CURATED PAST EXAM ITEMS
- Solutions -

ILA 201-U – Valuation and Advanced Product and Risk Management, U.S.

Important Information:

o These curated past exam items are intended to allow candidates to focus on past SOA fellowship assessments. These items are organized by topic and learning objective with relevant learning outcomes, source materials, and candidate commentary identified. We have included items that are relevant in the new course structure, and where feasible we have made updates to questions to make them relevant.

o Where an item applies to multiple learning objectives, it has been placed under each applicable learning objective.

o Candidate solutions other than those presented in this material, if appropriate for the context, could receive full marks. For interpretation items, solutions presented in these documents are not necessarily the only valid solutions.

o Learning Outcome Statements and supporting syllabus materials may have changed since each exam was administered. New assessment items are developed from the current Learning Outcome Statements and syllabus materials. The inclusion in these curated past exam questions of material that is no longer current does not bring such material into scope for current assessments.

o Thus, while we have made our best effort and conducted multiple reviews, alignment with the current system or choice of classification may not be perfect. Candidates with questions or ideas for improvement may reach out to education@soa.org. We expect to make updates annually.

Course ILA 201-U

Curated Past Exam Solutions

All Learning Objectives

Learning Objective 1: U.S. Financial Reporting Requirements

Learning Objective 2: Capital Management

Learning Objective 3: Management and Evaluation of Life Insurance Risks

Learning Objective 4: Advanced Product Management

The following solutions are taken from Valuation and Advanced Product and Risk Management, International Exams from 2020 – 2024. They have been mapped to the learning objectives and syllabus materials for the ILA 201-U 2025-2026 course, and in some cases modified to fit the 2025-2026 curriculum.

The related questions and Excel spreadsheets are provided in separate files.

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1. Fall 2024 ILA-LFMU Exam (LOs 1b)

Learning Objectives:
1.   The candidate will understand and apply U.S. valuation principles and methods applicable to individual life insurance and annuity products issued by U.S. life insurance companies.

Learning Outcomes:
(1b) Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US GAAP framework, including the calculation of reserves and related items (e.g., DAC)

Relevant Sources:
US GAAP for Insurers, Freedman, M., and Frasca, R., 3rd Edition, 2024 - Chapter 11: Deferred Annuities

US GAAP for Insurers, Freedman, M., and Frasca, R., 3rd Edition, 2024 - Chapter 12: Payout Annuities

Commentary on Question:
This question tested the candidates' understanding of profit emergence under GAAP accounting for payout annuities. Most candidates demonstrated an understanding of the principles behind benefit reserves, DAC, and deferred profits in a general sense. However, the written answer portion in part (c) showed less understanding of how these principles apply to specific aspects of payout annuities.

Calculations in part (a) were generally done well, though minor errors in survivorship and discount rate calculations were common, as well as errors in calculating amortization. Candidates often had challenges updating for experience in part (b).

1.   Continued

Solution:

(a)   **(LO 1b)** You are given:

Policy year	Survivors (beginning of year, based on assumed mortality)
0	100
1	90
2	80
3	70
4	60
5	50
6	40
7	30
8	20
9	10
10	0

Calculate the following at the end of Year 1, assuming the current discount rate is the same as the locked-in discount rate:

(i)   Benefit reserves

(ii)   DAC

(iii)   DPL

Commentary on Question:
Candidates generally did well on parts (i) and (ii). In part (i), most candidates correctly calculated the benefits during the 2-year certain period, but many candidates calculated year 3+ annuity benefits using end of year survivorship instead of beginning of year survivorship, as outlined in the product description.

Most candidates correctly deferred the full commissions at time 0 for part (ii). Common mistakes with the k factor included summing future annuity benefits instead of survivors, applying discounting to future survivors, and using the amortization base at time (t) instead of time (t-1) when calculating the k factor. Many candidates also mistakenly applied the k factor to survivors at time t instead of time (t-1). Candidates received at least partial credit for the calculation when they demonstrated the understanding of subsequent components, even if the amortization base calculation included a minor error.

1. Continued

Many candidates struggled with the DPL calculation in part (iii). A common error in calculating the initial DPL was to subtract commissions from the paid premium amount. The most common error was to amortize the DPL using methods appropriate for life or health insurance instead of annuities, including using the future in-force as the amortization basis instead of projected benefits. The next most common error was not including interest accretion under the retrospective method. Candidates received full credit using either the prospective or retrospective methods.

The annuity benefit for years 1 and 2 = 2,000 * initial policy counts = 200,000 because of the term-certain period. The annuity benefit for year 3+ = 2000 * survivors as of the beginning of the year.

Year 1 = 2,000 * 100 = 200,000
Year 2 = 2,000 * 100 = 200,000
Year 3 = 2,000 * 80 = 160,000
Year 4 = 2,000 * 70 = 140,000
Year 5 = 2,000 * 60 = 120,000
Year 6 = 2,000 * 50 = 100,000
Year 7 = 2,000 * 40 = 80,000
Year 8 = 2,000 * 30 = 60,000
Year 9 = 2,000 * 20 = 40,000
Year 10 = 2,000 * 10 = 20,000

It is equivalent to calculate survivorship instead of just multiplying by the survivors. Under this view, the annuity benefit for year 1 and year 2 = 2,000 * initial policy counts. The annuity benefit for year 3+ = 2000 * initial policy counts * survivorship.

Year 1 = 2,000 * 100 = 200,000
Year 2 = 2,000 * 100 = 200,000
Year 3 = 2,000 * 100 * (80/100) = 160,000
Year 3 = 2,000 * 100 * (70/100) = 140,000
Etc.

The **benefit reserve at time 1** is the liability for future policy benefits (LFPB) at time 1. The LFPB at time 1 is the present value of the annuity benefits from years 2-10, discounted to time 1 using the 4.5% discount rate.

(Year 2 Benefit * v + Year 3 benefit * v^2 + Year 4 benefit * v^3…)
200,000 * (1.045^-1) + 160,000*(1.045^-2) + 140,000*(1.045^-3) + 120,000*(1.045^-4) + 100,000*(1.045^-5) + 80,000*(1.045^-6) + 60,000*(1.045^-7) + 40,000*(1.045^-8) + 20,000*(1.045^-9) = **788,565.20**

1. Continued

The full commission should be capitalized, so the time 0 DAC is initial premium * policy count * commission % = 10,000 * 100 * 5% = 50,000

Using the policies inforce as the amortization basis, DAC(t) = DAC(t-1) – prior period inforce * k factor, where the k factor = DAC (t-1) / sum of projected inforce as of time (t-1).

Time 0 DAC = 50,000
Time 0 Inforce = 100
Time 0 sum of projected inforce = 100 + 90 + 80 + 70 + 60 + 50 + 40 + 30 + 20 + 10 - 550

Time 1 DAC = 50,000 – 100 * (50,000/550) = **40,909.09**

The DPL calculation can be calculated using either the retrospective or prospective method.

Retrospective method: DPL(t) = DPL(t-1) * (1 + i) – DPL amortization percentage * annuity benefit (t), where i is the locked-in discount rate

Prospective method: DPL(t) = LFPB(t) * DPL amortization percentage

Under both methods the DPL amortization percentage = initial DPL / time 0 LFPB, where the initial DPL = max(0, initial policy count * initial premium – time 0 LFPB)

To calculate the time 0 LFPB use the same method as was used for the time 1 LFPB but with the additional year of benefits.

200,000 * (1.045^-1) + 200,000 * (1.045^-2) +160,000*(1.045^-3) + 140,000*(1.045^-4) + 120,000*(1.045^-5) + 100,000*(1.045^-6) + 80,000*(1.045^-7) + 60,000*(1.045^-8) + 40,000*(1.045^-9) + 20,000*(1.045^-10) = 945,995.41

Initial DPL = max(0, 100 * 10,000 – 945,995.41) = 54,004.59

k = 54,004.59 / 945,995.41 = 5.71%

Retrospective method: DPL(1) = 54,004.59 * (1+.045) – 5.71% * 200,000 = **45,017.28**

Prospective method: DPL(1) = 788,565.20 * 5.71% = **45,017.28**

1. Continued

(b) **(LO 1b)** Based on actual experience, a revised in-force projection, and market conditions, you are given:

- The current discount rate is 6%.

Policy year	Survivors (beginning of year, based on actual and assumed mortality)
0	100
1	95
2	85
3	75
4	65
5	55
6	45
7	35
8	25
9	15
10	0

(i) Calculate the DPL balance at the end of year 3.

(ii) Calculate the Accumulated Other Comprehensive Income (AOCI) at the end of year 3.

Commentary on Question:
Many candidates had challenges with part (i). This question tested the candidates' understanding of the DPL, where candidates were expected to indicate that there was no profit in year 0 based on the updated assumptions and therefore no DPL to amortize. Many candidates used the current discount rate instead of the locked-in rate to recalculate the initial LFPB, which resulted in a positive DPL. Several candidates successfully calculated the correct revised LFPB at time 0, but they did not recalculate the initial profit, so they used the original DPL/the revised LFPB as the DPL amortization percentage. Partial credit was received if candidates used a min() function in excel, even if other calculations were flawed, as this demonstrated awareness of the DPL floor. Candidates also received partial credit if the initial LFPB was calculated correctly, even if subsequent steps were performed incorrectly.

1. Continued

Most candidates struggled with the AOCI calculation in part (ii). A common mistake was to use values other than the LFPB to calculate the AOCI, including the DPL or DAC. Maximum credit was received by demonstrating that the AOCI is the difference in LFPB from using the current discount rate vs. the locked in rate. Many candidates mistakenly compared LFPB values that used different mortality expectations.

The DPL calculation should be done in the same manner as in part A, with the only difference between the updated survivorship experience and projections. Both the initial DPL and the DPL amortization percentage must be recalculated based on the time 0 LFPB using the updated assumptions and the locked-in discount rate.

Time 0 LFPB $= 200{,}000 * (1.045\text{^}-1) + 200{,}000 * (1.045\text{^}-2) + 170{,}000*(1.045\text{^}-3) + 150{,}000*(1.045\text{^}-4) + 130{,}000*(1.045\text{^}-5) + 110{,}000*(1.045\text{^}-6) + 90{,}000*(1.045\text{^}-7) + 70{,}000*(1.045\text{^}-8) + 50{,}000*(1.045\text{^}-9) + 30{,}000*(1.045\text{^}-10) = 1{,}006{,}396.91$

Initial DPL $= \max(0, 100 * 10{,}000 - 1{,}006{,}396.91) = 0$

$k = 0 / 1{,}006{,}396.91 = 0\%$

Retrospective method:
DPL(1) $= 0 * (1+.045) - 0\% * 200{,}000 = \mathbf{0}$
DPL(2) $= 0 * (1+.045) - 0\% * 200{,}000 = \mathbf{0}$
DPL(3) $= 0 * (1+.045) - 0\% * 170{,}000 = \mathbf{0}$

Prospective method: DPL(3) = Time 3 reserve $* 0\% = \mathbf{0}$

AOCI = LFPB using discount rate (4.5%) at inception - LFPB using revised discount rate (6.0%). AOCI is meant to capture changes in discount rates only, so both so the LFPB must be calculated with current inforce projections.

LFPB using discount rate (4.5%) at inception $= 150{,}000*(1.045\text{^}-1) + 130{,}000*(1.045\text{^}-2) + 110{,}000*(1.045\text{^}-3) + 90{,}000*(1.045\text{^}-4) + 70{,}000*(1.045\text{^}-5) + 50{,}000*(1.045\text{^}-6) + 30{,}000*(1.045\text{^}-7) = 551{,}059.92$

LFPB using revised discount rate (6.0%) $= 150{,}000*(1.06\text{^}-1) + 130{,}000*(1.06\text{^}-2) + 110{,}000*(1.06\text{^}-3) + 90{,}000*(1.06\text{^}-4) + 70{,}000*(1.06\text{^}-5) + 50{,}000*(1.06\text{^}-6) + 30{,}000*(1.06\text{^}-7) = 528{,}363.33$

551,059.92 - 528,363.33 = **22,697.59**

1. Continued

(c) **(LO 1b)** Critique the following statement with regards to a payout annuity contract under the LDTI standards:

> *A.*   *The reason that DPL needs to be calculated for this block of payout annuities due to their classification as investment contracts.*

> *B.*   *When a payout annuity liability is established upon the derecognition of a market risk benefit for a guaranteed minimum withdrawal benefit, the DPL should be calculated based on the amount of accumulated attributed fees collected that exceeds the liability for future policy benefits.*

Commentary on Question:
For statement A, candidates generally identified the payout annuity contract as an insurance contract rather than an investment contract. Fewer candidates were successful in articulating the reason why the DPL is needed for limited pay contracts. In addition to identifying the contract as an insurance contract, candidates who earned the most credit explained the role of DPL in smoothing profit emergence.

Most candidates demonstrated less understanding of statement B. Maximum credit was earned by candidates who demonstrated an understanding that the DPL is based on the difference between the derecognized MRB amount and the LFPB, not based on the amount of attributed fees. Partial credit was earned by candidates who correctly stated that attributed fees are not part of the DPL calculation.

Statement A is false. This payout annuity contract has significant mortality risk because only the first two years are term-certain and would therefore be classified as an insurance contract. The DPL is needed because the premium is received over a limited period that is shorter than the coverage period. The DPL ensures that profit is reflected over the full coverage period.

Statement B is also false. Accumulated attributed fees are not used in the DPL calculation. The initial DPL is the excess of the fair value of the derecognized market risk benefit over the initial LFPB.

2. Fall 2024 ILA-LFMU Exam (LOs 1b)

Learning Objectives:
1. The candidate will understand and apply U.S. valuation principles and methods applicable to individual life insurance and annuity products issued by U.S. life insurance companies.

Learning Outcomes:
(1a) Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US statutory framework, including the calculation of principles-based reserves and formulaic reserves

(1b) Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US GAAP framework, including the calculation of reserves and related items (e.g., DAC)

Relevant Sources:
Statutory Valuation of Individual Life and Annuity Contracts, Claire, D., Lombardi, L. and Summers, S., 5th Edition, 2018 - Chapter 23: VM-20: PBR for Life Products (excluding 23.1)

US GAAP for Insurers, Freedman, M., and Frasca, R., 3rd Edition, 2024:
      Chapter 3: Product Classification and Measurement
      Chapter 4: Expenses
      Chapter 5: Nonparticipating Traditional Life Insurance

Commentary on Question:
This question tested the candidates' knowledge of U.S. GAAP valuation principles and methods.

Solution:
(a) **(LO 1b)** CLT is planning to sell a new level premium whole life product while minimizing the first-year surplus strain on a US GAAP basis, and is considering the following marketing options:

    Option 1: Hire a marketing agency to sell the policies and collect 100% commission on first year premium. There is no additional cost.

    Option 2: Use the internal sales team to sell the policies. The annual fixed salary for the sales team is 1,200,000, and they will receive commission of 5% of premium every year the policy is inforce.

(i)   Calculate the first-year expenses associated with the sale of the policies for each option. Assume total first year premium collected will be 5,000,000. Show all work.

2. Continued

     (ii)   Determine the deferrable acquisition costs for each option during the first year.

     (iii)   Recommend which option optimizes CLT's performance during the first year, assuming all other elements are constant. Justify your response.

Commentary on Question:
This part of the question tested the candidates' understanding of expenses and capitalization (deferral) of expenses. Candidates were expected to differentiate deferrable and non-deferrable expenses, as well as making the connection of deferred expenses to net income. Candidates generally did well on this part of the question.

In part (i), a common mistake was not including both the Fixed Costs and Commission in the calculation for Option 2.

To receive full credit in part (ii) candidates had to provide both a numerical answer and an explanation of why expenses were or were not included. A common mistake was suggesting part of the Fixed Salaries are deferrable for Option 2.

To receive full credit in part (iii) candidates had to not only identify Option 1 as the option that optimizes performance, but also that Option 1 allows for a DAC asset to be set up that offsets the large year 1 expenses. Candidates had to identify the impact that expenses and DAC have on GAAP Net Income and recognize that optimal performance is based on this. A common mistake was basing the decision off DAC or expenses only, and not the impact on GAAP Net Income and strain. Another common mistake was ignoring the offsetting impact of DAC on Option 1 expenses.

(i)

	Option 1	Option 2	Description
First Year Premium	5,000,000	5,000,000	Given
Fixed Costs	0	1,200,000	Given
Commission Rate	100%	5%	Given
Commission Paid	5,000,000	250,000	Premium * Commission Rate
Total Expense (Answer to i)	**5,000,000**	**1,450,000**	**Fixed Costs + Commission Paid**

2. **Continued**

(ii)

	Option 1	Option 2	Description
First Year Premium	5,000,000	5,000,000	Given
Commission Rate	100%	5%	Given
Ultimate Commission Rate	0%	5%	Given
Excess Commission	100%	0%	Commission Rate – Ultimate Commission Rate
Deferrable Commission (Answer to ii)	**5,000,000**	**0**	**Premium * Excess Commission**

(iii)

Option 1 optimizes CLT's performance during the first year by providing higher GAAP Net Income. GAAP Net Income is defined as Revenue – Benefits – Expenses + DAC Increase. While Option 1 has a higher commission expense, this is entirely offset by the DAC that is set up and realized over time. Option 2 does not have any deferrable expenses to offset costs each year. As a result, after deferral, Option 1 has lower expenses. Since Option 1's Expense minus DAC Increase is lower than Option 2, it produces a higher GAAP Net Income and less strain.

(b) **(No Longer Relevant)** ~~You are given the following information on CLT's invested assets:~~

~~Asset~~	~~Effective yield~~	~~Classification~~	~~Years to maturity~~	~~Balance sheet value (millions)~~
~~X~~	~~5%~~	~~Available for sale~~	~~10~~	~~50~~
~~Y~~	~~2%~~	~~Held to maturity~~	~~5~~	~~160~~
~~Z~~	~~7%~~	~~Trading~~	~~7~~	~~10~~

~~Critique each of the following statements with respect to US GAAP:~~

~~A.~~   ~~The recent volatility is expected to have negative impact in the short term, but may revert back in the future. CLT should sell and exit all positions in Asset X, so it doesn't affect net income.~~

~~B.~~   ~~Asset Y was purchased when market yields were at 2%. The market is currently yielding 7%. There is no downside to rebalancing CLT's portfolio and liquidating half of its position in Y to higher yielding assets.~~

2. Continued

C. Asset Z pays coupons denominated in a foreign currency, which are immediately converted to USD with the exchange rate on the coupon date. CLT has accumulated other comprehensive income (AOCI) from miscellaneous activities. CLT can use their AOCI to offset the negative currency exchange impacts in the previous two quarters.

Commentary on Question:
This question tested the candidates' understanding of investment and hedge accounting. Candidates were expected to apply the different accounting treatments of assets to the situation and assess the impact on Net Income.

Candidates generally struggled to provide a full critique of each question.

To receive full credit for statement A candidates had to explain that periodic changes in the value of the asset flow through OCI and the unrealized gain/loss is only realized in Net Income when the asset is sold. Partial credit was received for stating that changes in value flow through OCI instead of Net Income.

To receive full credit for statement B candidates had to explain the downside, as liquidating part of a Held-to-Maturity portfolio risks tainting all of the assets in that portfolio, causing a forced asset reclassification. This reclassification will cause any losses in OCI due to interest changes to be realized. Partial credit was received if candidates only mentioned the liquidation would taint the assets or cause a reclassification. Most candidates did not identify that OCI losses would be realized as a result of reclassification.

To receive full credit for statement C candidates had to state that the Miscellaneous OCI cannot offset the currency impact and that any hedge relationship must be established before the OCI is accumulated to be realized. Partial credit was received if candidates only mentioned that Miscellaneous OCI cannot be used to offset the currency impact. Most candidates did not identify that the hedge relationship must be established before OCI can be used.

A. Since Asset X is classified as Available for Sale, it is measured at Fair Value. As long as the asset is not sold, periodic changes in Fair Value are recognized in Other Comprehensive Income, not Net Income. Once Asset X is sold, the unrealized gain or loss becomes realized and can actually hurt Net Income.

B. There is a downside. By liquidating any part of its position in Asset Y, sales or transfers that do not meet the strict requirements under ASC Topic 320 result in the tainting of all investments in the held-to-maturity category and require the reclassification of these investments to available-for-sale, with any unrealized gains and losses due to interest differences being recognized in other comprehensive income.

