract over the amount determined in A

The increase in tax reserve is the deduction for 2020.

Calculations:

Step 1: Calculate Tax Reserve for 2019

A= max (net surrender value, separate account reserve under IRC Section 817)

= max (1180,1200) = 1200

B= max (0,92.81% x (1380-A))

= max (0,92.81% x (1380-1200))

= 167.06

2019 Tax Reserve = min(stat reserve excluding deficiency reserve, A+B)

=min(1370,1200+167.06) =1367.06

Step 2: Calculate the tax reserve for 2020

A= max (net surrender value, separate account reserve under IRC Section 817)

= max (1375,1385) = 1385

B= max (0,92.81% x (1540-A))

= max (0,92.81% x (1540-1385))

= 143.86

2020 Tax Reserve = min(stat reserve excluding deficiency reserve, A+B)

=min(1510,1385+143.86) =1510

Step 3: Calculate the increase in tax reserve in 2020

Increase in tax reserve = 2020 Tax Reserve – 2019 Tax Reserve

=1510 – 1367.06 = 142.94

Step 4: The deduction in 2020 is equal to the increase in tax reserve – 142.94

4. Continued

(b) Assume:

- QRS has adopted Long-Duration Targeted Improvements (LDTI) for GAAP and has elected the amount of insurance in force as the constant level basis for amortizing deferred acquisition costs over the life of the contracts
 - QRS is a calendar year taxpayer and has more than 15 million of specified policy acquisition expenses each year
- (i) Calculate the expected amount of GAAP DAC amortization in 2023. Show all work.
- (ii) Calculate the expected amount of DAC Tax amortization in 2023. Show all work.

Commentary on Question:

Candidates generally did not demonstrate knowledge that part (i) is about GAAP DAC and part (ii) is about Tax DAC. These are two separate concepts and are governed by different principles.

For part (i), only excess acquisition expenses are eligible for deferral. Renewal expenses do not get deferred. Since a lot of information provided, it is important to use the correct data for the calculations.

For part (ii), all premium is subject to DAC Tax, not just first year premium. Although it does not apply, a small company special treatment allows a shorter amortization period. The amortization starts in the first month of the second half of the calendar year, and for calendar year taxpayers, this means that the first-year amortization is only half of the annual amortization.

- (i)
The deferrable expense is the excess of first year commissions over renewal commissions. This amount is capitalized and amortized on a straight-line basis, based on insurance in force at the beginning of the year.

Method 1

Calculations:

Step 1: Calculate the deferrable expense:

$$\begin{aligned} & (\text{first year commission rate} - \text{renewal commission rate}) \times \text{first year premium} \\ & = (15\% - 3\%) \times 15,000 = 1800 \end{aligned}$$

4. Continued

Step 2: Calculate the amortization in 2023:
= 1800 x (inforce at the beginning of 2023 / sum of projected inforce amounts)
= 1800 x (1,470,000 / 25,000,000)
= 1800 x 0.0588
= 105.84

Method 2

Calculations:

Step 1: Calculate the deferrable expense:

(first year commission rate – renewal commission rate) x first year premium
= (15% - 3%) x 15,000 = 1800

Step 2: Calculate the amortization in 2022:
= 1800 x (inforce at the beginning of 2022 / sum of projected inforce amounts)
= 1800 x (1,500,000 / 25,000,000)
= 1800 x 0.06
= 108

Step 3: Calculate EOY DAC for 2022
= 1800 – 180 = 1692

Step 4: Calculate the amortization in 2023:
= 1692 x (inforce at the beginning of 2023 / updated sum of projected inforce amounts)
= 1692 x (1,470,000 / (25,000,000-1,500,000))
= 1692 x 0.0623
= 105.84

(ii)

For each taxable year, a percentage of premium is capitalized. This applies to all premium, not just first year.

For life insurance, the percentage is 9.2%.

The amortization period is 180 months and begins with the first month in the second half of the taxable year.

A special rule allows a portion of the amount capitalized to be amortized over 60 months if the company's specified policy acquisition expenses for the taxable year are less than 15 million.

Since QRS has more than 15 million of specified policy acquisition expenses each year, it does not qualify for the special small company rule and will have to amortize capitalized amounts over 180 months.

4. Continued

Calculations:

Step 1: Calculate the amount capitalized in 2022: $9.2\% \times 2022 \text{ premium} = 0.092 \times 15,000 = 1380$.

Step 2: For the amount capitalized in 2022, calculate the amount amortized in 2023. Since the premium was received in 2022, there will be a full year of amortization in 2023: $(1380 / 15) = 92$

Step 3: Calculate the amount capitalized in 2023: $9.2\% \times 2023 \text{ premium} = 0.092 \times 14,700 = 1352.40$

Step 4: For the amount capitalized in 2023, calculate the amount amortized in 2023. Since the premium was received in 2023, there will be a half year of amortization: $(1352.40 / 15) \times 0.5 = 45.08$

Step 5: The total amount of DAC Tax amortization in 2023 is the sum of Steps 2 and 4: $92 + 45.08 = 137.08$.

5. Learning Objectives:

1. The candidate will understand and apply U.S. GAAP valuation principles and methods applicable to individual life insurance and annuity products issued by U.S. life insurance companies.
2. The candidate will understand and apply U.S. Statutory valuation principles and methods applicable to individual life insurance and annuity products issued by U.S. life insurance companies.

Learning Outcomes:

- (1c) Describe, apply and evaluate the appropriate accounting treatments for derivatives and hedging arrangements.
- (2a) Describe, apply and evaluate the appropriate valuation methods and techniques and related accounting treatments for reserves and related items, and other assets and liabilities for specific insurance products under the U.S. Statutory rules. Further, describe and recommend assumptions and margins appropriate to these statutory reserves.

Sources:

Statutory Valuation of Individual Life and Annuity Contracts by Claire, D., Lombardi, L. and Summers, S., Chapter 16 (exclude 16.4.2-3)

LFM-840-20 A Comprehensive Guide - Derivatives and Hedging, E&Y, 2019
(Sections 1.1-1.7, 3.1-3.3, 4.1-4.3, 9.1-9.5, Appendices A and C1.1-4)

Commentary on Question:

This question tested the candidates' understanding of an indexed UL contract and the steps in calculating the statutory reserve for an indexed UL policy.