2. Continued

(c) **(LO 1a, 1b)** You are given the following information from the pricing model used to develop a whole life product:

Best estimate assumptions	PV @3.5%	PV @4%	PV @5%
Premium	10,000,000	9,000,000	8,000,000
Death benefits	7,000,000	6,500,000	6,000,000
Surrender benefits	1,500,000	1,480,000	1,460,000
Commissions	750,000	675,000	600,000
Claim expense	70,000	65,000	60,000
All other expenses	175,000	162,500	150,000

Prudent estimate assumptions	PV @3.5%	PV @4%	PV @5%
Premium	9,500,000	8,550,000	7,600,000
Death benefits	7,350,000	6,825,000	6,300,000
Surrender benefits	1,550,000	1,500,000	1,475,000
Commissions	715,000	650,000	600,000
Claim expense	73,500	68,250	63,000
All other expenses	175,000	162,500	150,000

- The net asset earned rate is 5%
- The upper-medium quality fixed income yield is 4%
- The statutory valuation interest rate is 3.5%

Calculate the following at issue:
   (i)   Net premium ratio used to calculate the US GAAP liability for future policy benefits

> *The response for this part is to be provided in the Excel spreadsheet.*

   (ii)   Deterministic reserves under VM-20

Commentary on Question:
This part of the question tested the candidates' understanding of reserving for future policy benefits. Candidates were expected to use the appropriate assumptions to calculate a Net Premium Ratio and VM-20 Deterministic Reserve.

Candidates generally did very well on this part of the question.

2. **Continued**

In part (i), the most common mistake was including commissions and other expenses in the expense calculation. Partial credit was received if other aspects of the answer were correct.

In part (ii), the most common mistake was not using the Net Asset Earned Rate as the source of Present Values. Partial credit was received if other aspects of the answer were correct.

(i)   In calculating the Net Premium Ratio, all values are projected using
   a. Best Estimate Assumptions, and
   b. Upper-Medium Quality Fixed Income Yields

	Value	Description
PV Rate	4%	Upper-Medium Quality Fixed Income Yield
PV (Gross Premium)	9,000,000	Given
PV (Lifetime Benefits)	6,500,000 + 1,480,000 = 7,980,000	Death Benefits + Surrender Benefits
PV (NonLevel Expenses)	65,000	Non-Recurring Non-Acquisition Expenses = Claim Expenses
Net Premium Ratio (Answer to i)	(7,980,000 + 65,000) / 9,000,000 = **0.893889**	**PV (Lifetime Benefits + NonLevel Expenses) / PV (Gross Premium)**

(ii)   In calculating the Deterministic Reserve under VM-20, all values are projected using
   a. Prudent Estimate Assumptions, and
   b. Net Asset Earned Rate

	Value	Description
PV Rate	5%	Net Asset Earned Rate
PV (Gross Premium)	7,600,000	Given
PV (Lifetime Benefits)	6,300,000 + 1,475,000 = 7,775,000	Death Benefits + Surrender Benefits
PV (Expenses)	600,000 + 63,000 + 150,000 = 813,000	Commissions + Claim Expenses + All Other Expenses
Deterministic Reserve (Answer to ii)	7,775,000 + 813,000 – 7,600,000 = **988,000**	**PV (Lifetime Benefits + Expenses) – PV (Gross Premium)**

3. Fall 2024 ILA-LFMU Exam (LOs 1a)

Learning Objectives:
1.   The candidate will understand and apply U.S. valuation principles and methods applicable to individual life insurance and annuity products issued by U.S. life insurance companies.

Learning Outcomes:
(1a)   Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US statutory framework, including the calculation of principles-based reserves and formulaic reserves.

Relevant Sources:
Valuation of Life Insurance Liabilities, Lombardi, Louis J., 5th Edition, 2018, Chapter 18 – Fixed Deferred Annuities (exclude 18.7.4, 18.8)

Commentary on Question:
The question tested the candidates' understanding of CARVM (Commissioners' Annuity Reserve Valuation Method) in the context of valuing fixed-rate deferred annuities.

Solution:
(a)   **(LO 1a)** Critique each of the following statements for a fixed rate deferred annuity under CARVM:

  A.   *Integrated benefit streams can only end in annuitization and full withdrawal.*

  B.   *Elective benefits should only assume 0% or 100% incidence rates.*

  C.   *The same valuation interest rate should be used for elective and non-elective benefits.*

  D.   *Regardless of either an issue year basis or a change-in-fund basis, the valuation interest rates will remain constant throughout the life of the contract.*

  Commentary on Question:
  Candidates generally did not do well on this part of the question. Many candidates incorrectly stated that the integrated benefit streams could include death benefits, which do not qualify as an elective benefit, other than withdrawal or annuitization. Additionally, several candidates incorrectly mentioned that dynamic valuation interest rates are used for the issue year basis.

3. Continued

A. False. Integrated benefit streams can end in full withdrawal, annuitization, and other elective benefits.

B. False. Elective benefits should assume all possible instance rates between 0% and 100% to determine greatest present value. However, AG XXXIII notes that the greatest present value typically occurs assuming an incidence rate of either 0% or 100%. Due to this and practical considerations, companies often only test at 0% and 100%.

C. False. Valuation rate for elective and non-elective benefits may (and are likely to) differ. Integrated benefit streams are required to be split into an elective portion and a non-elective portion in order to discount the benefit payments at the appropriate interest rate.

D. False. if using issue year basis, the interest rate is determined at issue of the contract and remains constant for life of contract. If using change in fund basis, the future benefits are discounted using different interest rates depending upon when the increase in the fund value occurred which generated the specific benefits.

(b)   **(LO 1a)** Calculate the CARVM reserve at issue for a fixed rate deferred annuity with the following assumptions:

Single premium	100,000
Current credited interest rate (all years)	8%
Guaranteed credited interest rate (years 1-4)	6%
Guaranteed credited interest rate (years 5+)	3%
Valuation interest rate	4.5%

Surrender Charge:

Year	% of Account Value
1	7
2	6
3	5
4	4
5	3
6	2
7	1
8	0

There are no deaths, partial withdrawals, or annuitizations.

3. **Continued**

Commentary on Question:
Candidates generally performed well on this part of the question. A common mistake was using the current crediting rate of 8% for the projected CSV. Another common mistake was selecting the maximum of the guaranteed AV or the current AV.

The model solution is provided in the spreadsheet.

4. Fall 2024 ILA-LFMU Exam (LOs 1a)

Learning Objectives:
1.   The candidate will understand and apply U.S. valuation principles and methods applicable to individual life insurance and annuity products issued by U.S. life insurance companies.

Learning Outcomes:
(1a)   Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US statutory framework, including the calculation of principles-based reserves and formulaic reserves

Relevant Sources:
Principle-Based Reserves Interactive Model
Valuation of Life Insurance Liabilities, Lombardi, Louis J., 5th Edition, 2018, Chapter 16 – Indexed Universal Life (exclude 16.4.2-3)

Commentary on Question:
This question tested the candidates' knowledge of U.S. Statutory valuation principles, particularly Principles Based Reserves (PBR).

Solution:
(a)   **(LO 1a)** Determine if the policy passes the Stochastic Exclusion Test given the following information. Show all work.

Scenario	Gross Premium Reserve
01- Pop Up, High Equity	280
02- Pop Up, Low Equity	280
03- Pop Down, High Equity	470
04- Pop Down, Low Equity	470
05- Up/Down, High Equity	315
06- Up/Down, Low Equity	315
07- Down/Up, High Equity	330
08- Down/Up, Low Equity	330
09- Baseline Scenario	325
10- Inverted Yield Curves	320
11- Volatile Equity Returns	322
12- Deterministic for Valuation	344
13- Delayed Pop Up, High Equity	280
14- Delayed Pop Up, Low Equity	280
15- Delayed Pop Down, High Equity	355
16- Delayed Pop Down, Low Equity	355

4. **Continued**

PV(Benefits) for Scenario 09 = 2,500

Commentary on Question:
This part of the question tested the candidates' knowledge of the Stochastic Exclusion Ratio Test (SERT) calculation. Candidates generally did well on this part of the question. Some candidates failed to identify 'a' as Scenario 9, which is the baseline scenario. A few candidates used 'b-a' as the maximum difference between all the scenarios or the difference between Scenario 01 and Scenario 16.

a = 325 = Scenario 9 Reserve
(Scenario 9 = Baseline Scenario as specified in VM-20)

b = 470 = Max Reserve
b – a = 145 = Max Excess
c = 2,500 = Scenario 9 PV(Benefits)

Exclusion Ratio = (b – a) / c = (470 – 325) / 2,500 = 5.8%

Ratio < 6.0%? Yes. PASS the Stochastic Exclusion Ratio Test. Company is not required to model the stochastic reserve for the respective group of policies.

(b)   **(LO 1a)** Company B and Company C both decide to sell a 20-year term life product. Company C offers a lower premium than Company B. Both companies have implemented the VM-20 reserving methodology. You are given:

- Mortality Credibility (Limited Fluctuation Method)

Company B	95%
Company C	50%

Explain which component of VM-20 reserves will likely dominate for each company.

(i)   Company B

(ii)   Company C

4. **Continued**

Commentary on Question:
Most candidates recognized that higher premium versus lower premium would have an effect on the level of reserve. Some candidates recognized credibility may be a factor in determining the likely controlling reserve among the various Life PBR components. Some candidates mentioned only one of premium level or credibility level when mention of both was expected. Many candidates had difficulty recognizing drivers of the Deterministic Reserve vs Net Premium Reserve.

(i) Company B
- Has higher premiums, which leads to lower deterministic reserve.
- Has higher credibility, which leads to lower margin and lower deterministic reserve.
- Will be more likely to have NPR dominate.

(ii) Company C
- Has lower premiums, which leads to higher deterministic reserve.
- Has lower credibility, which leads to higher margin and higher deterministic reserve.
- Will be more likely to have the deterministic reserve dominate.

(c) **(LO 1a)** For an indexed universal life insurance contract, you were given the following information:

Indexed Fund

Initial Premium	150,000
Expense charge	9%
Minimum guaranteed interest rate	3.5%
Participation Rate	80%
Participation period	1 year

Call Option Terms

Index	S&P 500
Volatility	13%
Dividend rate	2.5%
Risk free rate	5%
Option cost (per contract)	50
Number of option contracts	50

Statutory valuation interest rate: 4%

4. Continued

Determine the credited interest rate for the indexed universal life insurance contract by using the Implied Guaranteed Rate Method (IGRM). Show all work.

Commentary on Question:
Few candidates did well on this part of the question. Some candidates attempted to adjust by participation rate, volatility, or dividend rate. Some candidates used the risk-free rate instead of Statutory valuation interest rate. Some candidates calculated Indexed Fund value without expense charge.

The question did not specify Implied Guaranteed Rate Method (IGRM) should be calculated at initial period (t=0) or future period (t>0). Full credit was received if the candidate had the correct formula for either t=0 or t>0.

IC (0) = IC Guaranteed (0) + Option Cost % (0) * (1 + Valuation Interest Rate)

IC (0) = Interest Credited for Implied Guaranteed Rate Method (IRGM) at time 0
IC Guaranteed (0) = 3.5% = Guaranteed credited interest on indexed portion (0)
Valuation Interest Rate = 4.0%.

Option Cost % (0) = Option cost as a % of Indexed portion
Option Cost $ (0) = Option Cost (per contract) * Count of option contracts
Option Cost $ (0) = 50 * 50 = $2,500
Indexed portion = $150,000 * (1 – 9%) = $136,500
Option Cost % (0) = 2,500 / 136,500 = 1.83%

IC (0) = 5.4% = 3.5% + 1.83% * (1 + 4%)

7. Fall 2024 ILA-LFMU Exam (LO 2d)

Learning Objectives:
2.   The candidate will understand how to explain and apply the methods, approaches and tools of financial capital management for life insurance company under a US regulatory framework.

Learning Outcomes:
(2d)   Explain and apply methods in capital management.

Relevant Sources:
Economic Capital for Life Insurance Companies, SOA Research Paper, Oct 2016 (Sections 2 and 6)

A Multi-Stakeholder Approach to Capital Adequacy, Conning Research, Actuarial Practice Forum

Commentary on Question:
This question tested the candidates' knowledge of the fundamental purpose of capital, its determination and its stakeholders.

Solution:
(a)   **(LO 2d)** You are reviewing the capital position of CJA Life.

Critique the following statements:

(i)   *CJA Life adopts an active market investment strategy. The use of a fair value risk assessment for the economic capital modeling is not appropriate for CJA Life.*

(ii)   *All stakeholders of CJA will want CJA to hold as much capital as possible to remain solvent.*

(iii)   **(NOT RELEVANT)** ~~Group capital calculations for US banks and non-US insurers are calculated in accordance with the same principles as a US-based life insurer.~~

Commentary on Question (a):
This part of the question tested the candidates' understanding of economic capital models, particularly the appropriateness of using fair value risk assessment in economic capital modeling.
Candidates generally did not do well on this question. Candidates did not explain fair value risk assessment. Very few candidates mentioned STAT and GAAP differences in valuation as examples of regime dependent differences in risk assessment.

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7. *Continued*

The question also tested the candidates' knowledge on the objectives of various stakeholders for holding capital and the capital requirements for non-insurer (banks) and non-U.S. insurer companies.

(i)   This statement is false.
    The capital position of CJA Life is a function of assets and liabilities. Assets may be different under U.S. stat (admitted assets), and U.S. GAAP, and liabilities may be different depending on valuation rules and assumptions. Therefore, the difference will be different under each regime. Fair value risk assessment of liabilities is used to approximate a price that would be agreed by two independent parties conducting an arm's length transaction. The principles of fair value assessment of assets and liabilities promote assessment that is independent of any regulatory or accounting framework. They enable a consistent assessment of risks across different companies and geographies. Some practitioners argue against the use of fair value risk assessment for economic capital models. They argue that these bases are inappropriate for many types of life insurance liabilities, that short-term volatility is inappropriate for the measure of long-term economic risk and that they do not appropriately recognize the long-term nature of their business and their ability to hold assets and liabilities for the long term. However, it could be argued that even an insurer with an active trading department is still motivated by long-term objectives. This is why the use of fair value risk assessment for economic capital modeling is appropriate for CJA life.

(ii)   This statement is false. The objectives of various stakeholders are not always identical. While policyholders, regulators, debtholders and rating agencies want insurers to hold as much capital as possible, shareholders want to maximize their return on equity, while maintaining enough capital to absorb unexpected non-diversifiable risk. They also want enough capital to support growth of new and existing operations that will meet their return on capital requirements.
    Holding less capital increases the return on capital by reducing the denominator of the capital ratio. However, if a company holds only the regulatory prescribed minimum, even mildly adverse performance may cause them to breach this requirement over the next year and suffer the associated frictional costs and loss to franchise value. These costs affect the numerator of the return on capital equation. The optimal return on capital is achieved by simultaneously limiting the probability and severity of these costs while not holding excess levels of capital above those for the smooth operation of the business.

7. *Continued*

(iii)   *(NOT RELEVANT)* ~~False for U.S. banks. Non-insurers such as banks are subject to their own valuation methods (typically GAAP) and their own regulatory capital requirements (e.g. OCC, Federal Reserve, FDIC, or other requirements for banks.~~
~~False for non-U.S. insurers. The available and calculated capital of non-U.S. insurers is determined by reference to the home jurisdiction's capital requirements.~~

(b)   **(LO 2d)** You are given the following statements from CJA Life's three main stakeholders:

Stakeholder 1: *We care about policyholder security and our aim is to meet our obligations under all circumstances. The best way to combat this is to hold no less than the minimum regulatory capital requirement which will meet our policyholder and regulator needs.*

Stakeholder 2: *The regulatory requirements for CJA Life appear to be quite onerous and capital intensive. The key is optimizing capital efficiently for CJA Life to achieve record high returns. Any more is a waste of capital.*

Stakeholder 3: *We need to go above and beyond our minimum requirements. Reducing the risk of insolvency is key to our future success. CJA Life needs to strengthen their credit rating to attract new business.*

You are also given:

Option	Description	Capital Level
A	99.5th VAR of future obligations	200
B	400% RBC Level	750
C	Required capital by AM Best to maintain A+ Rating	500

Identify the option from the table above that would be preferred by each stakeholder based on their statements. Justify your answers.
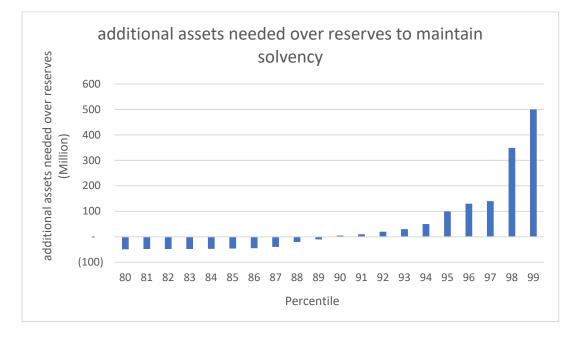
Commentary on Question (b):
Candidates did well on this part of the question if they correctly identified the option choices for each stakeholder.

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7. *Continued*

Stakeholder 1 prefers Option B – 400% RBC Level. Stakeholder 1 wants the company to hold enough capital to maintain the operation of the company through unexpected shocks. This is generally aligned with the objectives of policyholders and debtholders. Higher capital levels desired by Stakeholder 1 give added flexibility in the operation of the company and its ability to assume risk and take advantage of opportunities as they arise. Stakeholder 1 wants to satisfy regulators that they are meeting the regulatory minimum requirement to fulfill their policy obligations. Falling below minimum regulatory required capital levels may result in removal of authorization to write new business, restrictions on management actions, forced liquidations or capital raising in unfavorable circumstances.

Stakeholder 2 prefers Option A. Stakeholder 2 is concerned about inefficient use of capita and over capitalization. Even though an operation might have a solid return on revenue, the operation might because of overcapitalization have a sub-par return on capital. The lower the level of capital in the return-on-capital formula, the higher the return on capital.

Stakeholder 3 prefers Option C. Stakeholder 3 wants to strengthen their credit rating to attract new business. Having insufficient assets to meet policyholder benefit payments would downgrade credit ratings, making it difficult to attract new business profitably or refinance debt. Even a one notch credit rating downgrade, can lead to the beginning of a "death spiral", because of the importance of having a high credit rating in attracting new business and keeping it.

7. *Continued*

(c) **(LO 2d)** You are given:

additional assets needed over reserves to maintain solvency

- Current RBC is set at 200 million.
- The company's risk objective is to maintain solvency with 98% confidence.

Critique the following statements based on the given information:

> *ABC should hold capital at the economic level. Given RBC is redundant compared to economic capital, we can release RBC while still meeting our risk target of maintaining solvency with 98% confidence.*

Commentary on Question (c):
While most candidates interpreted the graph correctly, some candidates had difficulty determining what action the company should take to maintain solvency with 98% confidence.

The statement is false. The graph shows that total capital needed to maintain solvency with 98% confidence is approximately $350 million. Since RBC is only $200 million, RBC does not currently meet this threshold. Since RBC is insufficient, it cannot be released and more capital is needed.

1. Spring 2024 ILA-LFMU Exam (LO 1b)

Learning Objectives:

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

Learning Outcomes:

(1b)   Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US GAAP framework, including the calculation of reserves and related items (e.g., DAC).

Sources:

US GAAP for Insurers, Freedman, M., and Frasca, R., 3rd Edition, 2024 - Chapter 11: Deferred Annuities

Commentary on Question:

This question tested the candidates' knowledge of U.S. GAAP valuation principles and methods, particularly around accounting classification of annuity contracts and the calculation of Market Risk Benefits (MRBs) that were introduced as part of the Long Duration Targeted Improvements (LDTI). Overall, candidates generally demonstrated an understanding of the concepts. It was more common for candidates to have challenges with part (a) than on parts (b) and (c).

Solution:

(a)   **(LO 1b)** Describe the test that XYZ Life needs to perform to determine the new VA product classification under US GAAP.

1. Continued

Commentary on Question:
Few candidates were able to demonstrate a full understanding of the product classification. A common error was focusing on the market risk component and describing the MRB, rather than the test for VA product classification and the insurance risks associated with it. The key concepts for candidates were describing how deferred annuities may be classified as either investment contracts or as universal life-type contracts and that the key differentiator between the two types was the presence of significant insurance risk. Candidates that performed well explained the determination ratio and threshold.

- Deferred annuities may be classified as either investment contracts or as universal life-type contracts. The key differentiator is the presence of significant mortality or morbidity risks.
- The determination of significance of mortality or morbidity risk shall be based on a comparison of the following amounts:
  - Excess payments. The present value of expected excess payments to be made under insurance benefit features—that is, insurance benefit amounts and related incremental claim adjustment expenses in excess of the account balances.
  - Revenue. The present value of all amounts expected to be assessed against the contract holder and the expected investment margin.
- Based on the applicable guidance, the insurer determines the significance of mortality or morbidity risk only on features and provisions exclusive of the option to annuitize.
- Typically, the insurer establishes an accounting policy where mortality or morbidity risk is determined to be significant if the ratio of excess payments to revenue, as defined above, exceeds a defined threshold.

(b) **(LO 1b)** Calculate the GMDB Market Risk Benefit (MRB) liability at the valuation date. Show all work.

Commentary on Question:
Most candidates were able to demonstrate at least a partial understanding of this part of the question. Common mistakes include calculating a different survivorship than the given persistency (net of decrements), missing one or both of mortality and persistency for decremented excess benefit, not flooring excess benefits at zero, not discounting fees to the beginning of year, and not using the right discount rate in at issue and/or valuation date. Also, candidates often did not provide both calculations at issue to determine the attributed fee percentage and at the valuation date to determine the MRB.

The solution for this part of the question is provided in an Excel spreadsheet.

1. Continued

(c) **(LO 1b)** Calculate the Accumulated Other Comprehensive Income (AOCI) at the valuation date. Show all work.

Commentary on Question:
In general, candidates did well on this part of the question in understanding that the AOCI was a comparison of MRB with respect to the change in own credit from issue to the valuation date. A common mistake was not using the right discount rate at valuation date keeping the risk-free portion the same but with at-issue own credit.

The solution for this part of the question is provided in an Excel spreadsheet.

2. Spring 2024 ILA-LFMU Exam (LO 1b)

Learning Objectives:
1. The candidate will understand and apply U.S. valuation principles and methods applicable to individual life insurance and annuity products issued by U.S. life insurance companies.

Learning Outcomes:
(1b) Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US GAAP framework, including the calculation of reserves and related items (e.g., DAC).

Sources:
US GAAP for Insurers, Freedman, M., and Frasca, R., 3rd Edition, 2024:
- Chapter 3: Product Classification and Measurement
- Chapter 4: Expenses

Commentary on Question:
This part of the question tested the candidates' understanding of U.S. GAAP valuation principles and methods.

Solution:
(a) **(LO 1.b)** For the new LTC product, you are given:

Claim projections

Incurral Year	Projection Year				
	1	2	3	4	5
1	2,500	2,250	-	-	-
2		6,063	5,456	-	-
Total	2,500	8,313	5,456	-	-

Corporate Bond Yield Curve

Moody's rating	Curve	1	2	3	4	5
Prime	Spot	5.00%	5.50%	5.25%	4.50%	4.00%
High Grade	Spot	5.25%	5.25%	5.00%	4.75%	4.50%
Upper Medium	Spot	5.50%	6.00%	5.50%	5.00%	4.75%
Prime	Forward	5.00%	6.00%	4.75%	2.25%	2.00%
High Grade	Forward	5.25%	5.25%	4.50%	4.00%	3.50%
Upper Medium	Forward	5.50%	6.50%	4.50%	3.50%	3.75%

    (i) Calculate the claim reserve under US GAAP for year 1 and 2 using the spot rate locked in at issue. Show all work.

(ii)   Calculate the claim reserve under US GAAP for year 1 and 2 using the
         forward rate locked in at issue. Show all work.

Commentary on Question:
For this part of the question, candidates were required to determine GAAP claim reserves for a new long-term care product by discounting claims in their year of incurred to the beginning of the first two claim projection years using given spot and forward interest rates.
Candidates generally calculated the GAAP claim reserves accurately. However, candidates had difficulty with distinguishing the projection year from year of incurred or that claims incurred in a particular projection year may be associated with additional claim payments in a later projection year and would be included in the calculation of the GAAP claim reserve for the earlier projection year. Many candidates only calculated GAAP claim reserves as of the beginning of projection year 1 and did not calculate the GAAP claim reserve at the beginning of projection year 2. Another common error was the derivation of the discounted interest rates. In most cases, candidates derived the projection year 1 values correctly, but when calculating the projection year 2 values candidates used the same discount rates used in their projection year 1 calculations.
The solution is based on the spot and forward rates provided in the question. Typically, spot and forward rates are directly related. It is this relationship which should result in identical results. However, that relationship does not exist in the spot and forward rates for this question. Candidates who realized and demonstrated this concept received full credit.

Claim reserves under US GAAP are equal to the present value of future projected claims discounted back to the beginning of the desired claim projection year using the upper medium interest rates.

CV(x,y) = Claim Reserve at the beginning of projection year x for claims incurred in year y associated with claim payments being made in year y and later. Claims are assumed to be paid at the end of the year.

(i)   To calculate the claim reserve under US GAAP for year 1 and 2 using the
         spot rate locked in at issue:

2. **Continued**

Total Claim Reserve at Beginning of Projection Year 1 = CV(1,1) + CV(1,2)
CV(1,1) = 2,500 / (1+.055)^1 + 2,250 / (1+.06)^2
   = 2,369.67 + 2,002.49 = 4,372.16
CV(1,2) = 6,063 / (1+.06)^2 + 5,456 / (1+.055)^3
   = 5,396.05 + 4,646.40 = 10,042.45
Total Claim Reserve at Beginning of Projection Year 1 = 4,372.16 + 10,042.45 = 14,414.61

Total Claim Reserve at Beginning of Projection Year 2 = CV(2,1) + CV(2,2)
CV(2,1) = 2,250 / (1+.06)^1 = 2,122.64
CV(2,2) = 6,063 / (1+.06)^1 + 5,456 / (1+.055)^2
   = 5,719.81 + 4,901.96 = 10,621.77
Total Claim Reserve at Beginning of Projection Year 2 = 2,122.64 + 10,621.77 = 12,744.41

(ii) To calculate the claim reserve under US GAAP for year 1 and 2 using the forward rate locked in at issue:

Total Claim Reserve at Beginning of Projection Year 1 = CV(1,1) + CV(1,2)
CV(1,1) = 2500 / (1+.055) + 2250 / (1+.065) /(1+.055)
   = 2,369.67 + 2,002.54 = 4,372.21
CV(1,2) = 6,063 / (1+.065) / (1+.055) + 5,456 / (1+.045) / (1+.065) / (1+.055)
   = 5,396.17 + 4,646.82 = 10,042.99
Total Claim Reserve at Beginning of Projection Year 1 = 4,372.21 + 10,042.99 = 14,415.20

Total Claim Reserve at Beginning of Projection Year 2 = CV(2,1) + CV(2,2)
CV(2,1) = 2,250 /(1+.065) = 2,112.68
CV(2,2) = 6,063 / (1+.065) + 5,456 / (1+.045) / (1+.065)
   = 5,692.96 + 4,902.40 = 10,595.36
Total Claim Reserve at Beginning of Projection Year 2 = 2,112.68 + 10,595.36 = 12,708.04

(b) **(NO LONGER RELEVANT)** ~~QWE would like to use reinsurance to mitigate GAAP income volatility from the risk of entering the LTC market.~~

~~Assess whether each proposal below meets the objective of QWE.~~

(i) ~~Proposal 1: Cede 80% of morbidity risk with a large ceding commission to boost surplus at inception. QWE will pay a morbidity premium set at 500% of best estimate morbidity, and will receive an experience rating refund on ceded premium paid over 0.05% of statutory reserves at the end of each year.~~

2.   Continued

> (ii)   Proposal 2: QWE will pay a quarterly premium at 107% of the industry
> morbidity rate, with the first-year reinsurance premium being waived for
> all policies. The reinsurer will reimburse all LTC claims after the second
> year a policy has been on claim.

> **Commentary on Question**:
> *For this part of the question, candidates were required to evaluate the
> appropriateness of two reinsurance proposals with respect to mitigating GAAP
> income volatility from the risk of entering the LTC market.*
> *Some candidates failed to state if either proposal meets QWE's objective. Some
> candidates argued that portions of each proposal satisfy QWE's objective and
> other portions of the same proposal did not satisfy QWE's objective. Many
> candidates failed to explain why deposit accounting would be applied to Proposal
> 1 and that such accounting has no impact to GAAP income volatility, or that
> reinsurance accounting treatment would be applied to Proposal 2 and that such
> accounting lessens GAAP income volatility. Repeating the proposal was not
> sufficient for a candidate to earn full credit for this part of the question.*

> (i)   Proposal 1 does not meet the objective of QWE to mitigate GAAP income
> volatility from the risk of entering the LTC market. QWE paying a
> morbidity premium equal to 500% of best estimate morbidity is excessive.
> For QWE to receive an experience rating refund on ceded premium paid
> over 0.05% of statutory reserves at the end of each year limits the
> reinsurance risk and raises risk transfer concerns such that it may be more
> difficult to assert that substantially all the insurance risk has been assumed
> by the reinsurer. Thus, this proposal does not have sufficient risk transfer.
> Long-duration reinsurance contracts that do not indemnify the ceding
> insurer or subject the assuming reinsurer to significant mortality or
> morbidity risk are treated as deposits. In this case, deposit accounting
> applies which has no impact on income volatility due to new risks.

> (ii)   Proposal 2 does meet the objective of QWE to mitigate GAAP income
> volatility from the risk of entering the LTC market. QWE paying a
> quarterly premium at 107% of the industry morbidity rate with the first-
> year premium being waived seems reasonable and in line with the
> reinsurer reimbursing all LTC claims after the second year a policy has
> been on claim. Thus, it appears that QWE is indeed transferring
> substantially all the insurance risk on the reinsured portions of the
> underlying contracts to the reinsurer and therefore, qualifies as a
> reinsurance contract. This reinsurance treaty meets the requirements of
> reinsurance accounting. Such accounting treatment lessens the income
> volatility induced by the morbidity risk.

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2. Continued

(c)   To boost competitiveness for the LTC product, QWE's chief marketing officer
        has decided to increase the commission on the LTC products. The agents selling
        the policies have proposed the following commission schedules:

        - **Schedule A**: 10% commission on first year premium only
        - **Schedule B**: 1% commission on all premium collected
        - **Schedule C**: fixed cost per year regardless of sales. Cost is
          approximately 8% of projected first year premium

        The expected life of the policy is 30 years.

        Identify the commission schedule that:

        (i)   Results in the least statutory surplus strain at issue.

        (ii)   Results in the highest GAAP net income.

        (iii)   Results in the least mismatch between statutory income and GAAP
                income.

        Justify your answer.

        Commentary on Question:
        *For this part of the question, candidates were required to evaluate the impact of
        three proposed commission scales to GAAP and statutory income statements.*
        Candidates generally did well on this part of the question. Many candidates
        demonstrated their knowledge of which commission schedule had expenses which
        were eligible for deferral into a DAC asset and available for amortization.
        Candidates also demonstrated their understanding how deferability of an expense
        or lack of deferability impacts statutory surplus, GAAP net income, and the
        relationship between statutory and GAAP income statements. For part (iii)
        candidates received full credit if they answered Schedule B, Schedule C, or
        Schedules B and C.

        (i)   The commission schedule which results in the least statutory surplus strain
                at issue is the commission schedule which produces the least amount of
                expenses in the first year. Expenses are expensed as incurred in a
                statutory income statement. Thus, Schedule B with its 1% of commission
                on all premium collected will produce the least amount of expenses among
                the three schedules in the first year.

---

2. **Continued**

    (ii)   The commission schedule which results in the highest GAAP income is Schedule A because its commissions are deferrable and amortized over 30 years since its commissions are in excess of 0% ultimate commissions. Annually such expenses would be amortized (expensed) in a GAAP income statement as 1/3% of premiums in each year on a straight-line basis for 30 years. The commissions for both Schedules B and C are not deferrable and would be expensed as incurred. The amortized expenses for Schedule A are lower than the expenses incurred by Schedules B and C and results in the least expense reduction of the three schedules.

    (iii)   The commission schedules that result in the least mismatch between statutory income and GAAP income are Schedules B and C. Schedule B's commissions are not deferrable since its commission schedule are a level percent of premium without a lower ultimate commission and thus, its expenses are identically expensed as incurred in both Statutory and GAAP income statements. Schedule C's commissions are classified as fixed expenses since they do not directly vary with sales and as a result, are not deferrable and thus, as similar to Schedule B, its expenses are identically expensed as incurred in both Statutory and GAAP income statements. This is not true for Schedule A since its commissions are deferrable and therefore, its expenses in a GAAP income statement will not match the expenses in a Statutory income statement.

4. Spring 2024 ILA-LFMU Exam (LO 1a)

Learning Objectives:
1.   The candidate will understand and apply U.S. valuation principles and methods applicable to individual life insurance and annuity products issued by U.S. life insurance companies.

Learning Outcomes:
(1a)   Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US statutory framework, including the calculation of principles-based reserves and formulaic reserves.

Sources:
Statutory Valuation of Individual Life and Annuity Contracts, Claire, D., Lombardi, L. and Summers, S., 5th Edition, 2018
*   Chapter 23: VM-20: PBR for Life Products (excluding 23.1)

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

Solution:
(a)   **(LO 1.a)** Critique the following statements:

   A.   *The starting assets in the cash flow projection model should be 105% of the modeled reserve.*

   B.   *The Deterministic Exclusion Test is not required as it is designed to identify policies that are insensitive to interest rate and asset return volatility risks.*

   C.   *The Stochastic Reserve is calculated as the sum of the starting assets and the greatest present value of accumulated deficiency.*

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4. **Continued**

Commentary on Question:
A. Most candidates correctly identified the fallacy of this statement.
B. This is a composite statement and is best analyzed as such. In discussing the application of the DET, the best-prepared candidates recognized the special nature of ULSG; however, this was not required to answer the question correctly.
C. Candidates generally did not do well critiquing this statement.

A. False. The starting assets should be in the range between 98% and 102% of the reported reserve.
B. False. The DET is not required; however, it is designed to determine whether premiums are sufficient to fund the policy's guarantees, not determine whether the policy is insensitive to interest rate and asset return volatility risks.
C. False. The sum of starting assets and the greatest present value of accumulated deficiencies defines a scenario reserve, not the Stochastic Reserve.

(b) **(partially relevant)** Calculate the Scenario Reserve given the projected scenario below. Show all work.

Projection period	0	1	2	3	4	5	6	7	8	9	10
Statement Value of Assets (000s)	20	11	2	(7)	(3)	1	5	9	13	17	21
One-Year Treasury Rate (%)		1.34	0.65	0.14	1.03	1.08	0.74	0.59	1.05	0.57	0.48

Commentary on Question:
Given that the calculation was described in words in the text, the majority of candidates did well on this part of the question.
Common mistakes were:
(a) failing to multiply the Treasury rates by 105%; and
(b) errors in developing the Accumulative Discount Factors.

See spreadsheet for model solution

(c) **(LO 1.a)** Describe the steps to determine the prudent estimate mortality assumption given that ABC's mortality experience is only partially credible.

Commentary on Question:
This part of the question might be a bit challenging for candidates who never experienced this process. Most candidates failed to mention the requirement to add margins.

4. **Continued**

The actuary must select
(a) a set of mortality rates (Set 1) representing the company's mortality experience; and
(b) a corresponding set of mortality rates (Set 2) representing industry mortality experience.
A margin for conservatism is added to each of Set 1 and Set 2, to produce MSet 1 and MSet 2, respectively. The credibility score of the company's experience data is a factor in selecting the respective margins.

Using the detailed process defined in VM-20, MSet 1 and MSet 2 are blended together to produce the final prudent estimate assumption for mortality.

The process of grading the company experience rates (with margin) to the industry experience rates (with margin) uses a prescribed grading table that varies by the credibility level of the company data as well as the "sufficient data period". This period is defined as the last policy duration which has 50 or more claims. Generally, the lower the credibility of the company mortality data, the more quickly the company experience rates must grade into the industry mortality rates after sufficient data no longer exists, as determined by the sufficient data period.

If the actuary does not have sufficient mortality data on which to base the selection of Set 1, then Set 2 alone is used for the entire process.

(d)   **(NO LONGER RELEVANT)** ~~Describe the factors that can impact ABC Life's mortality improvement assumptions under a significant pandemic, such as COVID-19.~~

~~**Commentary on Question**:~~
~~*Most candidates treated this as a question about COVID-19. Rather, this a question about the lessons learned from COVID-19. Common errors were:*~~
~~*(a) discussing the mortality assumption rather than the mortality improvement assumption; and*~~
~~*(b) discussing whether to set a mortality improvement assumption. The question presumes that a mortality improvement assumption is being set.*~~

~~General: Like COVID-19, the future direction of mortality improvement might be unknown; so conservatism must be considered.~~

~~Factors that might sustain future mortality improvement:~~
~~1. The pandemic might have ended unhealthy lives, leaving behind a population that is healthier than pre-pandemic.~~
~~2. COVID-19 encouraged the use of telemedicine. For a future pandemic, this approach may lead to better health outcomes and longer survival.~~

4. Continued

Factors that might reduce future mortality improvement:
3. Latent effects may emerge later and cause unanticipated deaths.
4. The impact of the pandemic on mental health may have a negative impact on mortality improvement by way of increased suicides.

5. Spring 2024 ILA-LFMU Exam (LOs 1a, 1b)

Learning Objectives:
1.   The candidate will understand and apply U.S. valuation principles and methods applicable to individual life insurance and annuity products issued by U.S. life insurance companies.

Learning Outcomes:
(1a)   Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US statutory framework, including the calculation of principles-based reserves and formulaic reserves.

(1b)   Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US statutory framework, including the calculation of principles-based reserves and formulaic reserves.

Sources:
Statutory Valuation of Individual Life and Annuity Contracts, Claire, D., Lombardi, L. and Summers, S., 5th Edition, 2018
- Chapter 23: VM-20: PBR for Life Products (excluding 23.1)
- Chapter 25: Principle-Based Reserve Report

US GAAP for Insurers, Freedman, M., and Frasca, R., 3rd Edition, 2024 - Chapter 5: Nonparticipating Traditional Life Insurance

Commentary on Question:
This question tested the candidates' ability to compare a variety of standards. The question covers aspects VM-20, US GAAP, and IFRS17. Candidates with knowledge of all the standards generally did well on this question.

Solution:
(a)   **(LO 1.a & 1.b)** Due to the impact of COVID-19, PGY Group has been reviewing and revising some of its best estimate assumptions for a block of term business. You are given:

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5. **Continued**

Assumption	Before	After
Mortality	100% of past experience	10% increase
Maintenance expense	2,000 per policy	2,000 per policy with 3% inflation
Claim expense	1,000 per claim	1,000 per claim, decreasing by 5% each year, floored at 500
PGY's experience is considered fully credible		

Assess the current year directional impact of the assumption update (while holding all other assumptions constant) for each of the above assumptions with regard to each of the following:

(i)   Deterministic US Statutory Reserve under VM-20

(ii)   US GAAP Reserve

Justify your answers.

Commentary on Question:
Candidates generally did well on this part of the question in identifying the impact due to mortality but struggled on maintenance expenses and claim expenses. For a candidate to receive full credit, they had to ensure to relate their answer back to the standard. Candidates were able to answer the question when it related to mortality but were not able to tie the concepts back when asked about Maintenance Expenses and Claim expenses. This refers to future improvements not being included for VM20, or how maintenance expenses not being considered a part of US GAAP reserves. To receive full credit candidates had to provide the directional impact and the justification, which many candidates failed to do.

(i)   Deterministic US Statutory Reserve under VM-20

Mortality – The 10% increase in mortality will **increase** the reserve. As PGY's experience is fully credible, they are allowed to reflect the company experience as part of the assumption.

Maintenance Expenses – Including inflation in the expenses will **increase** the reserve. As the Deterministic Reserve under VM20 is a Gross Premium Valuation, all inflows and outflows are considered.

Claim expense – There will be **no impact** to the reserve. Under VM-20, future improvement is not allowed to be reflected as part of the result until it actually realized.

5.   Continued

   (ii)   US GAAP Reserve

Mortality – The 10% increase in mortality will **increase** the reserve. US GAAP Reserves uses best estimate assumption and allows the unlocking of assumptions at each valuation date.