Solution:

- (a) Calculate the following rates to be applied to the indexed portion of the fund balance:
 - (i) Indexed credited interest rate applied at the end of 2019 using the Point-to-Point Method with a 3 year participation period.
 - (ii) Indexed credited interest rate applied at the end of 2019 using the High-Water Mark Method with a 3 year participation period.
 - (iii) Indexed credited interest rate applied during the initial participation period in the calculation of the guaranteed maturity fund values
 - (iv) Indexed credited interest rate applied after the initial participation period in the calculation of the guaranteed maturity fund values

Show all work.

5. Continued

Commentary on Question:

Few candidates received full credit on this part of the question, but most candidates were able to demonstrate a good understanding of the components required to calculate the interest rates credited to a universal life policy fund.

For parts (i) and (ii), a common mistake was the omission of the 3-year participation period in the calculation of the participation cap and/or floor. Some candidates annualized the index return or calculated the index return from 2018 to 2019 only. Candidates that did not account for the participation floor or that did not compound the margin still received full credit.

For parts (iii) and (iv), partial credit was received if candidates used guaranteed rates different from the participation floor.

- (i) Point-to-Point method with a 3 year participation period:

$$\text{credited rate} = \max\left(PF, \min\left(PC, PR \times \left(\frac{I_{2019}}{I_{2016}} - 1\right) - PM\right)\right)$$

$$\text{Where PF} = \text{participation floor} = (1+1.5\%)^3 - 1 = 0.0457$$

$$\text{PC} = \text{participation cap} = (1+10\%)^3 - 1 = 0.3310$$

$$\text{PR} = \text{participation rate} = 75\%$$

$$\text{PM} = \text{participation margin} = (1+0.5\%)^3 - 1 = 0.0151$$

$$\begin{aligned}\text{credited rate} &= \max\left(0.0457, \min\left(0.3310, 0.75 \times \left(\frac{3231}{2252} - 1\right) - 0.0151\right)\right) \\ &= 0.3110\end{aligned}$$

- (ii) High-Water Mark method with a 3 year participation period:

$$\text{credited rate} = \max\left(PF, \min\left(PC, PR \times \left(\frac{I_{\max}}{I_{2016}} - 1\right) - PM\right)\right)$$

$$\text{Where PF} = \text{participation floor} = (1+1.5\%)^3 - 1 = 0.0457$$

$$\text{PC} = \text{participation cap} = (1+10\%)^3 - 1 = 0.3310$$

$$\text{PR} = \text{participation rate} = 75\%$$

$$\text{PM} = \text{participation margin} = (1+0.5\%)^3 - 1 = 0.0151$$

$$\begin{aligned}\text{credited rate} &= \max\left(0.0457, \min\left(0.3310, 0.75 \times \left(\frac{3248}{2252} - 1\right) - 0.0151\right)\right) \\ &= 0.3166\end{aligned}$$

- (iii) During the initial participation period, the indexed credited interest rate is determined using the following formula:

$$ic_0^{IGRM} = ic_0^G + oc_0 \times (1 + Si)$$

5. Continued

Where ic_0^G is the guaranteed credited rate (the participation floor in this case) of 1.5%

oc_0 is the option cost of 3.0%

Si is the statutory valuation rate of 4%.

$$ic_0^{IGRM} = 1.5\% + 3.0\% \times (1 + 4.0\%) = 4.62\%$$

(iv) After the initial participation period, the indexed credited interest rate is determined using the following formula:

$$ic_0^{IGRM} = ic_0^G + oc_{MA} \times (1 + Si)$$

Where ic_0^G is the guaranteed credited rate of 1.5%

oc_{MA} is the moving average option cost of 2.5%

Si is the statutory valuation rate of 4%.

$$ic_0^{IGRM} = 1.5\% + 2.5\% \times (1 + 4.0\%) = 4.10\%$$

(b) List four of the “Hedged as Required” criteria that must be met for the Implied Guaranteed Rate Method in Actuarial Guideline 36.

Commentary on Question:

Candidates that listed any four of the five criteria required for “Hedged as Required” as per Actuarial Guideline 36 received full credit on this part of the question.

Criteria needed for “Hedged as Required”:

- The option used is in-line with the contract benefits in terms of contract features (e.g. option type, strike price and term, index, etc.)
- Amount for hedge must substantially cover the greater of the account value or reserve
- Must have a plan for hedging risks associated with interim benefits such as death benefits or early surrenders.
- Must have a monitoring system that measures the effectiveness of the hedging strategy.
- Differences from hedging plan must be measurable and within a maximum tolerance level.

(c) Critique each of the following statements regarding GAAP valuation of the embedded derivative in an equity-indexed universal life policy:

A. *The appreciation in the account value arising from the equity-indexed feature is an embedded derivative requiring bifurcation. If the death benefit amount is also dependent on the cumulative return of the index, then that feature is also an embedded derivative requiring bifurcation.*

5. Continued

- B. Embedded derivatives requiring bifurcation are reported at fair value on the balance sheet, and any gains or losses resulting from changes in the fair value are recognized in current earnings.*
- C. The valuation of embedded derivatives requiring bifurcation should be based on assumptions about the future performance of the equity index. These assumptions can be obtained from any reliable source and do not necessarily have to be based on current market conditions.*
- D. The valuation of embedded derivatives requiring bifurcation should consider the credit risk of the insurance company issuing the policy as well as the credit risk of the insurance company's counterparties.*

Commentary on Question:

Candidates generally did well on this part of the question. For statement B, partial credit was received if the candidate mention that changes in fair value are recognized in OCI.

- A. The first statement is true. However, the second statement is false as the benefit can only be obtained upon the death of the insured.
- B. It is true that embedded derivatives requiring bifurcation are reported at fair value on the balance sheet. If the derivative does not qualify as hedging instrument, changes in fair value are reported in current earnings. Otherwise, the portion recognized in current earnings depends on the type of hedge being used.
- C. The first statement is true. The second statement is false; assumptions should be based on current market conditions whenever possible.
- D. The statement is true.