Maintenance Expenses – There will be **no impact** to the reserve. US GAAP Reserves do not include maintenance expenses,

Claim expense – There will be a decrease to the US GAAP Reserves. GAAP Reserves include claim costs which includes claim expenses. This are allowed to be reflected in the projected cash flows.

(b)   **(LO 1.a)** Critique the following statements for ULSG under VM-20:

   A.   *The VM-20 Minimum Reserves for a group of individual life insurance policies that pass both the deterministic and stochastic exclusion tests is NPR+Max[0, DR-NPR].*

   B.   *The process for calculating the NPR assumes that at issue, all policies are level premium permanent plans that will expire on the maturity date with a minimum guaranteed benefit.*

   C.   *When calculating the NPR floor, the COI would be determined to the next paid-to-date using credibility weighted company experience.*

Commentary on Question:
Candidates generally did well critiquing statement A, and generally did not do well critiquing statements B and C. Due to the ambiguity about the type of ULSG product stated, when critiquing statement A full credit was received if the candidate stated the the Reserve would just be the NPR, or that a ULSG will always needed to perform the DET. When critiquing statement B many candidates were unable identify that under NPR the fund value had to mature at a 0 value. When critiquing statement C, most candidates failed to identify that the COI should be based on the prescribed mortality rate and focused more on the weighting. No credit was received if a candidate just provided a True or False without any justification.

   A.   True, under VM-20, a a ULSG will always need to calculate the DR regardless of whether both the DET and SET have been passed.

5. **Continued**

B. False, when calculating the NPR, the assumption is that the policy will expire at a 0 maturity value.

C. False, when calculating the NPR, the COI would be determined to the next paid-to-date using the applicable prescribed mortality rate based on the issue date of the policy.

(c) **(NO LONGER RELEVANT)** ~~PGY Group's management will strategically assign a legal entity for each block of business to be reported through, with the goal of optimizing profit and capital.~~

~~You are given the following information on a block of whole life business at issue:~~

~~Plan~~	~~PV premium (millions)~~	~~PV claims (millions)~~	~~IFRS 17 Risk Adjustment (millions)~~	~~PV expenses (millions)~~
~~A~~	~~10~~	~~5~~	~~0.5~~	~~0~~
~~B~~	~~12~~	~~13~~	~~1~~	~~0~~

~~(i)   Calculate the GAAP liability for each plan. Show all work.~~

~~(ii)   Calculate the IFRS 17 fulfillment cashflow for each plan. Show all work.~~

~~(iii)   Calculate the IFRS 17 contractual service margin for each plan. Show all work.~~

~~(iv)   Recommend which entity below should be used for this block:~~

- ~~Entity 1: follows IFRS 17 reporting~~
- ~~Entity 2: follows U.S GAAP reporting~~

~~Justify your response.~~

~~**Commentary on Question**:~~
~~Candidates generally did not do well on part (i). Most candidates did not appropriately calculate Net Premium Ratio (NPR) and simply set the GAAP Liability to the PV of Claims – PV of Premiums. No credit was received for calculating this formula as it missed out a critical component of calculating the NPR.~~
~~Candidates generally did do well on part (ii) and (iii). Most candidates calculated these correctly and those who did not performed mostly careless mistakes.~~

5. Continued

Candidates performed well on part (iv). Most candidates were able to identify several appropriate reasons to show that US GAAP would be preferable for this entity. Candidates who suggested IFRS17 and provided reasonable justification received partial credit. For a candidate to receive full credit, they had to make reference to the calculations performed within parts (i), (ii) and (iii).

(i) GAAP Liability

NPR = min(1, PV Future Benefits/PV future Premiums)

GAAP Liability = PV Future Benefits – NPR x PV Future Premiums

Product A:

NPR = min(1,5/10) = 0.5

GAAP Liability = 5 – 0.5 * 10 = 0

Product B:

NPR = min(1,13/12) = 1

GAAP Liability = 13 – 1* 12 = 1

Total GAAP Liability = 0 + 1 = 1

(ii) Fulfillment cash flow

Fulfillment Cashflow = PV Claims + PV Expenses + Risk Adjustment – PV Premiums

Product A = 5 + 0 + 0.5 – 10 = -4.5

Product B = 13 + 0 + 1 – 12 = 2

(iii) Contractual Service Margin

CSM = Max(-Fulfillment Cashflow,0)

Product A = Max(-(-4.5),0) = 4.5

Product B = Max(-1,0) = 0

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5. Continued

(iv) ~~Entity 2 would be preferred for this block. Under US GAAP, products A and B can be aggregated together. Under IFRS17, as product B is Onerous they have to be reported separately. Under US GAAP as they can be aggregated gains and be used to subsided losses within the different product – under IFRS17 there is no subsiding allowed. As there is a lower GAAP Liability at issue, there will be higher capital compared to IFRS17 due to the initial loss.~~

6. Spring 2024 ILA-LFMU Exam (LO 1a)

Learning Objectives:
1.   The candidate will understand and apply U.S. valuation principles and methods applicable to individual life insurance and annuity products issued by U.S. life insurance companies.

Learning Outcomes:
(1a)   Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US statutory framework, including the calculation of principles-based reserves and formulaic reserves.

Sources:
Statutory Valuation of Individual Life and Annuity Contracts, Claire, D., Lombardi, L. and Summers, S., 5th Edition, 2018; Chapter 11: Valuation Methodologies (excluding 11.3.9-11.3.11)

Commentary on Question:
This question tested the candidate's knowledge of U.S. Statutory valuation principles and methods and the impact of taxation rules on products and life insurers. Candidates generally did well on this question. Most candidates received at least partial credit on each part of the question.

6. Continued

Solution:

(a) **(LO 1.a)** You are given the following information on an individual whole life policy as of 12/31/2023.

Issue date	April 10, 2016
Mean reserve (includes deficiency reserves)	5,000
Valuation premium	1,000
Deficiency reserve	1,000
Supplemental benefit reserve	100
Cash surrender value	3,500
Policy Mean Reserve	Semi Continuous Reserve Method assuming an Annual Valuation Mode
Policy premium mode	monthly

Calculate the tax reserve for the policy as of 12/31/2023. Show all work.

Commentary on Question:
Very few candidates received full credit on this part of the question. Most candidates were able to identify that the tax reserve is 92.81% of the stat reserve, and that the tax reserve is floored at the cash surrender value. Few candidates applied either correctly. Few candidates identified that the final tax reserve, including the rider reserve, is capped at the statutory reserve. When calculating the deferred premium asset, credit was given to assuming either 3/12 or 4/12 premium left in the policy year.

Tax Reserve = max(Mean Reserve – Deferred Premium – Deficiency Reserve)*0.9281, Cash surrender value)

Deferred premium = (4/12)*Valuation Premium = 333.33
Tax Reserve = max(5,000 – 333.33 – 1000)*0.9281, 3,500) = 3,500
Waiver Reserve = 100*0.9281 = 92.81
Total Tax Reserve is capped at statutory reserve

Total Reserve = min(3,500 + 92.81, 5,000 + 100) = 3,592.81

6. Continued

(b) **(NO LONGER RELEVANT)** ~~You are given the following information for a universal life policy:~~

~~Face amount~~	~~234,000~~
~~Minimum guarantee rate~~	~~2.0%~~
~~Issue age~~	~~46~~
~~Premium expense load~~	~~3.0%~~

	~~2%~~	~~4%~~	~~6%~~
~~Present value of death benefits~~	~~86,073.58~~	~~48,556.15~~	~~29,244.58~~
~~Present value of expenses~~	~~131.98~~	~~95.02~~	~~72.35~~
~~$\ddot{a}_{46}$~~	~~27.40~~	~~20.00~~	~~15.47~~
~~$\ddot{a}_{46:\overline{7}}$~~	~~6.57~~	~~6.22~~	~~5.89~~

~~Calculate the following:~~

~~(i)   Initial Cash Value Accumulation Test Net Single Premium~~

~~(ii)   Guideline Level Premium~~

~~(iii)   Guideline Single Premium~~

~~(iv)   7-Pay Premium~~

~~Show all work.~~

~~Commentary on Question~~~~:~~
~~Most candidates did well on this part of the question and received full credit. Not enough information was given on the issue date of the given contract to determine if it was issued pre- or post-2021, which would have determined if the revised rates under the Consolidated Appropriations Act of 2021 applied. Full credit was given to either approach. Additionally, some candidates included the premium expense load as part of the expenses for the GLP and GSP calculations, and other candidate did not. Full credit was received for either approach.~~

~~If issued pre-2021:~~
~~(i)   CVAT NSP = PVDB @ 4% = 48,556~~
~~(ii)   GLP = (PVDB + PVExp) / a46 @ 4% = 2,433~~
~~(iii)   GSP = (PVDB + PVExp) @ 6% = 29,317~~
~~(iv)   7-pay premium = PVDB / a46:7 @ 4% = 7,806~~

6. Continued

~~If issued post-2021:~~
~~(i) CVAT NSP = PVDB @ 2% = 86,074~~
~~(ii) GLP = (PVDB + PVExp) / a46 @ 2% = 3,146~~
~~(iii) GSP = (PVDB + PVExp) @ 4% = 48,651~~
~~(iv) 7-pay premium = PVDB / a46:7 @ 2% = 13,101~~

(c) **(NO LONGER RELEVANT)** ~~Using information from (b), you are given additional information about actual premium payments:~~

~~Policy Year~~	~~Premium Paid~~
~~1~~	~~10,000~~
~~2~~	~~5,000~~
~~3~~	~~25,000~~
~~4~~	~~3,000~~
~~5~~	~~2,500~~
~~6~~	~~2,000~~
~~7~~	~~0~~

~~(i) Determine whether the policy qualifies as life insurance using the guideline premium test. Show all work.~~

~~(ii) Determine whether the policy is a modified endowment contract. Show all work.~~

~~(iii) Describe how policyholder taxes change when the policy is a modified endowment contract.~~

~~Commentary on Question~~:
~~Most candidates were able to receive partial credit on this part of the question. If candidates did not arrive at the correct values in part (b) but used those values correctly in this part of the question to determine whether or not the contract qualifies as life insurance and is a MEC, full credit was received. In order to receive full credit on part (iii), candidates had to state two similarities and two differences between the tax treatment of MECs and non-MECs. Most candidates received at least partial credit on part (iii).~~

7. Spring 2024 ILA-LFMU Exam (LOs 2a, 3c)

Learning Objectives:
2.   The candidate will understand how to explain and apply the methods, approaches and tools of financial capital management for life insurance company under a US regulatory framework.

3.   The candidate will understand types of life insurance risks, the impacts of diversification, crediting rating agency frameworks, and the assessment of risk management.

Learning Outcomes:
(2a)   Explain and calculate required capital under a US regulatory framework.

(3c)   Explain and understand the use and application of the Own Risk Solvency Assessment (ORSA) report.

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

ILA201-802-25: NAIC Own Risk and Solvency Assessment (ORSA) Guidance Manual, National Association of Insurance Commissioners, Dec 2017

Commentary on Question:
This question tested the candidates' understanding of Risk-Based Capital and ORSA in the context of understanding various viewpoints on risk evaluation.

Solution:
(a)   **(LO 2.a & 3c)** The following is an excerpt from SPW Life's ORSA report:

- *SPW Life has identified its key risk to be disintermediation risk in the rising interest rate environment, where SPW Life will incur a large loss when selling assets to fund its high amount of lapses.*
- *SPW Life's experience in mortality underwriting has been more favorable than the industry, and it does not view mortality as a key risk.*

You have been provided the following information about SPW Life's RBC components:

RBC Component	Capital Amount (before diversification)
C0	0
C1	4,000,000

C2	100,000,000
C3	5,000,000
C4	0

Explain why the biggest risk identified from the RBC above may be different from the ORSA excerpt.

Commentary on Question:
Candidates who identified that ORSA is company specific and RBC is an industry-wide and factor-based approach received did well on this part of the question. Candidates generally did well on this part of the question.

- RBC is a factor-based calculation set by regulatory standards and application does not vary company to company.
- RBC components above are based solely on how regulators perceive risk.
- C2, representing insurance risk, is a factor applied to NAR to get the capital amount, so higher NAR on business issued will naturally make this capital component higher.
- ORSA is an own risk and solvency assessment and is the company's own view of risk; it is company specific and describes what is seen as a perceived risk and how to mitigate and monitor it. This positions SPW Life to acknowledge their mortality underwriting being more favorable than the industry.
- Therefore, there's no requirement the RBC and ORSA would identify the same risk.
- RBC likely should be a considered input when working through ORSA.

(b)   **(LO 3c)** Evaluate whether each of the following statements from SPW Life's ORSA report is consistent with the ORSA guidance.

A.   SPW Life has performed all its quantitative risk assessments, using stochastic analysis and actuarial judgement. All assessments were done on a quantitative basis.

B.   The stress tests used in ORSA calculations were based on historic worst cases experienced by SPW Life in the last 5 years.

C.   SPW Life defines solvency as having enough liquid assets, limited to cash and US Treasury bonds, to ensure all obligations will be able to be met within the next 3 years.

Commentary on Question:
Candidates generally did well evaluating statements A and B. Many candidates did not evaluate statement C correctly.

For statement A credit was received for identifying the qualitative analysis.

For statement B credit was received for identifying that the time horizon is likely too short and that testing beyond history is likely needed. Credit was also received for discussing the benefits of varying the stresses by risk category.

For statement C it was a common mistake to address what assets should be included in solvency. Identifying that the question is addressing a life insurance company and the timeline is likely longer received credit.

A.
- ORSA guidance proposes that both qualitative and quantitative analysis be performed.
- Using stochastic analysis can be appropriate for certain risks.

B.
- ORSA doesn't specifically require sensitivity or testing levels.
- Stresses can vary by risk category.
- Judgment will be used to determine what is appropriate to test.
- Stresses based solely on history may not be adequate, especially only the past 5 years.

C.
- This can be viewed as consistent as the statement includes a definition of solvency and a time horizon.
- Solvency should be considered over the expected coverage of the block of business, until one can deem there is no more material risk.
- The projected horizon is likely too short for a life insurance product.

(c)   **(LO 2.a)** Determine the C-3 Risk Category appropriate for each product below using the NAIC RBC rules at the inception of the product. Justify your reasoning.

(i)   Fixed deferred annuity with a 3-year surrender charge period and no Market Value Adjustment (MVA). The first-year surrender charge is 6%.

(ii)   Single premium deferred payout annuity. The single premium cannot be withdrawn for 5 years. Starting in year 6, payments are guaranteed for life.

(iii)   Fixed indexed annuity with a 2% surrender charge for only the first 5 years.

Commentary on Question:
To received full credit, candidates had to identify the correct risk level of the product (low, medium, high) and provide justification. A common mistake was to only identify the risk level.

7. Continued

(i) Product 1 - Medium risk due to surrender charge >5% threshold.

(ii) Product 2 - Low risk as it does not allow withdrawals.

(iii) Product 3 -High risk as surrender charge is <5% threshold.

8. Spring 2024 ILA-LFMU Exam (LO 4d)

Learning Objectives:
    4.   The candidate will understand the fundamentals of value creation and inforce management techniques for life and annuity products.

Learning Outcomes:
(4d)   Describe and apply the methods and principles of embedded value for an insurance enterprise

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

Commentary on Question:
The question tested the candidates' knowledge of embedded value and AAV.

Solution:
(a)   **(LO 4d)** CWY hired an investment bank to use the Comparable Company Analysis technique to generate a range of appraisal values for ELF.
You are given:

- price-to-book value multiples ranging from 1.1 to 1.8
- a change of control premium of 15%
- ELF's current book value is 1000

    (i)   Describe the general guidelines that are useful for peer group selection in the Comparable Company Analysis.

    (ii)   (NOT RELEVANT) ~~Calculate the range of appraisal value of ELF Insurance. Show all work.~~

    Commentary on Question:
    Few candidates received full credit for this part of the question.

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8. Continued

      (i)   Some guidelines to consider when selecting peer companies:
- The peer group must be large enough to be statistically significant
- Select companies with the same or similar regulatory, accounting and tax rules.
- The peer group should sell in the company's core or dominant segments
- Analyze companies that are similar performers in the same LOB

~~(ii)   Range of appraisal value~~
- ~~Lower end of range – 1000 X 1.1 X (1 + 0.15) = 1,265~~
- ~~Upper end of range – 1000 X 1.8 X (1 + 0.15) = 2,070~~

(b)   **(LO 4d)** You are given the following statutory projection:

	12/2023	12/2024	12/2025	12/2026	12/2027	12/2028
Premium		500	450	400	350	300
Investment Income (all assets)		138	131	125	118	112
Benefits		200	210	220	230	240
Commissions		10	9	8	7	6
Expenses		100	90	80	70	60
Statutory Reserves	2000	1900	1800	1700	1600	0
Total Required Capital	300	290	280	270	260	0

Assuming:

Pre-tax earned rate	6%
Tax rate	21%
Free surplus	0
Risk discount rate	10%

Taxable incomes equal to pre-tax earnings.

8. **Continued**

List formulas for the following information:

(i)   Book profit

(ii)   Cost of Capital

(iii)   Inforce Business Value

(iv)   Calculate Embedded Value

Commentary on Question:
Many candidates did not properly handle the change in the statutory reserve in the presentation of income or take into account federal income taxes. Most candidates also missed the adjustment for interest on required capital in the book profit calculation.

(i)   Book Profit
Revenue = premiums + investment income
Benefits / expenses = Benefits + Commissions + Expenses – Change in Reserve
Pre tax Stat Income = Revenue – Benefits
After tax Stat Income = Pre-tax – Taxes
Book Profit = After Tax Stat Income – int on required capital on after tax basis

~~Yearly Values~~

~~Revenue~~	~~638~~	~~581~~	~~525~~	~~468~~	~~412~~
~~Benefits/Exp~~	~~210~~	~~209~~	~~208~~	~~207~~	~~(1,294)~~
~~Pre tax Stat~~	~~428~~	~~372~~	~~317~~	~~261~~	~~1,706~~
~~Tax~~	~~90~~	~~78~~	~~67~~	~~55~~	~~358~~
~~After tax Stat~~	~~338~~	~~294~~	~~250~~	~~206~~	~~1,347~~

~~Req Capital Charge = Required Capital X Earned Rate X (1-Tax Rate)~~
~~= 14   14   13   13   12~~

~~Book Profit~~	~~324~~	~~280~~	~~237~~	~~194~~	~~1,335~~

8. Continued

     (ii)   ~~Cost of Capital~~

          ~~Cost of Capital Rate = 10% - 6% X (1 - 0.21) = 5.26%~~

          Cost of Capital = Required Capital (t-1) X (Discount Rate – Investment Return)

          = ~~15.78   15.25   14.73   14.20   13.68~~

     (iii)   Inforce Business Value

          IBV = PV Book Profit – PV Cost Of Capital using 10% rate

~~PV Book Profit =~~	~~1,665~~	~~1,508~~	~~1,378~~	~~1,279~~	~~1,214~~
~~PV COC =~~	~~56~~	~~46~~	~~35~~	~~24~~	~~12~~
~~IBV =~~	~~1,609~~	~~1,462~~	~~1,343~~	~~1,255~~	~~1,201~~

     (iv)   Embedded Value

          EV = AMW + IBV

          ANW = Req Capital + Free Surplus

          ANW = Required Capital in all years as Free Surplus is always zero.

ANW =	300	290	280	270	260
EV =	1,909	1,752	1,623	1,525	1,461

(c)   **(LO 4d)** Critique the following statements. Justify your answers.

    A.   *A going concern valuation captures only the value of all the tangible assets that are reflected on the seller's balance sheet.*

    B.   *For public companies, the actuarial appraisals developed by the seller are usually done on a US GAAP accounting basis.*

    C.   *The assumptions underlying the seller's actuarial appraisal analysis are intended to be moderately adverse to be conservative.*

    D.   *If embedded value assumptions are the same as actuarial appraisal assumptions and the same discount rates are used for both, then the actuarial appraisal value is the sum of embedded value and the value of future business.*

Commentary on Question:
Candidates did generally did well on this part of the question.

8. Continued

A.   False. A going concerning valuation captures the value of certain intangible assets that are not reflected on the seller's balance sheet.

B.   False. Actuarial appraisals are typically done on a statutory accounting basis rather than GAAP (although the GAAP impact of the transaction may be studied as part of the due diligence work).