6. Learning Objectives:

1. The candidate will understand and apply U.S. GAAP valuation principles and methods applicable to individual life insurance and annuity products issued by U.S. life insurance companies.
2. The candidate will understand and apply U.S. Statutory valuation principles and methods applicable to individual life insurance and annuity products issued by U.S. life insurance companies.

Learning Outcomes:

- (2b) Describe, apply and evaluate the Principle-Based Reserves valuation methods and techniques for specific insurance products under U.S. Statutory rules.

Sources:

Chapter 17: US GAAP - Reinsurance 17.4 to 17.6 (exclude 17.5.1, 17.6.1, 17.6.3.4, and 17.6.3.5)

Chapter 4: US GAAP - Traditional Life Insurance (SFAS 60 & 97) (exclude 4.4 to 4.14)

ASOP 52 - Principle-Based Reserves for Life Products under the NAIC Valuation Manual on PBR for Life Products, Section 3

Commentary on Question:

This question tested the candidates' understanding of reinsurance and its financial reporting requirements.

Solution:

- (a) Calculate the FAS60 ceded benefit reserve at the end of year 1 on the following alternative reinsurance arrangements:
- (i) Coinsurance
 - (ii) YRT

Show all work.

Commentary on Question:

Candidates were generally able to calculate the ceded benefit reserve for a coinsurance arrangement. Candidates generally had difficulty calculating the ceded benefit reserve for a YRT arrangement.

6. Continued

- (i) Coinsurance

Ceded Benefit Reserve(1) = Coinsurance Rate x JKC's Benefit Reserve before Reinsurance = 75% x 5 = 3.75

- (ii) YRT

Using retrospective reserve formula,

Ceded Benefit Reserve(1) = ((Ceded Benefit Reserve(0) – ((Present Value of Mortality Expense Reimbursed / Present Value of Ceded Premium Income) x Ceded YRT Premium Paid)) x (1 + Investment Rate) + (Mortality Expense Reimbursed x (1 + Investment Rate)^{0.5}) / (Inforce(1) / Inforce(0)), where

Ceded Benefit Reserve(0) = 0,

Present Value of Mortality Expense Reimbursed / Ceded Premium Income = 0.7,

Ceded YRT Premium Paid = Amt Ceded x 1st Year YRT Rate (Per 1000) / 1000, where

Amt Ceded = Coinsurance Rate x JKC's 1 Year NAR = 0.75 x 200 = 150, and thus,

Ceded YRT Premium Paid = 150 x 1.5 / 1000 = 0.225,

Mortality Expense Reimbursed = Amt Ceded x 1st Year Mortality Rate = 150 x 0.008 = 1.2,

Inforce(0) = 1,

Inforce(1) = 1 – 1st Year Mortality Rate = 1 – 0.008 = 0.992, and

Investment Rate = 0.04.

Thus,

Ceded Benefit Reserve(1) = (((0 – (0.7 x 0.225)) x 1.04) + (1.2 x (1.04^{0.5}))) / (0.992 / 1) = (- 0.1638 + 1.223764683) / 0.992 = 1.068513

6. Continued

(b) Critique the following statements:

- A. *The information given is sufficient to demonstrate that JKC has fulfilled the requirements necessary to qualify for reinsurance treatment under FAS 113.*
- B. *As long as a contract qualifies for reinsurance accounting under FAS 113, the ceding company should report liabilities on reinsured contracts net of the effects of reinsurance. In assumption reinsurance, if the ceding company incurs a loss due to the assumption arrangement, that loss should be amortized over the contract period.*
- C. *Reinsurance on contracts classified as investment contracts for GAAP sometimes qualify for reinsurance accounting under FAS 113, such as single-premium deferred-annuity contracts. The accounting treatment is the same as other reinsurance arrangements.*
- D. *After the reinsurance contract takes effect, the PBR statutory reserve from the perspective of JKC uses best estimate assumptions. Unlike in GAAP, the PBR gross and ceded reserves should be reported on an aggregated basis. The PBR has a net premium reserve floor using company specified assumptions.*
- E. *Compared to YRT, ceded reserves are lower for a coinsurance structure, and first year profits are generally higher for coinsurance.*
- F. *Both a YRT and a coinsurance arrangement can result in profits, net of reinsurance, that are a level percentage of premiums.*

Commentary on Question:

Candidates generally provided the necessary changes to validate the statements. A common error was to declare a statement true, false, correct, or incorrect without justification.

For statement D, the “aggregate basis” is referring to the consolidation of gross and ceded reserves, or net reserves, rather than consolidating such reserves across product lines.

For statement F, candidates were generally aware that profits for both YRT and coinsurance rarely emerge as a level percentage of premium primarily due to assumptions not matching reality. However, statement F did use the word “can”, which implies the possibility that earnings can emerge as a level percentage of premium, which is a principle of FAS 60, the GAAP accounting basis that is applicable to the level-premium non-participating whole life insurance product that the statement was referencing.

6. Continued

Statement A: Sufficient information is not given to demonstrate that JKC has fulfilled the requirements necessary to qualify for reinsurance treatment under SFAS 113, which include:

- a. the reasonable possibility that the reinsurer may realize significant loss from assuming insurance risk, and
- b. the reinsurance treaty on long-duration contracts transfers substantially all the insurance risk on the reinsured portions of the underlying contracts to the reinsurer.

Statement B: SFAS 113 does not permit the ceding company to report liabilities on reinsured contracts net of the effects of reinsurance, except for assumption reinsurance. Any unearned premium, claim, or benefit reserve credits arising from reinsurance are to be reported as reinsurance receivable assets by the ceding company for GAAP reporting purposes. If the ceding company incurs a loss due to the assumption arrangement, that loss must be recognized immediately.

Statement C: Reinsurance of contracts classified as investment contracts for GAAP do not qualify for reinsurance accounting under SFAS 113. Reinsurance treaties that do not qualify for GAAP reinsurance accounting under SFAS 113 are to be reported as deposits. Such accounting treatment is the same as though the reinsurance arrangement was a financing transaction or a loan.

Statement D: After the anticipated experience assumptions are established, the actuary should modify each assumption to include a margin for estimation error and moderately adverse deviation, such that the stochastic reserve or deterministic reserve being calculated is increased. With regard to non-guaranteed YRT, reserve credit is based on pre-PBR (VM-20) reserve standards. Both GAAP and PBR require gross and ceded reserves to be reported separately. PBR has a net premium reserve floor using prescribed assumptions.

Statement E: Ceded reserves for coinsurance are higher than ceded reserves for YRT because coinsurance transfers more risks to the reinsurer than YRT, which transfers just the mortality risk. First-year profits for coinsurance are generally lower than first-year profits for YRT since more profits under coinsurance are transferred to the reinsurer than under YRT.

Statement F: For coinsurance, profits net of reinsurance can display profit as a level percentage of the net premium since both of the direct and the reinsured businesses, individually, follow the “level percentage of premium” approach. With regard to YRT, it is possible to amortize the cost of reinsurance so that emerging profits are a level percentage of the direct premium on the policies being reinsured. In such a case, profits net of reinsurance can emerge as a level percentage of premiums net of reinsurance, provided actual experience matches reserve assumptions.

7. Learning Objectives:

4. The candidate will understand the fundamental features of the U.S. and International regulatory framework.
5. The candidate will understand the fundamental purpose of capital, and its determination and stakeholders.

Learning Outcomes:

- (5a) The Candidate will be able to describe and evaluate the theory of capital (including economic capital), and evaluate its applicability for various purposes and its value to different stakeholders.

Sources:

LFM-144-20 The Modernization of Insurance Company Solvency Regulation in the US, Klein, Networks Financial Institute Policy Brief 2021

Lombardi, Chapter 29 – Risk Based Capital, Valuation of Insurance Liabilities, 5th Ed.

LFM-145-20 Global Insurance Regulatory Issues: Implications for U.S. Policy and Regulation, Nov. 2015 (excl pg. 20-29 for US)

Commentary on Question:

This question tested the candidates' knowledge of U.S. and international capital standards.

Solution:

- (a) Describe how existing US capital standards differ from an International alternative such as Solvency II.

Commentary on Question:

Full credit was received if at least four of the differences below were described.

- US System is static formula and ratio-based whereas the European systems are dynamic and model-based
 - US RBC takes a “one-size fits all” approach, Solvency II and Swiss Solvency Test can be geared to individual company characteristics
 - US RBC omits some risks that can be quantified (operational and catastrophe)
 - A model-based approach has the desirable attributes of compelling insurers to take a more forward-looking and comprehensive view
 - Capital Calibration = RBC: VaR 95, Solvency II: VaR 99.5
- (b) Describe four principles of the NAIC’s Solvency Modernization Initiative.

7. Continued

Commentary on Question:

Full credit was received if the candidate described at least four of the principles below. Few candidates stated the principles of NAIC's solvency modernization initiative. Candidates generally described them, resulting in partial credit.

Capital Requirements

- Introduction of property-casualty catastrophe risk charge
- Increased granularity of asset and investment risk charges (C-1)
- Refinement of credit risk charge for reinsurance recoverables

Governance and Risk Management transparency

- Made up of 4 parts: risk management, actuarial analysis, internal audit, and internal controls
- ORSA report
- A framework of rules and practice by which a board of directors ensures accountability, fairness, and transparency in an insurer's relationship with all of its stakeholders.

Group Supervision

- Coordinated financial regulatory structure for groups which contains insurance companies and the financial condition of these companies are not compromised by the activities of their groups.
- “windows and walls” approach
- Four goals: effective communication (Memoranda of Understanding (MOUs)), supervisory colleges, regulators' access to and collection of information, enforcement measures

Statutory Accounting and Financial Reporting

- The objective is to achieve greater standardization in accounting guidelines across states and to provide guidance for statutory principles when they differ from GAAP.

Reinsurance

- Standardization of the treatment of reinsurance in granting credit for reinsurance recoverables (foreign and domestic).

- (c) Determine whether your company has triggered any regulatory action level. Show all work.

Commentary on Question:

Partial credit was received if the candidate identified the correct action level for the RBC ratio calculated. For example, if a candidate erroneously calculated an RBC ratio of 150%, but correctly identified the action level of regulatory action level, no credit was lost for the action level identification. The action level table below is for informational purposes and not required for full credit. Candidates in general correctly calculated several of the risk factors but incorrectly calculated the ACL formula.

7. Continued

Calculate Statutory Surplus = Assets – Liabilities
 Assets = sum of all Statutory Assets = 254
 Liabilities = sum of all Statutory Liabilities = 245
 Statutory Surplus = 254 – 245 = 9

Calculate Total Adjusted Capital (TAC) = Surplus + AVR + 1/2 Div Liab
 TAC = 9 + 3 + 0.5*4 = 14

Calculate the Authorized Control Level (ACL)
 C0 = Subsidiary RBC Amount = 2
 C1o = 1%*Bonds + 1.5%*Mortgages = 1%*112+1.5%*45 = 1.795
 C1cs = 30%*Stocks = 9
 C2 = 0.05%*NAR = 0.05%*(Face - Term Reserves)
 = 0.05%*(900-75) = 0.4125
 C3a = 1.54%*Term Reserves + 0.77%*Annuity Reserves
 = 1.54%*75 + 0.77%*120 = 2.079
 C3b = 0
 C3c = 0
 C4a = 3.08%*Annual Premium = 3.08%*8 = 0.2464

$$ACL = 0.50 \cdot \left[C_0 + C_{4a} + \sqrt{(C_{1o} + C_{3a})^2 + (C_{1cs} + C_{3c})^2 + C_2^2 + C_{3b}^2 + C_{4b}^2} \right]$$

$$= 6.0267$$

RBC Ratio = TAC / ACL = 14 / 6.0267 = 232%

Regulatory Action Level = 200-300% = Trend Test Corridor

Action Levels	RBC Range	Action Level
Above Minimum Limit	> 300%	No action triggered
Trend Test Corridor	200-300%	Company needs to perform trend test
Company Action Level	150-200%	Company must submit RBC action plan to commissioner
Regulatory Action Level	100-150%	Commissioner works with insurer and an RBC action plan
Authorized Control	70-100%	Commissioner can take control or any other steps necessary
Authorized Control	<70%	Commissioner is mandated to take control of insurance company

7. Continued

(d) Critique the following statements:

- A. *Insurance Holding Company regulation applies when any new Insurance Company is formed by a non-insurance group.*
- B. *The ORSA is a qualitative regulatory review conducted annually by regulators on an insurer's solvency and risk management processes.*
- C. *The main advantages of the NAIC is its ability to compel members to adopt policy and model legislation, and the authority to represent the US internationally on insurance issues.*
- D. *Covered Agreements are needed between US States to ensure that an insurer domiciled in one state can operate in all the others.*

Commentary on Question:

Full credit was received if an explanation of why the statement is false was provided.