C.   False. The assumption underlying the actuarial appraisal analysis are intended to be best estimate (i.e., without margin for conservatism).

D.   True. EV and AAV usually differs in three ways: (1) actuarial appraisals typically assign a value to the contribution of future new business whereas EV does not, (2) actuarial appraisals are typically calculated using higher discount rates than EV, and (3) expense assumptions used in calculating EV are typically more company specific than those used in actuarial appraisals, where the assumptions tend to be more reflective of the prevailing sentiment of the market.

1. Fall 2023 ILA-LFMU Exam (LO 2d)

Learning Objectives:
2. The candidate will understand how to explain and apply the methods, approaches and tools of financial capital management for life insurance company under a US regulatory framework.

Learning Outcomes:
(2d) The Candidate will be able to explain and apply methods in capital management

Relevant Sources:
ILA201-800-25: Theory of Risk Capital in Financial Firms

Commentary on Question:
This question tested the candidates' understanding of risk capital frameworks. Candidates demonstrated an understanding of the basic concepts but did not demonstrate an in depth understanding.

Solution:
(a) Critique the following statements regarding a risk capital framework:
Commentary on Question:
Candidates generally did well on this part of the question. For statement A, candidates that answered 'partially true' received full credit if they provided appropriate justification (e.g., if some specific fixed income asset may have higher risk).

A.   All else being equal, a firm that invests predominantly in equities will require more risk capital than a firm that invests predominantly in fixed income securities.

True
Risk capital depends on the riskiness of the assets. The riskier the assets, the more risk capital.

B.   As long as there are no changes in a firm's underlying gross assets, changes in any liabilities will have no impact on the amount of risk capital required.

1. Continued

False
Risk capital depends on the amount of net assets (gross assets less liabilities). Changes in either would impact risk capital.

(b) You are given:

- Marginal risk capital is used to allocate risk capital across business units.
- The continuously compounded risk-free rate of interest is 3%.

Correlation of profits by business unit

	Annuities	Mutual Funds	Seg Funds	Term Life
Annuities	1.00			
Mutual Funds	0.25	1.00		
Seg Funds	0.50	0.20	1.00	
Term Life	0.00	0.00	0.00	1.00

Business Unit Group	Annual Volatility of profits	Liabilities at time 0	Risk-free value of net assets at the end of the first year
Annuities (1)	30.0%	2,000	250
Mutual Funds (2)	40.0%	1,000	200
Seg Funds (3)	25.0%	3,000	500
Term Life (4)	20.0%	8,000	500
1 & 2 & 3	22.2%	6,000	950
1 & 2 & 4	16.2%	11,000	950
1 & 3 & 4	15.2%	13,000	1,250
2 & 3 & 4	15.3%	12,000	1,200
1 & 2 & 3 & 4	14.8%	14,000	1,450

(i) Calculate the variance of business profits of a portfolio consisting of mutual funds and segregated funds.

(ii) Calculate the proportion of unallocated risk capital for MGP at the end of the second year.

Commentary on Question:
Candidates generally did not do well on this part of the question. Candidates received partial credit for providing high level definition of total, unallocated, and marginal capital. Common errors included:

1. Continued

- *Using net assets instead of total assets for the time 0 asset calculation*
- *Failing to reflect timing in the calculation of asset at time 0, and consequently getting the incorrect results for weighting*
- *Failing to include weighting in the calculation of variance*
- *Missing the square root in the calculation for approximate RC*

i)

	A	B	C	D
Business Unit Group	Annual Volatility of profits	Liabilities at time 0	Risk-free value of net assets at the end of the first year	Assets at time 0
Annities (1)	30%	2,000	250	2,242.61
Mutual Funds (2)	40%	1,000	200	1,194.09
Seg Funds (3)	25%	3,000	500	3,485.22
Term Life (4)	20%	8,000	500	8,485.22
1 & 2 & 3	22.2%	6,000	950	6,921.92
1 & 2 & 4	16.2%	11,000	950	11,921.92
1 & 3 & 4	15.2%	13,000	1,250	14,213.06
2 & 3 & 4	15.3%	12,000	1,200	13,164.53
1 & 2 & 3 & 4	14.8%	14,000	1,450	15,407.15

Where D = C/Exp(risk free rate)+B, and risk free rate is 3% as given – most candidates missed adding back B to get the assets at time 0

Solve for asset at time 0:

> Risk-Free Value of Net Assets
> $= (Assets_0 - Liabilities_0) * e^{rT}$

Calculate the weights of a portfolio of only mutual and seg funds

> $$\omega_i = Weight_i = \frac{Assets_{0,i}}{Assets_{0,portfolio}}$$

Calculate variance for a portfolio of mutual funds (2) and seg funds (3):

> $$Variance = \sum_i \sum_j \omega_i \omega_j \rho_{i,j} \sigma_i \sigma_j$$

1. Continued

i	j	a p(i,j)	b vol(i)		c vol(j)		d weight(i)	e weight(j)	f Product
2	2	1		40%		40%	25.5%	25.5%	0.0104
2	3	0.2		40%		25%	25.5%	74.5%	0.0038
3	2	0.2		25%		40%	74.5%	25.5%	0.0038
3	3	1		25%		25%	74.5%	74.5%	0.0347
								Sum:	**5.3%**

Where $f = a*b*c*d*e$

ii)
Solve for Assets at time zero for all business unit groups using formula from part i)
Calculate the Approximate Risk Capital for each business unit group. Volatilities as given, T = 2

$$Approx.\ Risk\ Capital = 0.4 * Assets_0 * \sigma * \sqrt{T}$$

Where $T = 2$

Calculate the Marginal Risk Capital for each business:

Marginal Risk capital for business unit i = Total RC - RC for the portfolio without business i.
Unallocated Risk Capital = Total Risk Capital - Sum of all Marginals
Proportion = Unallocated Risk Capital / Total Risk Capital

Business Unit Group	Marginal Business	Annual Volatility of profits	Assets at time 0	Approx. Risk Capital	Marginal Risk Capital
1 & 2 & 3	4	22.2%	6,921.92	869.27	420.64
1 & 2 & 4	3	16.2%	11,921.92	1,092.54	197.37
1 & 3 & 4	2	15.2%	14,213.06	1,222.10	67.81
2 & 3 & 4	1	15.3%	13,164.53	1,139.39	150.52
1 & 2 & 3 & 4		14.8%	15,407.15	1,289.91	

Unallocated Risk Capital:
= 1289.91 – (420.64+ 197.37+67.81+150.52) = 453.57

Proportion:
453.57/1289.91 = 35%

1. Continued

(c)   MGP is considering expanding their business to include whole life insurance but is concerned about the impact on risk capital.

Recommend two criteria for MGP to use in making this decision.

Commentary on Question:
A sample of valid criteria is provided below. Only two are required for full credit. Most candidates provided two valid criteria. The most common criteria given were the correlation aspect and the additional capital needed for introducing new line of business.

- Entering a business will increase the overall risk capital of the firm. Need to calculate how much this increase is to know how much additional risk capital you need. (risk capital is a function of assets, new business = more assets = increase)
- New business may change the economic cost of risk capital for the firm, should understand those impacts.
- Should understand how correlated the profits of the new business are to current business. It is likely whole life insurance will be somewhat correlated with other insurance products. (correlation is a part of the risk capital formula)
- Should ensure the expected profits of the business are in excess of the risk capital & spread required.

2. Fall 2023 ILA-LFMU Exam (LO 1b)

Learning Objectives:
1. The candidate will understand and apply U.S. valuation principles and methods applicable to individual life insurance and annuity products issued by U.S. life insurance companies.

Learning Outcomes:
(1b) Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US GAAP framework, including the calculation of reserves and related items (e.g., DAC)

Relevant Sources:
US GAAP for Insurers, Freedman, M., and Frasca, R., 3rd Edition, 2024
  - Chapter 11: Deferred Annuities

Commentary on Question:
This question tested the candidates' knowledge the index credit and GAAP reserve for fixed indexed annuity policies.

Solution:
(a) You are given:

IR: Index return	7%
PR: Participation rate	110%
SR: Index spread	2%
CR: Cap rate	6%
FR: Floor rate	1%

Calculate the index credit for this crediting period.

Commentary on Question:
Candidates generally did well on this part of the questions and were able to calculate the index credit correctly.

Step 1: Multiply PR * IR = 110% * 7% = 7.7%
Step 2: Subtract SR = 7.7% - 2 % = 5.7%
Step 3: Cap at CR = Min (5.7%, 6.0%) = 5.7%
Step 4: Floor at FR = Max (5.7%, 1.0%) = 5.7%
Steps 3 and 4 can be in reverse order and still results in the correct answer.

2. Continued

(b)   You are given:

Option budget	3.0%
Guaranteed interest rate	0.5%
Risk-free interest rate	2.0%
Discount rate	3.5%

Year	Index AV	Guaranteed Value	Mortality	Lapse	Persistency	Decremented Index AV	Decremented Guaranteed Value
0	100,000	100,000			0.94050	100,000	100,000
1	103,060	100,500	1%	5%	0.88454	96,928	94,520
2	106,214	101,003	1%	5%	0.83191	93,950	89,341
3	109,464	101,508	1%	5%	0.78241	91,064	84,445
4	112,813	102,015	1%	5%	0.73586	88,266	79,818
5	116,265	102,525	1%	5%	0.69207	85,555	75,444
6	119,823	103,038	1%	5%	0.65090	82,927	71,310
7	123,490	103,553	1%	5%	0.61217	80,379	67,402
8	127,269	104,071	1%	5%	0.57574	77,910	63,709
9	131,163	104,591	1%	5%	0.00000	75,516	60,218
10	135,177	105,114	1%	100%		0	0

Calculate the GAAP benefit reserve for this policy at the end of year 5. Show all work.

Commentary on Question:
Results were mixed among candidates who demonstrated their knowledge of the GAAP methodology, candidates who knew some of the steps of the methodology and candidates who did not demonstrate any knowledge of the methodology. While candidates generally did not calculate the index and guaranteed benefits in the same way as the example in the study note, partial credit was received if the subsequent reserve methodology and formulas were correct. Most candidates did not use the un-decremented AVs to calculate the index and guaranteed benefits. Many candidates were able to demonstrate some knowledge of the calculation of the VED, Host IRR and Host Value, and received partial credit for calculation errors such as using the wrong discount rate.

Following are the steps to calculate the GAAP reserve.

Step 1: Calculate Index AV Death Benefits (n) = Mortality * Index AV at end of year (n).

Step 2: Calculate Index AV Surrender Benefits (n) = Lapse * Index AV at end of year (n) * (1 - Mortality).

2. Continued

Step 3: Calculate Guaranteed Value Death Benefits (n) = Mortality * Guaranteed Value at end of year (n).

Step 4: Calculate Guaranteed Value Surrender Benefits (n) = Lapse * Guaranteed Value at end of year (n) * (1 - Mortality).

Step 5: Calculate Excess Benefits (n) = Index AV Death Benefits (n) + Index AV Surrender
Benefits (n) - Guaranteed Value Death Benefits (n) - Guaranteed Value Surrender Benefits (n).

Step 6: Calculate VED (n) = NPV (Discount Rate, Future Excess Benefits).

Step 7: Host Cashflow (0) = Decremented Index AV (0) - VED (0),
Host Cashflow (n) = - Guaranteed Value Death Benefits (n) - Guaranteed Value Surrender Benefits (n)

Step 8: Host Contract Interest Rate = IRR (Host Cashflows)

Step 9: Value of Host Contract (0) = Host Cashflow (0),
Value of Host Contract (n) = Value of Host Contract (n-1) * (1 + Host Contract Interest Rate) - Host Cashflow (n).

Step 10: GAAP Reserve (n) = Value of Host Contract (n) + VED (n)

Below is a table of all the values for each step with the final answer highlighted in yellow.

2. Continued

Year	Step 1 — Index Account Value — Death Benefits	Step 2 — Index Account Value — Surrender Benefits	Step 3 — Guaranteed Value — Death Benefits	Step 4 — Guaranteed Value — Surrender Benefits	Step 5 — Excess Benefits	Step 6 — Value of Embedded Derivative	Step 7 — Host Cash Flow	Step 8 — Host Contract Interest Rate	Step 9 — Value of Host Contract	Step 10 — GAAP Reserve
0						27,377	72,623	**10.59%**	72,623	100,000
1	1,031	5,101	1,005	4,975	152	28,183	(5,980)		74,335	102,518
2	1,062	5,258	1,010	5,000	310	28,859	(6,010)		76,198	105,057
3	1,095	5,418	1,015	5,025	473	29,396	(6,040)		78,228	107,624
4	1,128	5,584	1,020	5,050	642	29,782	(6,070)		80,443	110,225
5	1,163	5,755	1,025	5,075	818	**30,007**	(6,100)		**82,863**	**112,869**
6	1,198	5,931	1,030	5,100	999	30,058	(6,131)		85,508	115,566
7	1,235	6,113	1,036	5,126	1,186	29,924	(6,161)		88,402	118,326
8	1,273	6,300	1,041	5,151	1,380	29,591	(6,192)		91,573	121,164
9	1,312	6,493	1,046	5,177	1,581	29,046	(6,223)		95,048	124,094
10	1,352	133,825	1,051	104,063	30,063	-	(105,114)		(0)	(0)

3. Fall 2023 ILA-LFMU Exam (LO 1b)

Learning Objectives:
1. The candidate will understand and apply U.S. valuation principles and methods applicable to individual life insurance and annuity products issued by U.S. life insurance companies.

Learning Outcomes:
(1b) Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US GAAP framework, including the calculation of reserves and related items (e.g., DAC)

Relevant Sources:
US GAAP for Insurers, Freedman, M., and Frasca, R., 3rd Edition, 2024
*   Chapter 12: Payout Annuities
Targeted Improvements Interactive Model

Commentary on Question:
This question tested the candidates' understanding of LFPB, DAC, and LFPB for payout annuities under LDTI. Candidates had to demonstrate knowledge on how to decompose LFPB to illustrate drivers of earnings.

Solution:
(a)   **(LO 1b)** Calculate the projected Liability for Future Policyholder Benefits (LFPB) at the end of the third policy year.
        Commentary on Question:
        Generally, candidates did well on calculating the LFPB for this part of the question.
        Candidates received credit if they showed the benefits were guaranteed at $110/year for the first 10 policy durations.
        Candidates received partial credit if they did not extend out the formulas until no lives remained. (i.e. at attained age 93).
        Some candidates checked to see if this contract qualified as an investment contract by calculating the PV of benefits vs. PV of premium at issue. If this ratio was <=5-10% and calculated correctly by the candidate, then it would qualify as an investment contract and then corresponding IRR would be an appropriate discount rate. Otherwise, full credit was given for using the given 4.25% discount rate.
        Under LDTI, the LFPB no longer requires provisions for adverse deviation (PADs) and only claim-related expenses are included in the calculation. As such, candidates received credit if they did NOT include a PAD on the mortality and if they did NOT include the maintenance expense assumption of $10/policy.

        The solution for this part of the question is provided in an Excel spreadsheet.

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3. **Continued**

(b)   **(LO 1b)** Calculate the projected DAC at the end of the third policy year using the group contract method.

Commentary on Question:
Candidates generally did well on this part of the question in calculating the DAC on these SPIA contracts.

Some candidates only included the per policy acquisition expense and did not include the commission component. In this instance, only partial credit was received for the total deferrable expenses.

Candidates received partial credit if they did not extend out the formulas until no lives or benefits remained (i.e. at attained age 93).

Under LDTI, interest accretion is no longer applicable, so no credit was received if interest was included in the DAC calculations.

In order to receive full credit for the DAC amortization, candidates had to amortize the initial deferable expenses over the SPIA benefit stream, including the 10 years of period certain payments. Full credit was also received if deferred expenses were amortized over the projected lives, but reflecting no decrements in the first 10 durations due to the period certain portion of the contract.

Some candidates attempted to calculate DAC by taking the difference between the LFPB on a gross and net basis. This approach does not work under LDTI, partially because DAC no longer includes an interest component, whereas the LFPB does. Rather, DAC needs to be amortized over a constant basis.

The solution for this part of the question is provided in an Excel spreadsheet.

(c)   **(LO 1b)** You are given:

- Experience was equal to expected for 2023-2025
- Actual annual mortality rate increased from 20% to 60% in 2026
- No change to future best estimate mortality rate
- No change to the current discount rate in any year

Calculate the LFPB remeasurement gain or loss in 2026.
Show all work.

Commentary on Question:
Candidates generally did well on this part of the question, particularly if they understood part (a).

---

3. Continued

To receive full credit, candidates needed to state whether the remeasurement was a gain or a loss. While it was not required to explain why the remeasurement was a gain or loss, providing a rationale demonstrated that the candidate understood the ramifications of elevated mortality in duration 3 and how that impacted the LFPB (i.e. the restated LFPB offsets part of the elevated mortality).

Similar to part (a), the LFPB under LDTI does not include any PADs. Credit was not received if the 10% PAD was also applied to the 60% experience in year 3.

Most candidates did not reflect the correct time period for the remeasurement gain/loss.

The solution for this part of the question is provided in an Excel spreadsheet.

5. Fall 2023 ILA-LFMU (LO 1a)

Learning Objectives:
1.   The candidate will understand and apply U.S. valuation principles and methods applicable to individual life insurance and annuity products issued by U.S. life insurance companies.

Learning Outcomes:
(1a)   Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US statutory framework, including the calculation of principles-based reserves and formulaic reserves.

Relevant Sources:
Interactive Principle-Based Reserves Model
Statutory Valuation of Individual Life and Annuity Contracts, Claire, D., Lombardi, L. and Summers, S., 5th Edition, 2018
- Chapter 23: VM-20: PBR for Life Products (excluding 23.1)
- Chapter 25: Principle-Based Reserve Report

Commentary on Question:
This question tested the candidates' understanding of U.S. Statutory valuation principles and methods.

Solution:
(a)   **(LO 1a)** ABC Life sold an identical level term product to a policyholder population with the same demographics, but ABC Life's premium is lower than XYZ Life's.

Evaluate which company's net premium reserve will more likely dominate its PBR reserves.

Commentary on Question:
Many candidates failed to recognize the difference between what drives the deterministic reserve versus NPR. In cases where candidates correctly identified XYZ's NPR will likely dominate, partial credit was lost due to not identifying that ABC and XYZ will have the same NPR.

The NPR will more likely dominate for XYZ Life because higher premiums decrease its deterministic reserve relative to the NPR. ABC Life will have a higher deterministic reserve due to its lower premiums; therefore, there is a less likelihood that NPR will dominate.

5.   Continued

The NPR is a formulaic reserve using prescribed assumptions and sets the reserve floor. Since the insurable populations are identical, the NPR will be the same between the two companies (assuming the premium slope is the same between the two companies).

The deterministic reserve is principle-based calculation that allow for assumptions based on company experience. The deterministic reserve will be different between the two companies, depending on the premium amounts.

(b)   **(LO 1a)** Critique the following statements under PBR Reserves

   A. *The mortality margin for adverse deviation is based on actuarial judgement and analysis, with support shown in the PBR Actuarial Report.*

   B. *The expense margin for adverse deviation is prescribed based on credible company experience.*

   C. *The lapse margin for term products should decrease the lapse assumption.*

   D. *VM-20 prohibits future mortality improvement but allows a company to recognize a percentage of its post-level term profits based on a prescribed formula.*

   E. *The investment rate margin is implicitly prescribed based on VM-20 required treasury rates, gross spreads, defaults, recoveries, and guardrails on the reinvestment strategy for fixed income.*

   F. *The sum of the individual margin impacts equals the total impacts of all margins.*

Commentary on Question:
Most candidates did well for this part of the question especially for statements C, E and F. Credit was not received if justification was not provided where applicable, and credit was received for reasonable critiques not provided below.

   A.   Incorrect. The mortality margin for adverse deviation is based on the calculated credibility considering both company's own experience and industry experience.

   B.   Incorrect. The expense margin for adverse deviation relies on a company's actuarial judgement and analysis to determine the margin, with support shown in the PBR Actuarial Report.

5.   Continued

C. Correct. In most cases, term products are lapse supportive thus the margin should decrease the lapse assumption to make reserve more conservative.

D. Incorrect [or Partially Correct]. VM-20 prohibits not only future mortality improvement but also post-level term profits to the extend of prescribed limits.

E. Correct. The investment rate margin is implicitly prescribed based on VM-20 required treasury rates, gross spreads, defaults, recoveries, and guardrails on the reinvestment strategy for fixed income.

F. Incorrect. The sum of individual margins exceeds the total margin given some assumptions and margins are correlated. For instance, there is correlation between the lapse margin, mortality margin, and post-level profit restriction in the deterministic reserve. The sum of the individual margin impacts won't equal the total impacts of all margins.

(c)   **(LO 1a)** Explain the impact on XYZ Life's net premium reserve of the following:

(i) Changing the post-level premium-to-benefit ratio to 150% from the VM-20 prescribed ratio

(ii) Changing the post-level premium-to-benefit ratio to 100% from the VM-20 prescribed ratio

Commentary on Question:
Some candidates did not recognize how a change in post-level premium-to-benefit ratio would impact NPR. Candidates were expected to specify it is the change from the "projected" post level profits cash flows that impacted the reserve to receive full credit.

- When the ratio goes up from 135% to 150%, the reserve goes down, especially in the later years within the level period. This is because increasing the constraint from 135% to 150% effectively allows 50% of post-level profits (instead of 35%) projected in the NPR calculation to be recognized when determining the reserve during the term level premium period.

- In contrast, if the ratio were changed to 100%, essentially, no post-level profits are allowed to pre-fund the level period reserve, then the reserves would increase. The impact is greater towards the end of the level period because the present value of post-level cash flows is greater at this point in the projection.

5.   Continued

(d)   **(LO 1a)** As part of its US Statutory valuation, XYZ Life performed the stochastic exclusion test.

- Baseline scenario reserve = 300 million
- Maximum reserve of 16 scenarios prescribed by VM-20 scenario generator = 350 million
- Baseline scenario present value of benefits and expenses = 2,500 million

(i) Determine whether XYZ Life passed the stochastic exclusion test.

(ii) Explain whether this product contains significant interest rate risk.

(iii) Explain why a company might calculate the stochastic reserve despite passing the stochastic exclusion test.

Commentary on Question:
Most candidates did well in part (i) of the question. For part (ii) of the question full credit was received only if candidates elaborated on the SERT test itself and commented on the short duration nature of term products. Most candidates did not do well on part (iii) of the question as candidates generally did not explain the broader benefits of doing the stochastic reserve when the term product itself passes the SERT.

(i) The exclusion ratio = (Adjusted DR from baseline scenario- Max Adjusted DR)/ PVFB from baseline scenario = (350-300)/2500 = 2%

XYZ Life passes the SET since its ratio of 2% is less than 6% required.

(ii) No. The product passed the stochastic exclusion ratio test which evidenced the limited exposure to the interest rate risk. VM-20 scenario generator prescribes 16 scenarios in the stochastic exclusion ratio test, where a range of interest rate shocks are selected combined with varying levels of equity makeup. More broadly, this is driven by the short duration of the term product relative to other permanent products, creating less exposure to interest rate risk.

5.   **Continued**

(iii)A company might calculate the stochastic reserve despite passing the stochastic exclusion test for the following possible reasons:

    a. Potential diversification benefits with other products and/or less than 100% correlation of risks with another product.
    b. The benefit due to the net premium reserve being greater than the deterministic or stochastic reserve, can partially or even fully offset the surplus of the deterministic or stochastic reserve being greater than the NPR of another product.
    c. If the company has clearly defined hedging strategy (CDHS), it is required to calculate stochastic reserve regardless of the result of SERT.
    d. Could also be a judgement call of the company/actuary, due to desire of better understanding interest rate risk sensitivities and appetite (or other reasonable rational).

6. Fall 2023 ILA-LFMU (LO 1a)

Learning Objectives:
1. The candidate will understand and apply U.S. valuation principles and methods applicable to individual life insurance and annuity products issued by U.S. life insurance companies.

Learning Outcomes:
(1a) Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US statutory framework, including the calculation of principles-based reserves and formulaic reserves

Relevant Sources:
Statutory Valuation of Individual Life and Annuity Contracts – Chapters 18 and 21

Commentary on Question:
This question tested the candidates' understanding of U.S. Statutory valuation principles and methods.

Solution:
(a) **(LO 1a)** Critique the following statements:

> A. *For a deferred annuity contract with the option to annuitize at the guarantee or current annuitization purchase rates, the basic CARVM reserve shall be no less than 80% of the amount used to purchase annuitization benefits at the time of valuation.*

> B. *Structured settlements are not permitted to use substandard mortality when calculating statutory reserves.*

> C. *A cash refund annuity would have a lower reserve at issue than an installment refund annuity.*

Commentary on Question:
Candidates generally did well on this part of the question.

A. This is false – the 80% needs to be upped to 93%
B. This is false – you can use substandard mortality for the valuation of settlement annuities.
C. This is false- installment refunds get more discounting than cash refund annuities resulting in a lower reserve

6.   Continued

(b)   **(LO 1a)** You are given the following for a deferred annuity policy:

- Term: 10-year
- Contract is terminated after the initial term
- Guaranteed Interest Rate: 3%
- Issue date: July 1, 2020
- Valuation date: June 30, 2021
    - Account value of 103,000 on June 30, 2021
    - Policyholder will turn 46 on July 1, 2021
    - Valuation interest rate is 3.25%
    - All benefits are paid at the end of the period

Year	Surrender Charge %
1	9%
2	8%
3	7%
4	6%
5	5%
6+	0%

Calculate the CARVM reserve at the valuation date using the mortality table provided in Excel. Show all work.

Commentary on Question:
Few candidates received full credit for this part of the question. Full credit was received if the calculation was done on an annual or monthly basis as long as the mortality was adjusted accordingly.

The solution for this part of the question is provided in an Excel spreadsheet.

7. Fall 2023 ILA-LFMU (LO 1a)

Learning Objectives:
1. The candidate will understand and apply U.S. valuation principles and methods applicable to individual life insurance and annuity products issued by U.S. life insurance companies.

Learning Outcomes:
(1a)   Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US statutory framework, including the calculation of principles-based reserves and formulaic reserves.

Relevant Sources:
Statutory Valuation of Individual Life and Annuity Contracts, Claire, D., Lombardi, L. and Summers, S., 5th Edition, 2018
- Chapter 5: The Valuation Manual (excluding 5.4)
- Chapter 10: Valuation Assumptions (excluding 10.1.3 & 10.3.8)
- Chapter 14: Universal Life (excluding 14.4.8, 14.4.9, 14.5.0 & 14.6.2-14.6.6)
- Chapter 23: VM-20: PBR for Life Products (excluding 23.1)

Interactive Principle-Based Reserves Model

Commentary on Question:
This question tested the candidates' ability evaluate the differences between valuation methods before and after VM-20 was effective.

Solution:
(a)   **(LO 1a)** Compare the following under Universal Life Insurance Model Regulation and VM-20's Net Premium Reserve (NPR).

> (i) Guaranteed Maturity Premium
>
> (ii) r-ratio
>
> (iii) Reserve calculation assumptions
>
> (iv) Minimum reserve floor

7.   Continued

(i)   The Guaranteed Maturity Premium (GMP) is used to determine a premium
that should be used within the UL Reserving calculation. The GMP in the
UL Model Regulation is assumed to endow the fund value to equal the
face amount at maturity. The GMP within NPR is assumed to the get the
fund value to 0 at maturity instead.

(ii)   The r-ratio is the ratio of the Guaranteed Maturity Fund (GMF) to the
Actual Fund Value (FV), capped at 1 (r-ratio = max(1,GMF/FV)). This
ratio calculated consistently within both regulation calculations.

(iii)   The Mortality and Interest assumptions largely remained the same, where
they are determined as of the Issue date of the underlying policy. Both
reserve assumption also allows the use of an expense assumption. The
NPR however, allows the use of a lapse assumption, depending on the
underlying funding level, while UL Model Regulation does not allow it.

(iv)   The minimum reserve floor remained the same within both regulations,
where there is a Cash Value floor and the Cost of Insurance to the next
paid-to-date.

(b)   **(LO 1a)** Critique the following statements pertaining to BFB's business.

A. *Under VM-20, mirror reserves are no longer required. Under VM-20,
BFB can use their own experience-based mortality assumption as long as
the mortality assumption credibility is above 99%.*

B. *When calculating the Deterministic Reserve, starting assets must be
between 98% and 102% of modeled net reserves.*

C. *After VM-20 went into effect, the formulaic Net Premium Reserve (NPR)
completely replaced CRVM*

7.   Continued

Candidates generally did not do well critiquing statement B. Most candidates focused on the portion discussing net reserves, rather than within the ratio itself.
Most candidates did well critiquing statement C.

    A. The first statement is true, but the second is not. Under VM20, as each insurance company has to use part of their own assumptions, a Cedant and a Reinsurer may have different assumptions. VM20 allows a company to use their own experience, if a minimum level of credibility is achieved. However, even if the credibility is close to 100%, a company is required to grade their own mortality assumption to an industry assumption, just at a later date.

    B. This is not necessarily a true. If a company cannot demonstrate that their deterministic reserves are within 98% and a 102% of modeled net reserves, they need to provide reasonable assurances within the PBR report that they are still complaint and holding a sufficient reserve. This can involve additional testing, such as sensitivity testing.

    C. This statement is false. There are a few situations where CRVM is still required. The first situation is for all policies issued pre-2017, as VM20 is not retroactive, so any policy issued prior to 2017 (or 2020 if elected for deferral), CRVM remains into effect. The second situation is when a Non-Term or UL Policy, issued after the operative date passes the Deterministic Exclusion Test, it will then use CRVM. A Whole Life policy would typically fall under this section.

(c)   **(LO 1a)** You are given:

Present Values	In millions
Benefits with margins	150
Expenses with margins and commissions	25
Premiums with margins	80
Aggregate CRVM reserve	120
Aggregate AG38 reserve	200
Aggregate NPR reserve	40

Calculate the following:

(i)   VM-20 reserve, assume the information given is from policies issued in 2022.

7.   Continued

(ii)   ~~AG-48 reserve, assume the information given is from policies issued in 2016.~~ –
NO LONGER RELEVANT

Commentary on Question:
Candidates generally did well on part (i) of the question and generally did not do well on part (ii) of the question. For part (i) of the question, credit was received if the appropriate formula was used. For part (ii) of the question, most candidates did not demonstrate understanding of AG-48 reserves. Many candidates restated the part (i) reply or just stated the AG-38 reserve.

(i)   VM20 Reserve = NPR + Max [0, (DR-NPR)]

DR = Present Value of outflows with margins - Present Value of inflows with margins

DR = 150 + 25 - 80 = 95

NPR = 40

VM20 Reserve = 40 + Max [0, (95-40)] = 95

(ii)   ~~Under AG48, the Primary Security is the DR calculated under PBR = 95~~

~~The Redundant Reserve = AG38 Reserve – CRVM Reserve = 200-120=80~~

~~The Retained Reserve = CRVM Reserve + Primary Security = 95+120 = 215~~

~~AG48 Reserve/Amount to be Financed = AG38 Reserve – Retained Reserve~~
~~= 200 – 215 = -15~~

~~As the amount to be financed is -15, nothing would be financed. The final answer would be 0.~~

1. Spring 2023 ILA-LFMU (LOs 2a, 2b, 2c, 2d, 3c)

Learning Objectives:
2.   The candidate will understand how to explain and apply the methods, approaches and tools of financial capital management for life insurance company under a US regulatory framework.
3.   The candidate will understand types of life insurance risks, the impacts of diversification, crediting rating agency frameworks, and the assessment of risk management.

Learning Outcomes:
The Candidate will be able to:
(2a)   Explain and calculate required capital under a US regulatory framework
(2b)   Describe the purpose and application of economic capital
(2c)   Explain and evaluate the respective perspectives of regulators, investors, policyholders and insurance company management regarding the role and determination of capital
(2d)   Explain and apply methods in capital management
(3c)   Explain and understand the use and application of the Own Risk Solvency Assessment (ORSA) report

Relevant Sources:
Statutory Valuation of Individual Life and Annuity Contracts, Claire, D., Lombardi, L. and Summers, S., 5th Edition, 2018
  • Ch. 29: Risk-Based Capital
Economic Capital for Life Insurance Companies, SOA Research Paper, Oct 2016 (Sections 2 & 6)
A Multi-Stakeholder Approach to Capital Adequacy, Conning Research
ILA201-800-25: Theory of Risk Capital in Financial Firms
ILA201-802-25: NAIC Own Risk and Solvency Assessment (ORSA) Guidance Manual, National Association of Insurance Commissioners, Dec 2017

Commentary on Question:
This question tested the candidates' understanding of capital management.

Solution:
(a)   **(LO 3c)** List the major areas that should be discussed in the Own Risk and Solvency Assessment (ORSA) Summary Report.
Commentary on Question:
Candidates generally listed some of the major areas. Some candidates listed multiple items within the same area but failed to identify other major areas.
The ORSA Summary Report should discuss the following major elements:
  • Description of the Insurer's Risk Management Framework
  • Insurer's Assessment of Risk Exposure
  • Group Assessment of Risk Capital and Prospective Solvency Assessment
1.   Continued

(b)   **(LOs 2a, 2b, 2c, 2d)** Critique the following statements:

> A. *The results of an economic capital model could lead to forced receivership of the company or downgrade of the company.*

Commentary on Question:
Candidates generally did well in their critique of this statement.

False. Economic capital models take a customized view of the insurer's need for capital, but, unlike the standardized regulatory and rating agency models, have no real consequences for the insurer. The results of the economic capital model are currently used only to provide information to the company.

> B. *Company ABC determines its interest rate risk as a fixed 10% of reserves factor. The risk assessment is deemed as realistic as the reserves reflect the risk.*

Commentary on Question:
Most candidates correctly identified that this statement was false but did not provide sufficient rationale to receive full credit.

False. We do not classify this as a realistic risk assessment because it does not consider the specific risks faced by the company, is not based on current market data or historical analysis and is not updated frequently.

> C. *Both rating agencies and shareholders consider the more capital an insurer has, the better.*

Commentary on Question:
Most candidates correctly distinguished the difference in objectives between rating agencies and shareholders and addressed the opposing objectives shareholders face.

False (True for rating agencies but false for shareholders).

Rating agencies, like regulators, are concerned with the ability of the insurer to meet its obligations. Generally, from a rating agency perspective, more capital is the favored position.

1. Continued

The shareholders' objective is to maximize their return on capital while maintaining enough capital to absorb unexpected, non-diversifiable risk. In addition, shareholders want enough capital to support growth of new and existing operations that will meet their return-on-capital requirements. Shareholders thus have multiple objectives that pull the amount of required capital in opposing directions. That is, some objectives are satisfied with higher capital levels, some objectives are satisfied with lower capital levels.

> D. *The "correlation matrix approach" is a common approach used for evaluating the diversification benefit. The correlation assumptions are often set by a combination of historical data or expert forecasts that analyze the relationship between risk scenarios. The correlations are applied to the risk scenarios.*

Commentary on Question:
Candidates generally did not do well in their critique of this statement.
Most candidates correctly identified that the first sentence was correct. Many candidates identified the second sentence as incorrect when in fact it was correct. Many candidates did not identify the last sentence as incorrect. For the second and third sentences, a common mistake was around understanding how risk scenarios are related to the Correlation Matrix Approach.

True statement for how the correlation assumptions are set. False statement for how the correlation assumptions are applied, the correlations are applied to the standalone capital amount not the risk scenarios itself. The implication of this approach is that balance sheets respond linearly to risk scenarios, which can be a severe approximation for some types of business, creating a diversification amount which is a function of individual exposures rather than the underlying relationship between risk drivers.

> E. *Under the finite risk horizon approach, the Economic Capital represents the current market value of assets required to ensure that the value of liabilities can be covered at a finite point in the future, at the chosen security level, less the current value of liabilities. Under this approach, a run off projection is still required.*

Commentary on Question:
Candidates generally did not do well in their critique of this statement. The most common error was to state that a run-off project was not required.

True. It is important to note that even under the finite risk horizon approach, a runoff projection is still required, since a terminal value of liabilities at the end of the risk horizon is needed. Future uncertainty surrounding the risk beyond the risk horizon is captured within the value of the liabilities at the end of the year.

1.   Continued

(c)   **(LOs 2b, 2d)** Describe how Economic Capital can be used as a risk management tool in the following areas below.

   (i)   Capital adequacy

   (ii)   Risk appetite

Commentary on Question:
Candidates generally did not do well on this part of the question. Many repeated or rephrased answers already given in previous parts of the question.

(i)
Capital adequacy is the core use of EC for most insurers—providing a measure of capital that truly captures the risk of the insurer's own portfolio, free from the distortions of regulatory reserving and capital requirements and the simplified approximations within most rating agency models.

Effective use of EC in measuring capital adequacy requires the EC measure to be integrated into the capital management process, with potential EC requirements along a number of scenario paths being developed and capital funding strategies developed to address these. EC can also be used to help determine asset allocations by lines of businesses.

EC often features strongly in discussions on capital adequacy with regulators, rating agencies, and plays an important role in discussions with shareholders and investment analysts.

(ii)
EC is a key measure of risk from a policyholder perspective and therefore frequently features as an important component of an insurer's risk appetite framework and in the monitoring processes implemented to ensure the insurer remains within that risk appetite.

To do this, target ranges for EC utilization need to be established for each geography, business unit and/or risk, and actual EC monitored against these target ranges. The setting of such ranges and limits needs to consider the expected level of diversification between risks as well as the level of granularity. EC can also be used to develop a tiered approach of deploying capital.

As risk profiles of the organization changes, the use of EC for this purpose requires an ability to update EC.

2. Spring 2023 ILA-LFMU (LO 1b)

Learning Objectives:
1. The candidate will understand and apply U.S. valuation principles and methods applicable to individual life insurance and annuity products issued by U.S. life insurance companies.

Learning Outcomes:
(1b) Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US GAAP framework, including the calculation of reserves and related items (e.g., DAC).

Relevant Sources:
US GAAP for Insurers, Freedman, M., and Frasca, R., 3rd Edition, 2024
- Chapter 3: Product Classification and Measurement
- Chapter 11: Deferred Annuities

Commentary on Question:
This question tested the candidates' knowledge of US GAAP valuation principles.

Solution:
(a)   **(LO 1b)** Describe the key considerations when classifying the following GAAP reserves of a fixed index annuity (FIA) with a guaranteed lifetime withdrawal benefit:

      (i)   Market risk benefits

      (ii)   Embedded derivatives

Commentary on Question:
This question tested the candidates' knowledge of MRBs and EDs. Most candidates recognized that a "guaranteed lifetime withdrawal benefit" (GLWB) is an MRB. Most candidates recognized that chosen indexes in the FIA will result in an ED. Some candidates recognized that an MRB and ED are both valued at fair value. Order is important per ASU 2018-12 on identifying any MRBs first, then evaluate and identify any remaining ED. Candidates could receive full credit without including any items under "Criteria Details" below. They are available for partial credit and further describe applicable criteria.

      (i)
GLWB is a Market Risk Benefit (MRB); accounted under fair value

Two-fold criteria for a feature to be an MRB: 1) It must protect the policyholder from, and 2) expose the insurer to, "other than nominal" capital market risk.

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2.   Continued

Criteria Details:
a) Protection refers to the transfer of a loss in, or shortfall (difference between account balance and benefit amount) of, the policyholder's account balance from the policyholder to the insurer, with such transfer exposing the insurer to capital market risk that would otherwise have been borne by the policyholder.

b) Protection does not include death benefit component of a life insurance policy (difference between account balance and death benefit amount). This condition does not apply to an investment or an annuity contract (including an annuity contract classified as an insurance contract).

c) A nominal risk, explained in paragraph 944-20-15-21, is a risk of insignificant amount or that has a remote probability of occurring. An MRB is presumed to expose insurer to other-than-nominal capital market risk if benefit would vary more than an insignificant amount in response to capital market volatility.

(ii)
The chosen index(es) within the fixed indexed annuity are embedded derivatives; accounted under fair value

Once MRBs are identified, the remainder is evaluated to determine whether it contains an embedded derivative or meets definition of a stand-alone derivative.

Criteria Details:
   a) It contains an underlying and one or more notional amounts or payment provisions
   b) It does not require an initial net investment to enter into the contract
   c) The terms of the contract permit or require net settlement or allows delivery of an asset of similar value

(b)   **(LO 1b)** For a 5-year point-to-point FIA without living benefits, you are given:

Option budget	4.0%
Guaranteed value first year load	12.5%
Guaranteed minimum interest rate	1.5%
Risk-free interest rate	2.0%
Discount rate	2.5%

There are no lapses other than 100% lapse at the end of year 5.