A. *Insurance Holding Company regulation applies when any new Insurance Company is formed by a non-insurance group.*

False.

- IHC monitors transactions between insurance companies, especially acquisitions
- Regulatory approval is needed for material transactions
- This also covers material transactions between affiliates

B. *The ORSA is a qualitative regulatory review conducted annually by regulators on an insurer's solvency and risk management processes.*

False.

- The ORSA is performed by insurers on themselves, not by regulators.
- The focus of the report is indeed on risk management
- The report also contains a quantitative measurement of risk exposure in normal and stressed environments
- It also contains a prospective solvency assessment

C. *The main advantages of the NAIC is its ability to compel members to adopt policy and model legislation, and the authority to represent the US internationally on insurance issues.*

False.

- NAIC does not have ability to compel legislation which is a disadvantage
- FIO represents the industry internationally, but does not have authority domestically

7. Continued

D. Covered Agreements are needed between US States to ensure that an insurer domiciled in one state can operate in all the others. "

False.

- Covered Agreements are negotiated between the US and international bodies
- The purpose is to gain equivalence or acceptance as similar protection for certain insurance laws

8. Learning Objectives:

2. The candidate will understand and apply U.S. Statutory valuation principles and methods applicable to individual life insurance and annuity products issued by U.S. life insurance companies.

Learning Outcomes:

- (2a) Describe, apply and evaluate the appropriate valuation methods and techniques and related accounting treatments for reserves and related items, and other assets and liabilities for specific insurance products under the U.S. Statutory rules. Further, describe and recommend assumptions and margins appropriate to these statutory reserves.
- (2b) Describe, apply and evaluate the Principle-Based Reserves valuation methods and techniques for specific insurance products under U.S. Statutory rules.

Sources:

Reporting and Disclosure Requirements Under VM-31 Reporting Requirements for Business Subject to PB, FR 2017

LFM-143-20 Fundamentals of the Principle Based Approach to Statutory Reserves for Life Insurance

Commentary on Question:

This question tested the candidates' understanding of the requirements for PBR, most notably for reporting and disclosures.

Solution:

- (a) Critique the following statements about VM-31:
 - A. *Because the requirements of VM-31 are less stringent than the old AG43, companies will need to decrease the amount of detail shown in complying with minimum reserve requirements.*
 - B. *When determining the mortality assumption under VM-31, a company has discretion to segment their population. For example, they can lower reserves by reducing the amount of deaths expected based on the segments chosen.*
 - C. *Premium payment pattern sensitivities are recommended under VM-31, but insurers can only change modelled premium payment patterns once every three years.*
 - D. *Non-guaranteed element assumptions and policyholder behavior assumptions can be developed independently of each other as long as it is documented in the report.*

8. Continued

Commentary on Question:

This part of the question required candidates to critique statements regarding VM-31. Credit was not awarded for simply restating a statement correctly or only identifying as true or false, as some explanation was required to demonstrate an understanding of the topic. Candidates generally struggled to demonstrate sufficient knowledge to receive full credit. Full credit was not received if the candidate did not clearly address the validity of the statement.

Common omissions included not stating the sum of expected claims from mortality segments cannot be less than experience for the aggregated class in statement B; not stating that premium payment pattern sensitivities are required in statement C; and not stating the non-guaranteed element assumptions and policyholder behavior assumptions must be consistent with each other in statement D.

Candidates who stated part of a statement was true and part was false were awarded full credit as long as explanations were valid and the full statement was evaluated.

- A. This is not true. VM-31 reporting requirements are more stringent than those for AG 43 and requires an in-depth discussion of material decisions made and information used by the company to comply with minimum reserve requirements. For example, the PBR Actuarial Report requires rigorous sensitivity testing designed to promote transparency and clarity around various assumptions, and necessarily involve a detailed discussion of all assumptions. Though AG 43 is a good place to look to for examples and guidance for reporting under a principle-based approach, actuaries need to pay particular attention to the difference between the two.
- B. This is not true. When a company divides its experience into segments, it must provide evidence that the sum of expected claims from these segments is not lower than experience for the aggregated class. While companies have discretion to segment mortality within the three product groups (Term, Universal Life with Secondary Guarantee, and Life Insurance), companies must describe the mortality segments used to determine company experience mortality rates, the starting and ending period of time used to grade company experience rates to the industry table, and the description of the industry basic table used for each segment.
- C. This is not true. Companies are required to perform and document sensitivity testing for policies that give policyholders flexibility in premium payment, as well as for different premium payment patterns. Companies can change the premium pattern annually. Every three years, the result of an actual to expected analysis must also be included in the PBR Actuarial Report.

8. Continued

- D. This is not true. Non-guaranteed element and policyholder behavior assumptions must be developed together. VM-31 requires detailed explanations on the consistency between the two sets of assumptions. There is a challenge for companies to demonstrate and document the relationship between these two assumptions in order to provide transparency and understandability of results for regulators.
- (b) Describe the minimum reserve components required to be calculated under VM-20 for each of the following blocks:
- (i) Term policies that pass the stochastic exclusion test
 - (ii) Indexed UL policies with no secondary guarantees and without a clearly defined hedging strategy that pass the stochastic exclusion test
 - (iii) UL policies with lifetime secondary guarantees that do not pass the stochastic exclusion test

Commentary on Question:

Candidates were generally able to identify the minimum reserve components required under VM-20, but full credit was not received unless a formula for the minimum reserve was also provided. A common mistake was not identifying that the Deterministic Exclusion Test should be performed in part (ii) and that the Minimum Reserve varies depending on if it is passed or not.

- (i) Since the stochastic exclusion test was passed, the stochastic reserve (SR) is not needed. This block of policies is not eligible for the deterministic exclusion test, so it must calculate the deterministic reserve (DR), along with the net premium reserve (NPR), and any due and deferred premium asset (DDPA) held on account for those policies.