2.   Continued

Yr	Mortality	Persistency	Index Credit	Undecremented		Decremented	
				Index AV	Guaranteed Value	Index AV	Guaranteed Value
0		1.00000		1,000,000	875,000	1,000,000	875,000
1	0.1%	0.99900	40,800	1,040,800	888,125	1,039,759	887,237
2	0.3%	0.99600	42,465	1,083,265	901,447	1,078,935	897,844
3	0.5%	0.99102	44,197	1,127,462	914,969	1,117,341	906,755
4	0.7%	0.98409	46,000	1,173,462	928,693	1,154,788	913,914
5	0.9%	0.97523	47,877	1,221,340	942,624	1,191,086	919,274

Calculate the following GAAP liabilities at the end of year 2 using the option budget method:

(i) Value of embedded derivative

(ii) Host value

Show all work.

Commentary on Question:
This question tested the candidates' knowledge of VED and Host Value. Some candidates correctly calculated the death benefit, while few candidates correctly calculated the maturity benefit (it was frequently omitted leading to a very small VED and Host). Many candidates correctly split the total benefit into guaranteed benefit (covered by the host) and excess benefits (covered by the ED). Few candidates used the risk-free interest rate for VED calculation. Few candidates correctly created Host Cash Flows for an IRR calculation and then correctly used the IRR to calculate the Host Values. Some candidates attempted to calculate year 2 values from years 0-2 only (ignoring the rest of the years), which does not result in a correct calculation for VED or Host Value.

Table of Calculated Values

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Year	Death	Maturity	Guaranteed Benefit	Excess Benefit	VED	Host CF	IRR	Host Value
0					233,518	766,482	5.09%	766,482
1	1,000	0	875	125	238,063	(875)		804,606
2	3,119	0	2,662	458	242,367	(2,662)		842,888

3	5,395	0	4,489	905	246,309	(4,489)		881,287
4	7,821	0	6,347	1,474	249,761	(6,347)		919,782
5	10,393	1,210,946	966,584	254,756	0	(966,584)		0

(1) Death (t) = Undecremented Index AV (t-1) * Persistency (t-1) * Mortality (t)
Note: Persistency provided is cumulative (L_x), mortality is annual (q_x)
Alternatively: Death (t) = Decremented Index AV (t-1) * Mortality (t)

(2) Maturity (5) = Undecremented Index AV (5) – Death (5), otherwise 0

(3) Guaranteed Benefit (t) = {Death (t) + Maturity (t)} * {Undecremented Guaranteed Value (t-1) / Undecremented Index AV (t-1)}

(4) Excess Benefit (t) = Death (t) + Maturity (t) – Guaranteed Benefit (t)

Split is:
Excess Benefit → Value of Embedded Derivative (VED), Risk-Free Interest Rate
Guaranteed Benefit → Host Value, Solved IRR

(5) VED (t) = {VED (t+1) + Excess Benefit (t+1)} / (1+ Risk-Free Interest Rate)
Risk-Free Interest Rate is given as 2.00%
Note: Solve recursively as VED (5) = 0, work backward from 4 to 0

(6) Host CF (0) = Premium – VED (0)
Host CF (t>0) = – Guaranteed Benefit (t)

(7) IRR (Host Cash flows) = 5.09%

(8) Host (0) = Premium – VED (0)
Host (t>0) = Host (t-1) * (1 + IRR) + Host CF (t)

Reasonableness checks:
✓VED is growing toward Excess Benefit (5) as benefit concentrates there
✓IRR is within a reasonable range
✓Host is growing toward Guaranteed Benefit (5) as benefit concentrates there
    (i)   VED (2) = 242,367
    (ii)   Host (2) = 842,888

3. Spring 2023 ILA-LFMU (LO 1b)

Learning Objectives:
1.   The candidate will understand and apply U.S. valuation principles and methods applicable to individual life insurance and annuity products issued by U.S. life insurance companies.

Learning Outcomes:
(1b)   Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US GAAP framework, including the calculation of reserves and related items (e.g., DAC)

Relevant Sources:
US GAAP for Insurers, Freedman, M., and Frasca, R., 3rd Edition, 2024
- Chapter 3: Expenses

Commentary on Question:
This question tested the candidates' knowledge of US GAAP DAC principles.

Solution:
(a)   **(LO 1b)** Calculate the deferrable acquisition expenses per individual policy.

Commentary on Question:
This part of the question tested the candidates' understanding of expenses, the different drivers (premium, policy size, policy count) and which expenses are deferrable. Many candidates struggled with the policy fee, which are part of the premium, not an expense for the insurer. Many candidates did not know how to use the override. Some candidates calculated the total expenses for the block instead of the deferred acquisition expenses per individual policy. Some candidates did not include the overrides. Many candidates included marketing expenses in deferrable acquisition costs. Many candidates calculated underwriting expense incorrectly.

Premium per policy = premium per 1000 x average size / 1000 + policy fee

Deferrable Commission = (annual rate – ultimate rate) x (1+override) x premium

Underwriting expense is incurred per applications, but only 40% are issued. This is a per 1000 expense so it has to be multiplied by the average size in thousands.

Maintenance and marketing are not deferrable.

3.   Continued

Duration	Premium	Deferrable Commission	Issue Expense Per Policy	Underwriting Expense	Total Deferrable Expense
1	$487.50	$828.75	$50.00	$1,500	$2,378.75
2	$487.50	$91.41	$0.00	$0	$91.41
3	$487.50	$26.81	$0.00	$0	$26.81
4	$487.50	$26.81	$0.00	$0	$26.81
5	$487.50	$0.00	$0.00	$0	$0.00

(b)   **(LO 1b)** Determine the DAC asset to be reported for this block of business at the end of each of the next five years, under the following:

(i) Individual Contract Approach

(ii) Grouped Contract Approach

Commentary on Question:
This part of the question tested the candidates' understanding of the two DAC approaches and the differences between them. The first method requires calculation of the DAC per policy, then aggregating that by multiplying with the expected policies in force. It requires an understanding of capitalization and amortization (the latter updated under US GAAP LDTI). The second method requires aggregating the deferrable expenses before applying the amortization.

Many candidates knew to add current year capitalized expenses to the prior year DAC balance before applying the amortization percentage.

Individual approach:

Duration	Persistency	Deferrable Expense	DAC Amortization	End-of-Year DAC Asset	End-of-Year Number of Policies Inforce	Total End-of-Year DAC Asset
0	1			$2,379	10,000	$23,787,500
1	0.8	$2,378.8	$617.2	$1,762	8,000	$14,092,017
2	0.72	$91.4	$519.4	$1,333	7,200	$9,601,101
3	0.684	$26.8	$476.9	$883	6,840	$6,042,588
4	0.6498	$26.8	$466.8	$443	6,498	$2,881,514
5	0	$0.0	$443.4	$0	0	$0.00

3.   Continued

DAC Amortization = (Prior year DAC + Current Year Deferrable expense) x current survivorship factor / (sum of current and future survivorship factors)

DAC Asset at EoY = Prior year DAC Asset – Amortization + Current Year Deferrable Expense

Total DAC Asset = End of year number of policies x DAC Asset per policy

Grouped approach:

Duration	Number of Policies Inforce	Sum of Current and Future Inforce	Deferrable Expense Incurred	DAC Amortization	Total End-of-Year DAC Asset
0	10,000	38,538			$23,787,500
1	8,000	28,538	$23,787,500	$6,172,479	$17,615,021
2	7,200	20,538	$731,250	$5,142,973	$13,203,298
3	6,840	13,338	$193,050	$4,696,353	$8,699,994
4	6,498	6,498	$183,398	$4,555,586	$4,327,806
5	0	0	$0	$4,327,806	$0

Take per policy deferrable expense and multiply by the number of policies inforce to get the aggregate deferrable expense.

(c)   Recommend an approach for calculating the DAC asset. Justify your answer

Commentary on Question:
This part of the question tested the candidates' understanding of DAC and its relevance to insurers. DAC is used to defer expenses, which allows an insurer to recognize earnings even in the early years of a policy. While ease of use is one criterion for choosing a method, the impact on earnings is the key to this question, which many candidates struggled to recognize.

I recommend the group approach.
Under the individual contract approach, the entire DAC asset is written off, which results in faster amortization. This is not true under the grouped contract approach where terminations are built into the amortization schedule and no additional write-off happens because DAC is not explicitly allocated to the individual contract. The grouped approach amortizes DAC more slowly than the individual approach, which results in more GAAP income being reported sooner.

4. Spring 2023 ILA-LFMU (LOs 1a, 1b)

Learning Objectives:
1. The candidate will understand and apply U.S. valuation principles and methods applicable to individual life insurance and annuity products issued by U.S. life insurance companies.

Learning Outcomes:
(1a)   Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US statutory framework, including the calculation of principles-based reserves and formulaic reserves.

(1b)   Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US GAAP framework, including the calculation of reserves and related items (e.g., DAC).

Relevant Sources:
Statutory Valuation of Individual Life & Annuity Contracts, 5th Ed, 2018, Chapter 11 – Valuation Methodologies (exclude 11.3.9 to 11.3.11)

US GAAP for Insurers, Freedman, M., and Frasca, R., 3rd Edition, 2024
* Chapter 5: Nonparticipating Traditional Life Insurance

Commentary on Question:
This question tested the candidates' understanding of U.S. GAAP principles and methods.

Solution:
(a)   **(LO 1b)** Critique the following statements with regards to IKC's GAAP reserve calculation:

> A. *IKC expects the GAAP reserve for the traditional block of business to be 0 at issue, similar to the statutory reserve under CRVM.*

> B. *Since the net premium ratio is required to be capped at 100%, IKC doesn't need to perform loss recognition and profit followed by loss testing for the life block of business.*

> C. *IKC considered both the spot yield curve and effective yield curve as the discount rate for the term and payout business and expects the effective yield to be always less than all rates on the spot curve.*

> D. *For the payout business, the claim-related expense assumptions will be locked in since IKC expects the expense is less volatile. For the life block, IKC decides to update the expense assumption annually, the same frequency as other assumptions, e.g., mortality and lapse.*

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4.   Continued

Commentary on Question:
Most candidates received partial credit for this part of the question. Statement B required an understanding of a requirement of both loss recognition and profits-followed-by-losses testing for universal life-type contract at the given situation.

    A. If the net premium ratio ("NPR") is less than 100%, the GAAP reserve at inception will be 0. If the NPR is over 100%, GAAP reserve at inception will not be 0, and equal to the excess of the present value of benefits and applicable expenses over the present value of gross premiums.
        The time 0 CRVM reserve is 0, and the comment is correct.
    B. Loss recognition and profits-followed-by-losses testing are not applicable for Term and non-par whole life. For universal life-type contracts and participating whole life contracts, both loss recognition and profits-followed-by-losses testing is required.
    C. With premiums payable over multiple years and a normally (upward) sloped yield curve, it is possible for the effective yield to exceed even the long-term spot rates. This is because the negative cash outflows in the early years are discounted at a lower rate than the positive cash outflows in the later years, creating a leveraging effect when calculating the effective yield.
    D. Lock or not lock expense assumption should be the company-wide decision. Should not vary by line of business.

(b) **(LO 1b)** Calculate the following as of 1/1/2023:

    (i) GAAP reserve

    (ii) Accumulated Other Comprehensive Income

   Show all work.

Commentary on Question:
Candidates generally did well on the time 0 NPR calculation. The most common errors were anything to do with calculating the locked in 1/1/2023 reserve: not realizing the need to re-calculate the reserve with 1/1/2023 rates; or shifting the mortality and survivorship when it was not required.

4. Continued

Calculate in the spreadsheet in order:
- Locked in discount rate at time 0: $(1+ \text{locked in spot rate})^{\wedge}(-t)$.
- Locked in discount rate as of 1/1/2023: $(1+\text{locked-in spot rate})^{\wedge}(-(t-1))$ - assuming the same t as in row 25.
- Current discount rate as of 1/1/2023: $(1+\text{current spot rate})^{\wedge}(-(t-1))$ - assuming the same t as in row 25.
- px = prior period px *(1-qx).
- projected face amount = initial face amount * px.
- Premium = face amount * premium per unit.
- Death benefit = end of prior period face amount * qx.
- PV premium for NPR calculation.
- PV death benefit for NPR calculation.
- net premium ratio = min (1, pv death benefit/pv premium).
- Locked in PV premium and PV death benefit.
- Current PV premium and PV death benefit.
- Locked in and current GAAP reserve.
- AOCI.

More details are provided in the spreadsheet.

5. Spring 2023 ILA-LFMU (LO 1a)

Learning Objectives:
1. The candidate will understand and apply U.S. valuation principles and methods applicable to individual life insurance and annuity products issued by U.S. life insurance companies.

Learning Outcomes:
(1a) Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US statutory framework, including the calculation of principles-based reserves and formulaic reserves.

Relevant Sources:
Statutory Vauation of Individual Life & Annuity Contracts, 5th Ed, 2018
*   Chapter 10: Valuation Assumptions (excluding 10.1.3 & 10.3.8)
*   Chapter 18: Fixed Deferred Annuities (excluding 18.7.4 & 18.8)

Commentary on Question:
This question tested the candidates' knowledge of US Statutory valuation principles.

Solution:
(a) **(LO 1a)** You are given the following for a fixed deferred annuity contract:

Issue date	6/30/2018
Valuation date	6/30/2020
Issue age	50
Gender	Male
Guaranteed interest credited rate	2.5%
Fund value on valuation date	115,000
Valuation interest rate for death benefits	5.0%
Valuation interest rate for withdrawal benefits	4.0%
Death benefit	Fund value (paid at end of contract year)

	Age	2012 IAM Male Age Nearest Birthday (1000qx)	Projection Scale G2 Male, Age Nearest Birthday
Valuation mortality	50	2.285	1.0%
	51	2.557	1.1%
	52	2.828	1.1%
	53	3.088	1.2%
	54	3.345	1.2%
	55	3.616	1.3%
	56	3.922	1.3%
	57	4.272	1.4%
	58	4.681	1.4%
	59	5.146	1.5%

	Year	Surrender Charge %
Full surrender during the guarantee period is allowed, but incurs a surrender charge according to the following surrender charge schedule	1	5%
	2	4%
	3	3%
	4	2%
	5	1%
	6	0%
	7	0%

Calculate the present value of the integrated benefit stream with no partial withdrawals that ends in a full withdrawal at the end of the fifth contract year as of the valuation date.

Commentary on Question:
Candidates generally did well on this part of the questions. Key components of successful calculations were the projected fund values, cash surrender values, mortality rates, death benefits, withdrawal benefits, discounted benefits, and the sum of both the death benefits and withdrawal benefits as the integrated benefit stream.

Some areas where candidates struggled were:
- *Timing of the calculations (e.g., 5 years from the valuation date versus 5 years from the contract inception date)*
- *Application of mortality improvement (either did not reflect it or had the wrong number of years)*
- *Properly reflecting the impact of persistency ($_tp_x$).*

Solution provided in Excel sheet.

5. **Continued**

(b) **(LO 1a)** Critique the following statements.

A. *If the contract holder dies during the accumulation phase of a deferred annuity, the standard non-forfeiture law requires that the contract must pay the full fund value, waiving surrender charges.*

B. *The appointed actuary must certify quarterly that the insurer complies with the "Hedged as Required" criteria for any CARVM reserves calculated for an indexed deferred annuity product.*

C. *If an annuity contract contains a two-tiered interest credit feature, the CARVM reserve should be calculated with all benefits calculated based on the higher rate tier as that will result in the greater present value.*

D. *An elective partial withdrawal benefit has a historical utilization rate of 5%. Therefore, it is reasonable to use the 5% for the CARVM calculation.*

E. *When determining the valuation interest rates for different benefits on the same contract, the "plan type" is the only parameter that could cause the benefits to have different valuation interest rates.*

Commentary on Question:
In general, candidates did well on this part of the question. Successful candidates did more than just state whether the statement was true/false, correct/incorrect, etc., and provided rationale for their decision.

A: False, contract must pay a benefit equal to or greater than the minimum nonforfeiture value, which may be less.

B: False, this is only true if the reserves are calculated using the Type 1 EDIM method. Type 2 methods do not have this same requirement.

C: False, The funds for the two tiers should each be calculated separately, and each benefit stream should be based on the specific fund that applies to that benefit.

D: False, all possible utilization rates should be considered. It may be possible to show that the utilization rate should be either 0% or 100% can be shown to calculate the greatest present value.

E: False, the interest guarantee period should also be determined at the benefit level.

6. Spring 2023 ILA-LFMU (LO 1a)

Learning Objectives:

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

Learning Outcomes:
(1a) Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US statutory framework, including the calculation of principles-based reserves and formulaic reserves

Relevant Sources:
Statutory Valuation of Individual Life and Annuity Contracts, Claire, D., Lombardi, L. and Summers, S., 5th Edition, 2018
- Chapter 23: VM-20: PBR for Life Products (excluding 23.1)
LO#2 LFM-143-20: Fundamentals of the Principle-Based Approach to Statutory Reserves for Life Insurance, July 2019

PBA Corner, Financial Reporter, Jun 2016

Commentary on Question:
This question tested the candidates' knowledge of US Statutory valuation principles, particularly mortality.

Solution:
(a) **(NO LONGER RELEVANT)** ~~Calculate the Limited Fluctuation credibility factor Z. Show all work.~~

~~**Commentary on Question:**~~
~~Candidates generally did well on this part of the question.~~

~~Given:~~
~~r =.1;~~
~~z-value = 1.96;~~
~~Mortality A/E ratio =85%~~
~~Std Dev value of A/E ratio =.03~~

~~Formula: Min[1, (r x A/E Ratio) / (z-value x Std Dev)]~~

~~Z= (.1*85%)/(1.96*.03) =144.6%~~
~~Capped at 1 so Z=1~~

~~(Some candidates knew the current r factor has been dropped to .05 – they were not penalized for the different calculation)~~

(b)   **(NO LONGER RELEVANT)** ~~Describe the considerations for SYL Life to transition to VM-20, with respect to the following credibility methods:~~

~~(i) Limited Fluctuation~~

~~(ii) Bühlmann Empirical Bayesian~~

~~Commentary on Question:~~
~~Candidates generally did not do well on this part of the question. The key was the considerations specifically for SYL Life.~~

~~(i) Limited Fluctuation~~
- ~~easier to explain and uses only Company information – not industry~~
- ~~need to switch from counts to amounts in calculation~~
- ~~need to cap error margin at .05 which may reduce credibility~~

~~(ii) Bühlmann Empirical Bayesian~~
- ~~uses industry and Company information~~
- ~~based on face amounts – not counts~~
- ~~harder to interpret or explain the calculation~~
- ~~VM20 uses formulaic approximations for the industry~~

(c)   **(LO 1a)** During their transition to VM-20, SYL Life reviewed its process for setting mortality assumptions to assess whether any changes to the process would be necessary.

Critique the following statements in terms of VM-20 requirements:

>   A. *SYL Life can use its own mortality improvement experience for all projection years.*

>   B. *SYL Life's reinsurance agreements will no longer result in mirrored reserves and the calculation for reinsurance reserve credit is based on PBR standards.*

6.   Continued

   C. *Changes in SYL Life's circumstances that raise doubt about the reliability*
    of the anticipated experience assumption would be reflected in the
    mortality margin.

   D. *SYL Life can model its term and whole life blocks together for its*
    deterministic reserve calculation.

   E. *SYL Life's whole life lapse assumption is 100% credible, so even though*
    lapses are a material risk, it would not require a margin.

Commentary on Question:
Candidates generally did well in their critique of statements A, D and E. Some
candidates did not provide the rationale in their critiques.

A. This is incorrect – mortality improvement can not be projected past the valuation date
under VM20

B. While it is correct that mirrored reserves are unlikely to occur, YRT reinsurance
agreements with non-guaranteed rates would use pre-PBR standards.