Minimum Reserve = $\text{NPR} + \text{Max}[0, \text{DR} - (\text{NPR} - \text{DDPA})]$
- (ii) Since the stochastic exclusion test was passed, the stochastic reserve (SR) is not needed. This block of policies is eligible for the deterministic exclusion test. If the test is passed, the Minimum Reserve is simply the net premium reserve (NPR). If the test is not passed, it must calculate the deterministic reserve (DR), the net premium reserve (NPR), and will also need any due and deferred premium asset (DDPA) held on account for those policies. Minimum Reserve = $\text{NPR} + \text{Max}[0, \text{DR} - (\text{NPR} - \text{DDPA})]$

8. Continued

- (iii) Since the stochastic exclusion test was not passed, the stochastic reserve (SR) is needed. This block of policies is not eligible for the deterministic exclusion test, so it must calculate the deterministic reserve (DR), as well as the net premium reserve (NPR), and any due and deferred premium asset (DDPA) held on account for those policies.

$$\text{Minimum Reserve} = \text{NPR} + \text{Max}[0, \text{Max}(\text{DR}, \text{SR}) - (\text{NPR} - \text{DDPA})]$$

- (c) Calculate one of the scenario reserves for the VM-20 stochastic reserve assuming the following information.

Projection Period (y)	Statement Value of Assets	One-Year Forward Treasury Rate
0	11,350	
1	-915	1.83%
2	-970	0.25%
3	1,065	1.56%
4	-900	0.10%
5	-1,105	0.89%
6	-875	0.12%
7	-1,000	2.60%
8	-1,125	0.15%
9	-920	0.61%
10	9,450	0.29%

Commentary on Question:

Candidates performed well on this part of the question. Common mistakes included neglecting to multiply the one-year forward rates by 1.05; incorrectly calculating the cumulative discount factor; and not adding the time 0 Statement Value of Assets to the Greatest Present Value of Accumulated Deficiency (GPVAD) to get the Scenario Reserve.

8. Continued

	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6
Projection Period (y)	Negative Statement Value of Assets	105% of Treasury	Cumulative Discount Factor (y)	Discounted Negative Accumulated Deficiencies	Greatest Present Value of Accumulated Deficiency (GPVAD)	Scenario Reserve
0	(11,350)	0.00%	1		1,053	12,403
1	915	1.92%	0.981147	898		
2	970	0.26%	0.978578	949		
3	(1,065)	1.64%	0.962808	(1,025)		
4	900	0.11%	0.961798	866		
5	1,105	0.93%	0.952893	1,053		
6	875	0.13%	0.951694	833		
7	1,000	2.73%	0.926403	926		
8	1,125	0.16%	0.924946	1,041		
9	920	0.64%	0.91906	846		
10	(9,450)	0.30%	0.91627	(8,659)		

Step 1: Take the negative of the Statement Value of Assets for each projection period

Step 2: Multiply the one-year forward treasury rate by 1.05.

Example: Year 2 = 0.25% * 1.05 = 0.26%

Step 3: Calculate the cumulative discount rate in each year.

Example: Year 2 = $0.981147 / (1 + 0.26\%) = 0.978578$

Step 4: Discount the Negative Statement Value of Assets in each year.

Example: Year 2 = $970 * 0.978578 = 949$

Step 5: Find the maximum of the Discounted Negative Accumulated Deficiencies from all years.

Step 6: Add the time 0 Statement Value of Assets to the GPVAD to get the Scenario Reserve.

9. Learning Objectives:

1. The candidate will understand and apply U.S. GAAP valuation principles and methods applicable to individual life insurance and annuity products issued by U.S. life insurance companies.
2. The candidate will understand and apply U.S. Statutory valuation principles and methods applicable to individual life insurance and annuity products issued by U.S. life insurance companies.

Learning Outcomes:

- (1b) Describe and apply the requirements, calculations, and disclosures related to GAAP "Targeted Improvements".
- (2a) Describe, apply and evaluate the appropriate valuation methods and techniques and related accounting treatments for reserves and related items, and other assets and liabilities for specific insurance products under the U.S. Statutory rules. Further, describe and recommend assumptions and margins appropriate to these statutory reserves.
- (2b) Describe, apply and evaluate the Principle-Based Reserves valuation methods and techniques for specific insurance products under U.S. Statutory rules.

Sources:

LFM-844-20: Life Principle-Based Reserves Under VM-20, AAA Practice Note (required questions are listed on the first page of this study note)

LFM-149-21: Insurance Contracts, PwC (Accounting Guide for Insurance Contracts), 2019, (Sections 1.1, 3.5, 5.1-5.10; Figures IG 2-1, IG 2-2)

Lombardi, Chapter 11 – Valuation Methodologies (exclude 11.3.9 to 11.3.11)

Lombardi, Chapter 12 – Whole Life

Commentary on Question:

This question tested the candidates' knowledge of U.S. Statutory valuation principles and methods.

Solution:

- (a) Assign each of the given 8 policies into the minimum number of groupings required under ASU 2018-12. Justify your answers.

Commentary on Question:

Common errors in this part of the question included grouping the products according to their premium patterns or benefit patterns, but not into the specific groups delineated in ASU-2018-12; grouping the contracts in multi-year cohorts instead of single issue years; and grouping without justification.

9. Continued

Contracts should be grouped by year of issue and product type. For ASU 2018-12, the required product types are Whole Life and Term, Limited Pay, and UL.

Group 1: Policy A & B – Issued 2015 – Whole Life & Term

Group 2: Policy C – Issued 2015 – Limited Pay

Group 3: Policy D – Issued 2019

Group 4: Policies E, G, & H – Issued 2020 – Whole Life & Term

Group 5: Policy F – Issued 2020 - UL

- (b) Calculate the semi-continuous CRVM mean reserve as of 12/31/2020. Show your work.

Commentary on Question:

This part of the question required the calculation of reserves according to a specific valuation approach, namely CRVM. A common error was excluding the expense allowance amortization. Candidates generally calculated the 20-yr comparison and final mean reserve correctly. This calculation has several components and knowing which actuarial value to reference demonstrates knowledge of the reserve method. Candidates received partial credit in situations where numbers were calculated incorrectly but were appropriately set up the reserve elements.

There are multiple ways to solve this problem. Since it is a CRVM approach, we need to consider an Expense Allowance calculation as well as a Net Level Premium Calculation.

The Expense Allowance is the minimum of the level premium for the contract and a 20 pay whole life contract, after the first year.

$$EA (20 \text{ Pay}) = A_{1:19}/a_{1:19} = 365.14/7.79 = 46.87$$

$$EA (\text{Policy: } 10\text{-pay}) = A_{1:19}/a_{1:10} = 356.14/13.67 = 26.71$$

$$COI (\alpha) = A_1 = 1.21$$

$$\text{Minimum} = EA_{10 \text{ pay}} - \alpha = 26.71 - 1.21 = 25.50$$

The EA is amortized over premiums. The amortization amount for the EA is solved for as

$$PE = EA/a_{10} = 25.50/8.52 = 2.99$$

The Net Level Premium for the Benefit (PB) is solved for as

$$PB = A_x/a_{10} = 353.57/8.52 = 41.50$$

The CRVM Reserve then is the Present Value of Benefits Less The Present Value of Benefit Premium Less the Unamortized Expense Allowance.

9. Continued

$$\text{At time 5: } A_5 - PB_{x5} - PE_{x5} = 412.33 - 41.50 \times 4.64 - 2.99 \times 4.64 = 205.89$$

$$\text{At time 6: } A_4 - PB_{x4} - PE_{x4} = 424.62 - 41.50 \times 3.78 - 2.99 \times 4.64 = 256.44$$

The mean reserve is the average of the (terminal reserve at time 5 + benefit premium and EA amortization) and the terminal reserve at time 6.

$$\text{Mean Reserve} = 50\% \times (V_5 + PB + PE) + 50\% \times V_6$$

$$= 0.5 \times (205.89 + 41.50 + 2.99) + 0.5 \times 256.44 = 253.41$$

$$\text{For 250,000 we get } 250 \times 253.41 = 63,352.51$$

- (c) Assume the company passes the stochastic exclusion test for applicable plans except for UL with lifetime secondary guarantee.
- (i) Calculate the minimum PBR reserve permitted under the aggregation rules of VM-20.
 - (ii) Calculate the amount of reserve savings realized via aggregation.

Commentary on Question:

Under VM-20 the required groupings for aggregation are Term, UL with Secondary Guarantees and Other. Candidates had to differentiate the UL product types. The Asset Segments listed in the problem were mistakenly used in many answers as the aggregation level. This part of the question also required candidates to know which cash flows are included in the Deterministic Reserve calculations, and how to apply the maximums within a group before totaling the answer. Most candidates correctly used the Stochastic Reserve only for ULSG and using CTE70. Partial credit was received for correct DR and VM-20 reserves, even if incorrect groupings were used.

Part (i)

$$DR = PV \text{ Benefits} + PV \text{ Expenses} + PV \text{ Commissions} - PV \text{ Premiums}$$

- Term: $(49+14) + (14+6) + (3+0) - (44+26) = 16$
- ULSG: $16 + 6 + 2 - 19 = 5$
- Other: $6 + 35 + (3+12) + (0+6) - (15+44) = 3$

$$VM-20 = \text{MAX}(NPR, DR, SR) \text{ OR } NPR + \text{MAX}(0, \text{MAX}(DR, SR) - NPR)$$

SR is applicable only for ULSG that fail SET.

Use CTE 70

9. Continued

Groups: Term, UL with Secondary Guarantees, Other

GROUP	TERM	ULSG	Other
DR	16	5	3
SR		8	
NPR	20	7	17
MAX	20	8	17
TOTAL			45

Part (ii)

To quantify the benefit of aggregation, we need to take the difference between a VM-20 calculated for each product and the answer from Part i.

Plan	Accumulation UL	UL w Lifetime Secondary Guarantee	Agency Term	Direct Response Term	Whole Life
DR	-6	5	22	-6	9
SR		8			
NPR	6	7	17	3	11
VM20 Rsv	6	8	22	3	11
TOTAL					50

$$50 - 45 = 5$$

10. Learning Objectives:

2. The candidate will understand and apply U.S. Statutory valuation principles and methods applicable to individual life insurance and annuity products issued by U.S. life insurance companies.

Learning Outcomes:

- (2a) Describe, apply and evaluate the appropriate valuation methods and techniques and related accounting treatments for reserves and related items, and other assets and liabilities for specific insurance products under the U.S. Statutory rules. Further, describe and recommend assumptions and margins appropriate to these statutory reserves.
- (2b) Describe, apply and evaluate the Principle-Based Reserves valuation methods and techniques for specific insurance products under U.S. Statutory rules.
- (2c) Describe and evaluate the fundamental features and design of the U.S. Statutory regulatory system.

Sources:

Lombardi Chapter 24 Addendum for Variable Annuity PBR Updates

Lombardi Chapter 23

Commentary on Question:

This question tested the candidates' knowledge of U.S. Statutory valuation principles and methods.

Solution:

- (a)
 - (i) Assess which of the additional invested asset projections is most appropriate to use in the net asset earned rate (NAER) method. Justify your response.
 - (ii) Calculate the scenario reserve using the NAER method
 - (iii) Describe the changes to the projection that would result if the Direct Iteration method were used instead of the NAER method.

Commentary on Question:

On part (i), candidates were expected to show that only Portfolio B satisfies both criteria for use in the NAER method, which was challenging. Most candidates received partial credit for part (ii). Candidates generally did not appropriately calculate the deficiency as the negative of the modeled asset portfolio. Candidates who selected the wrong portfolio in part (i) were not penalized for that in part (ii).

10. Continued

For part (iii) many candidates explained the process of solving for a starting asset amount such that there were no deficiencies at the end of the projection period. To receive full credit, candidates had to discuss that the asset values had to prevent deficiencies at the end of each year of the projection.

(i):

The additional asset projection must:

1. Be greater than any deficiencies at any point in the projection.
 2. Be available in the General Account and **not** already included in the starting assets.
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1. Portfolio A covers all deficiencies except in year 30, when the asset portfolio value of 69,190 is less than the deficiency of 69,936 in the General Account. Portfolio B and C cover all deficiencies at all points in the projection.
 2. Portfolio A: Starting Assets of 38,400 + 25,670 GA Assets = 64,070
Portfolio B: Starting Assets of 39,150 + 25,670 GA Assets = 64,820
Portfolio C: Starting Assets of 39,150 + 25,670 GA Assets = 66,020
General Account Assets available at the Valuation Date: 65,550

Portfolios A and B appropriately start with fewer assets than available in the General Account. Portfolio C starts with more assets than available in the General Account, so it is not appropriate for selection for the NAER method.

Thus, only Portfolio B satisfies both criteria.

10. Continued

(ii)

Scenario Reserve = starting assets + Greatest PV of deficiencies

Year	NAER = PortfolioBVal _t / PortfolioBVal _{t-1}	v _t = NAER discount factor	Deficiency = -(GA Assets + SA Assets)	PV Deficiency = Deficiency * v _t
0		1.0000	(125,000)	(125,000)
1	3.17%	0.9693	(127,819)	(123,892)
2	2.65%	0.9443	(122,550)	(115,719)
3	2.50%	0.9212	(122,269)	(112,634)
4	2.40%	0.8996	(127,250)	(114,470)
5	2.33%	0.8791	(104,416)	(91,790)
6	2.27%	0.8596	(87,327)	(75,067)
7	2.21%	0.8410	(80,563)	(67,755)
8	2.16%	0.8232	(54,119)	(44,553)
9	2.11%	0.8062	(42,226)	(34,043)
10	2.07%	0.7899	(31,876)	(25,178)
11	2.03%	0.7742	(25,918)	(20,065)
12	1.99%	0.7591	(18,006)	(13,668)
13	1.95%	0.7445	(9,535)	(7,099)
14	1.92%	0.7305	(2,387)	(1,744)
15	1.88%	0.7170	4,142	2,970
16	1.85%	0.7040	9,896	6,967
17	1.82%	0.6914	15,568	10,763
18	1.79%	0.6792	18,403	12,500
19	1.76%	0.6675	22,380	14,938
20	1.73%	0.6561	26,531	17,406
21	1.71%	0.6450	30,861	19,907
22	1.68%	0.6344	34,574	21,933
23	1.66%	0.6240	37,875	23,636
24	1.63%	0.6140	40,952	25,145
25	1.61%	0.6043	47,411	28,650
26	1.59%	0.5949	52,523	31,244
27	1.57%	0.5857	58,021	33,983
28	1.54%	0.5768	62,027	35,777
29	1.52%	0.5682	65,420	37,169
30	1.50%	0.5598	69,936	39,148

10. Continued

Starting Assets	125,000
Greatest PV of Accumulated Deficiencies	39,148
Reserve	164,148

(iii)

Instead of using an additional asset portfolio to calculate discount rates, the amount of starting assets can be iteratively solved for such that when projected along with all contract cash flows results the assets will cover projected future benefits and expenses at the end of the projection horizon with no accumulated deficiencies at the end of any projection year during the projection period.

(b)

- (i) List four additional items beyond those given that LZT must identify and document for their hedging strategy to meet the requirements of a CDHS.
- (ii) Calculate the VM-21 reserve.
- (iii) Describe one requirement of the Company-Specific Market Path (CSMP) method that might increase the model's computation time relative to the CTEPA method, and one requirement that might decrease the computation time.

Commentary on Question:

On part (i), most candidates were able to list 3-4 additional items LZT needed to document so that their hedging strategy met the requirements of a CDHS.

On part (ii) candidates who did not have the correct Stochastic Reserve or Additional Standard Projection Amount resulted in incorrect calculation of the VM-21 Reserve, resulting in partial credit. A common omission was related to the Without Cash Surrender Value Floor CTE70 and CTE65 for buffer as part of Additional Standard Projection Amount. Candidates received full credit for Prescribed Projection Amount if Unbuffered Additional Standard Projection Amount was calculated correctly.

On part (iii), candidates were generally able to identify the difference in the number of scenarios to be modeled. Less common were responses about seriatim versus grouped calculations.

(i)

Candidates needed to list four of the following in order to receive full credit:

- The financial instruments used to hedge the risks
- The hedge trading rules, including permitted tolerances from hedging objectives
- The metrics for measuring hedge effectiveness

10. Continued

- The criteria that will be used to measure hedge effectiveness
- The frequency of measuring hedge effectiveness
- The conditions under which hedging will not take place
- The person or persons responsible for implementing the hedging strategy
- Areas where basis, gap or assumption risk related to the hedging strategy have been identified
- The circumstances under which hedging strategy will not be effective in hedging the risks

(ii)

Stochastic Reserve

$$\begin{aligned} &= CTE70(\text{best efforts}) + E \times \text{Max}(0, CTE70(\text{adjusted}) - CTE70(\text{best efforts})) \\ &= 1,710 + 30\% \times \text{Max}(0, 1,770 - 1,710) \\ &= 1,728 \end{aligned}$$

Prescribed Projection Amount

$$\begin{aligned} &= CTEPA70 (\text{since using CTEPA instead of CSMP}) \\ &= 1,860 \end{aligned}$$

Unbuffered Addtl Std. Proj Amount

$$\begin{aligned} &= \text{Prescribed Projection Amount} - CTE70(\text{adj}) \\ &= 1,860 - 1,770 \\ &= 90 \end{aligned}$$

Addtl Std. Projection Amount

$$\begin{aligned} &= \text{Unbuffered Addtl. Std. Proj Amount} - \text{Buffer} \\ &\quad \text{where Buffer} = CTE70(\text{adj}) - CTE65(\text{adj}) \\ &= 90 - (1,770 - 1,740) \\ &= 60 \end{aligned}$$

VM21 Reserve

$$\begin{aligned} &= \text{Max}(\text{CSV}, \text{Stochastic Reserve} + \text{Additional Std. Proj Amount} - \text{PIMR} + \text{Alt Reserve Meth}) \\ &= \text{Max}(1,675, 1,728 + 60 - 100 + 0) \\ &= 1,688 \end{aligned}$$

(iii)

The CSMP calculation is required to be a seriatim calculation. The CTEPA can be completed with grouped inforce data. The seriatim data requirement will increase computation time.

CSMP uses fewer scenarios, Path A and Path B, compared to CTEPA. This reduces computation time.