C. Correct – the greater the uncertainty in the anticipated experience assumption, the larger
the required margin

D. Incorrect – Term, Whole Life and ULSG should not be modelled together – the
methodology and assumptions for the seriatim calculation will be different.
(Some candidates explained that Term was required to calculate DR and that WL may
qualify for exemption using the Deterministic Exclusion Test)

E. Incorrect- even with 100% credibility, VM20 requires margins in any material risk not
stochastically modelled

7. Spring 2023 ILA-LFMU (LO 1a)

Learning Objectives:
1.   The candidate will understand and apply U.S. valuation principles and methods applicable to individual life insurance and annuity products issued by U.S. life insurance companies.

Learning Outcomes:
(1a)   Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US statutory framework, including the calculation of principles-based reserves and formulaic reserves.

Relevant Sources:
Statutory Valuation of Individual Life and Annuity Contracts, Claire, D., Lombardi, L. and Summers, S., 5th Edition, 2018
*   Chapter 23: VM-20: PBR for Life Products (excluding 23.1)
*   Chapter 25: Principle-Based Reserve Report
Interactive Principle-Based Reserves Model

Commentary on Question:
This question tested the candidate's knowledge of VM-20 requirements for a clearly defined hedging strategy as well as the calculation and drivers of the VM-20 reserves.

Solution:
(a)   **(LO 1a)** You are given MSY Life's risk mitigation strategy for ULSG below:

MSY Life will

> *   *Implement a hedging strategy to reduce long-term economic exposures from sustained low levels of interest rates and/or market volatility.*
> *   *Mortality and Policyholder behavior risk will be mitigated via a reinsurance strategy.*
> *   *Maintain dedicated ULSG Assets target levels in excess of the actuarially determined statutory reserves under stressed conditions (level or decreasing interest rates). This excess will be set so minor interest rate fluctuations don't require frequent adjustment of the Target Asset Levels. Assets will include general account assets and interest rate derivatives.*
> *   *Use interest rate swaps to better protect statutory capitalization in low interest rate environments. This risk mitigation strategy may negatively impact statutory and/or GAAP capitalization when interest rates are rising. It may also result in higher net income volatility due to the insensitivity of GAAP liabilities to changes in interest rates.*

Evaluate whether the above satisfies the VM-20 requirements for a clearly defined hedging strategy.

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7.   Continued

Commentary on Question:
Candidates received full credit by correctly identify which requirements satisfied by MSY Life's hedging strategy and partial credit if they only list the requirement and incorrectly identify if the requirement is met by the specified strategy.

MSY Life risk mitigation strategy satisfies the VM-20 requirements for a clearly defined hedging strategy (CDHS) in the following ways:

- The hedge objectives: To reduce interest rate and market volatility exposures
- Financial instruments used: Interest rate swaps
- The risks not being hedged: Mortality and policyholder risk mitigation through reinsurance is not in scope of CDHS
- The conditions under which hedging will not take place: minor interest rate fluctuations will not impact hedging targets, with excess assets held instead
- The circumstances under which hedging strategy will not be effective in hedging the risks: adverse impacts of the strategy on capitalization when interest rates rise

Other VM-20 requirements are not satisfied:

- The specific risks being hedged. Additional details on type of market and interest rate hedging should be mentioned
- Frequency of measuring hedge effectiveness
- The hedge trading rules including the permitted tolerances from hedging objectives
- The metrics for measuring hedge effectiveness
- The criteria used to measure hedge effectiveness
- The person(s) responsible for implementing the hedging strategy

(b) (LO 1a)   Calculate the Net Premium Reserve under VM-20 (ignoring expense allowance) at the end of year 5. Show all work.

Commentary on Question:
Candidates generally did well for the first four steps. Most candidates did not floor the NPR using the CSV. The cost of insurance is not provided in the question, so candidates are given full credit even if the COI is not mentioned.

Step 1: Determine a net level gross premium at issue = PV of future benefits at issue / PV of annuity at issue

$$= (1{,}000{,}000 \text{ x A35}) \div a_{35} = 5{,}088$$

Step 2: Expense allowance is zero given the time is 5 years from inception

7.   Continued

Step 3: Calculate the r-ratio of the current fund value to the Guaranteed maturity fund at the valuation date s calculated. The r-ratio cannot exceed 1

r-ratio = min(5000/34350, 1) = 0.15

Step 4: The net premium reserve at the end of fifth year = r-ratio x (PV of future benefits at age 40 – PV of net level gross premium at age 40)
$$= 0.15 \text{ x } (1,000,000 \text{ x A40} - 5088 \text{ x } a_{40})$$
$$= 3,952$$

Step 5: A floor of the surrender value and cost of insurance is applied to the net premium reserve. The surrender value is the current fund value given there is no surrender charge. The cost of insurance is not mentioned in the question and therefore candidates were not penalized for not flooring at Cx.

Net premium reserve applying floor = max (3,952 , 5000) = 5000

(c) **(LO 1a)**   Describe the effect on GMF and Net Premium Reserve in the following situations:

   (i) The fund value at the end of year 5 is 50,000

   (ii) The policyholder has a surrender charge of 1,000 at the end of year 5

   (iii)The 10-year Treasury rate goes up by 50 basis points at the end of year 5

   (iv) The current credited interest rate is 1% higher than the guaranteed interest rate and fund value at the end of year 5 remains at 5,000

Commentary on Question:
Candidates generally did not do well on this part of the question, especially on the GMF. Candidates need to provide the rationale for their conclusion of impacts on GMF and NPR to receive full credit. Partial credit was received if the correct rationale was provided but not the conclusion.

   (i)   The GMF remains unchanged as it is projected using policy guaranteed rates set at inception.
The NPR increases because (1) the increase in r-ratio (capped at 1) and   increases in the CSV floor.

   (ii)   The GMF remains unchanged as it is not impacted by the surrender charge.
NPR decreases because the cash surrender value will be fund x(1- surrender charge%) or fund -$1,000, leading to the lower floor.   The new floor would be $4,000 instead of $5,000 which is still higher than the pre-NPR reserve ($3,952)

7. Continued

    (iii)   Both GMF and NPR are unaffected given that the former is based on policy guaranteed rates set at issue whilst the NPR is calculated based on valuation interest rates prescribed at issue per prescribed formula by CRVM.

    (iv)   GMF is unaffected as it is projected using policy guaranteed rates set at inception

The NPR remains unchanged because (1) the r-ratio is unchanged as the fund value remains the same and (2) cash flows are based on guaranteed credited rates

10. Spring 2023 ILA-LFMU (LO 4d)

Learning Objectives:

4.   The candidate will understand the fundamentals of value creation and inforce management techniques for life and annuity products.

Learning Outcomes:

(4d)   Describe and apply the methods and principles of embedded value for an insurance enterprise

Relevant Sources:

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

Commentary on Question:

This question tested the candidates' understanding of Embedded Value in the context Insurance Mergers and Acquisitions. The question also tested the candidates' understanding of the relationship between Adjusted Net Worth (ANW) and Embedded Value, and the different approaches to calculate ANW.

Solution:

(a) **(NO LONGER RELEVANT)** ~~Describe two methods of determining a discount rate when assessing a merger and acquisition transaction.~~

~~**Commentary on Question**:~~
~~*Candidates generally did well on this part of the question. To receive full credit, candidates had to describe the two approaches used to determine the discount rates for mergers and acquisitions.*~~

~~Using a Weighted Average Cost of Capital to determine the discount.~~

~~Using an internal hurdle rate used in pricing~~

~~Using M&A market place discount rates that are taking place in industry~~

~~Cost of funds for transactions - a potential buyer may have a specific cost of funds for a given transaction which will be the appropriate discount rate~~

10.   Continued

(b) **(LO 4d)** PDX Life is calculating Embedded Value (EV) on a block of business.

   (i)   List three differences between an EV and an Actuarial Appraisal

   (ii)   Describe the two approaches to determining Adjusted Net Worth (ANW)

   (iii)   Describe how each approach affects the calculation of EV

   (iv)   Describe the circumstances under which each approach would be more
           appropriate for PDX Life.

Commentary on Question:
*Most candidates received full credit for identifying the differences between EV and
Actuarial Appraisal. However, candidates generally struggled on the remainder of the
question. Successful candidates emphasized that Required Capital can be either valued
on market or book value and that Free Surplus should be valued at market value but
failed to recognize that this distinction would impact the RDR used to discount EV.
Candidates received credit for understanding that valuing both Free Surplus and
Required Capital using market values would result in more volatile EV compared to
using book value for Required Capital.*

(i)
   * Actuarial Appraisals typically assign a value to the contribution of future new
     business, whereas EV focuses on only the current block of business.
   * Actuarial Appraisal are typically calculated using a higher discount rate than EV
   * Assumptions used to calculate Actuarial Appraisal tend to be more reflective of the
     industry assumptions, while EV focuses on assumptions that are more company
     specific

(ii)   The two approaches are the Literal Approach and the Less Literal Approach

The Literal Approach requires a company to mark their Free Surplus to market value and
their Required Capital at book value. This is because Free Surplus is distributable while
required capital is not immediately. This results in the Risk Discount Rate/Cost of Capital
for this approach to use book yield for required capital and market yield for free surplus.

The Less Literal Approach is to treat Free Surplus and Cost of Capital at Market value,
where the Risk Discount Rate and the Cost of Capital is based on market yield.

10.   Continued

(iii)   EV is calculated as Inforce Book Value + Adjusted Net Worth. Depending on the approach used and the book & market yields, the Adjusted Net Worth may be different and have varying effects on EV.

If the market yields are higher, the less literal approach would result in a lower ANW and a lower EV. If the book yields are higher, the literally approach would result in a lower ANW and a lower EV.

Additionally, Market Yields tend to be more sensitive and book yields tend to be more stable. As a result, the literal approach should generate a more stable ANW as book yields are used for the calculation of the Required Capital. However, in the less literal approach, when Market Yields are used for both portions, there is more variability introduced.

(iv)   It would depend on whether PDX would want a higher EV or not and where their book & market yields are at.

If PDX wants a higher EV, and the book yield is lower than the market yield, the literal approach would be preferable as the Required Capital would be higher, resulting in a higher ANW. If their market yield is lower than their book value, using the less literal approach would be preferable as both Required Capital and Free Surplus will be discounted at the lower market yield.

3. Fall 2022 ILA-LFMU (LO 1a)

Learning Objectives:
1. The candidate will understand and apply U.S. valuation principles and methods applicable to individual life insurance and annuity products issued by U.S. life insurance companies.

Learning Outcomes:
(1a) Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US statutory framework, including the calculation of principles-based reserves and formulaic reserves

Relevant Sources:
Statutory Valuation of Individual Life and Annuity Contracts, Claire, D., Lombardi, L. and Summers, S., 5th Edition, 2018

Interactive Principle-Based Reserves Model

Commentary on Question:
This question tested the candidates' understanding of U.S. Statutory valuation principles and methods.

Solution:
(a) **(LO 1a)** Compare the pre-PBR Standard Valuation Law to the Principles Based Reserve (PBR) for statutory reserves of life insurance policies with respect to the following:

      (i) Valuation Methodology/Calculation

      (ii) Assumptions

Commentary on Question:
Candidates generally demonstrated knowledge of the methodologies, calculation approaches, and assumptions applicable to statutory reserving.

      (i)   Pre-PBR Standard Valuation Law: The two most common methodologies are the Net Level Premium (NLP) and the Commissioners' Reserve Valuation Method (CRVM). Both methodologies are based on a simple projection of premiums and expected death benefits that center around the following formula: Reserve = Present Value of Future Death Benefits – Present Value of Future Statutory Net Premiums.

Principles Based Reserve: The minimum reserve to be held under this approach is addressed in the following formula: Minimum Reserve = AggNPR + Max(0, (Max(SR, DR) – (AggNPR – DDPA))), where

3.   Continued

AggNPR = Sum of Policy Minimum Net Premium Reserves,
SR = Stochastic Reserve,
DR = Deterministic Reserve, and
DDPA = Due and Deferred Premium Asset.

     (ii)   Standard Valuation Law:
         a. Mortality and interest assumptions are prescribed.
         b. Lapses and expenses are implicitly implied in the valuation margins inherent in the selection of conservative valuation mortality and interest assumptions.

Principles Based Reserves
         a. Prudent estimate assumptions are equal to anticipated experience assumptions plus a margin. The margin may increase or decrease the assumption to cover adverse deviations and estimation error.
         b. Economic assumptions, such as U.S. Treasuries and equities, are stochastically generated using a prescribed economic scenario generator.

(b) **(LO 1a)** Describe how each piece of the following information about XYZ Life should be used in setting assumptions under VM-20:

    (i) XYZ has been selling 10-year Level Term and Whole Life insurance for 20 years.

    (ii) Historically, sales have been limited to ages 18-50, but have been expanded to include ages 51-65 in the last 3 years.

    (iii)XYZ expects increased deaths from COVID-19 for the next 3 years.

    (iv)XYZ has implemented new underwriting guidelines that it expects to result in future mortality improvement.

    (v) XYZ does not have the capability to model mortality stochastically.

3.   *Continued*

Commentary on Question:
A common issue on this part of the question was that candidates' description for one part were more appropriate for other parts. Partial credit was received where appropriate.

   (i)   Policyholder behavior for the Level Term product should be taken into account where there is a dramatic increase in tail premiums.

   (ii)   Exposure period should be at least 3 years, but not more than 10 years. Recommendation must take into consideration the 20 years of sales with only 3 years of experience for ages 51 to 65.

   (iii)   If the actuary believes the mortality trends are expected to continue beyond the valuation date and would cause an increase to reserves, then the actuary should consider reflecting such trends in the assumptions for the cash flow projections.

   (iv)   Future mortality improvement is only allowed to be reflected up until the valuation date.

   (v)   Given the company's inability to model stochastically and since mortality is not required to be modelled stochastically, the company should set assumptions by developing prudent best estimates with additional appropriate margins.

Other answers that can be included above:
   1. Create experience segments, where applicable.
   2. Update experience study at least once every three years.
   3. Credibility must be determined using the Limited Fluctuation Method or Buhlmann Empirical Bayesian Method.
   4. There are prescribed margins for company experience and industry tables.
   5. Company experience grades into industry rates depending on sufficient data period.

3. *Continued*

(c) **(NO LONGER RELEVANT)** ~~Evaluate the following e-mail for compliance with the NAIC Life Insurance Illustration Model Regulation:~~

> To: Illustration Actuary
> From: Pricing Actuary
> Subject: Illustration Sign-off for Upcoming Whole Life Product
>
> My team has verified that for all illustrated points in time after the twentieth policy anniversary, the accumulated value of all policy cash flows equals or exceeds the policy cash surrender value (there are no other illustrated benefit amounts for this product). This is true under both experience assumptions and a modified persistency rate assumption. The modified persistency assumption uses experience persistency for the first 15 years and 100% persistency thereafter.
>
> Below is a numeric summary of a sample illustration for a male, age 35, non-smoker.
>
> | Age | Policy Year | Cash Surrender Value |
> |---|---|---|
> | 35 | 0 | $1,000 |
> | 40 | 5 | $2,500 |
> | 45 | 10 | $9,000 |
> | 55 | 20 | $25,000 |
> | 70 | 35 | $50,000 |

~~**Commentary on Question**:~~
~~Candidates generally did not perform well on this part of the question.~~

~~The team verifying that the accumulated value of all policy cash flows equals or exceeds the cash surrender value for all illustrated points in time after the fifteenth policy anniversary, not the twentieth policy anniversary, meets the self-support test.~~

~~The modified persistency assumption uses experience persistency for the first 5 years, not the first 15 years, and 100% persistency thereafter, meets the lapse-support test.~~

~~Policy years, as shown in the numeric summary of the sample illustration, are correctly assigned to the associated attained ages in the table.~~

3.   Continued

It is necessary to clearly identify the illustrated scale from the guaranteed scale, with the guaranteed scale appearing first.

It is necessary for non-guaranteed elements in an illustrated scale to be reduced as follow:

      i.   Dividends at 50% of the dividends contained in the illustrated scale used.
      ii.   All non-guaranteed charges, including but not limited to, term insurance charges, , mortality, and expense charges, at rates that are the average of the guaranteed rates and the rates contained in the illustrated scale used.

The illustration shall be labelled with the date on which it was prepared.

Each page shall be numbered and must show the relationship to the total number of pages.

The assumed dates of payment receipt and benefit payout within a policy year shall be clearly identified.

If issue age is shown as a component of the tabular detail, then it should be equal to issue year plus the number of years that the policy is assumed to have been in force.

The assumed payment on which the illustrated benefits and values are based shall be identified as premium outlay or contract premium.

Any illustration of non-guaranteed elements shall be accompanied by an statement indicating that (a) the benefit and values are not guaranteed, (b) the assumptions are subject to change, (c) and the result may be less favorable.

A basic illustration shall include a brief description of the policy being illustrated with a statement that it is a life insurance policy.

A brief description of any policy feature, riders, or options, that are guaranteed or non-guaranteed, which are shown in the basic illustration along with the impact they may have on the benefits and values of the policy.

4. Fall 2022 ILA-LFMU (LO 1b)

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.

Learning Outcomes:
(1b) Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US GAAP framework, including the calculation of reserves and related items (e.g., DAC).

Relevant Sources:
US GAAP for Insurers, Freedman, M., and Frasca, R., 3rd Edition, 2024
- Chapter 7: Universal Life Insurance (only sections 1, 2, 5-7)

Targeted Improvements Interactive Model

Implementation Considerations for VA Market Risk Benefits, Financial Reporter, Sep 2019

Commentary on Question:
This question tested the candidates' understanding of Market Risk Benefits and Embedded Derivatives under US GAAP Post LDTI. Candidates were expected to understand what characteristics define an MRB, whether common benefit features are considered to be MRB, and how to calculate the value of an MRB. Candidates had to understand the relationship between MRB, embedded derivatives, and the host contract.

Solution:
(a) **(LO 1b)** Assess whether the following benefit features meet the definition of Market Risk Benefits (MRB) under ASC 944 MRB Fair Value Guidance:

(i) Interest crediting rate on the account value based on performance of an equity index within an annuity

(ii) Guaranteed lifetime withdrawal benefit on a fixed-indexed annuity

(iii) Minimum guaranteed periodic payments on a variable immediate payout annuity, where payments will vary based on the investment performance of a related separate account fund

(iv) A secondary guarantee on a universal life contract, where the death benefit remains in force even if the account balance is insufficient to pay the cost of insurance assuming minimum funding requirements are met

4. **Continued**

Commentary on Question:
Candidates generally did well on this part of the question. Most candidates identified the correct conclusion and received at least partial credit. The more successful candidates were able to clearly show the reasons underlying their conclusions.

(i)   It depends on the termination provisions of the contract. If the equity index crediting earned to date is available upon surrender at any time, the equity index crediting is part of the account balance and is an embedded derivative. If the equity index crediting is only available after some specified period, or only upon death, it is an amount in addition to the account balance and may be an MRB.

(ii) Yes. These guarantee features are providing a potential benefit in addition to the account balance for difference between the guaranteed benefit and the account balance.

(iii) No. The MRB guidance applies to contracts with an account balance. A payout annuity has no account balance and there is only one benefit. Period certain guarantee is an embedded derivative.

(iv) No. The death benefit component of a life insurance product is excluded from the scope of the MRB guidance.

(b) **(LO 1b)** Critique the following statements regarding MRBs:

A. *An MRB shall be measured at fair value. Total attributed fees used to calculate the fair value of the MRB can be negative. The unit of account for the attributed fee determination for an MRB can be calculated for a group of contracts with similar product types and issuance period.*

B. *An MRB can be evaluated using either a non-option or option-based valuation approach. If an option-based approach is adopted, the terms of the MRB can be adjusted to result in the MRB being equal to zero at inception.*

C. *If a contract contains multiple MRBs, those MRBs shall be bundled together as a single compound MRB in the fair value determination.*

Commentary on Question:
Most candidates were able to provide some valid criticism. The most common errors were not understanding that the unit of account for MRB is at a policy (seriatim) level and cannot be grouped for similar product types. Another common error was not recognizing that the attributed fees for MRB cannot be negative.

A. It is true that MRB is measured at fair value. However, total attributed fees used to calculate the fair value of the market risk benefit shall not be negative or exceed total contract fees and assessments. Also, the unit of account for determining the attributed fee for an MRB is the individual policy (seriatim).

B. It is true that MRB can be evaluated using non-option valuation approach or option based approach. However, if an option-based valuation approach is used, the terms of the market risk benefit shall not be adjusted to result in the market risk benefit being equal to zero at the inception of the contract.

C. This statement is correct. The ASC specifically states that if a contract contains multiple market risk benefits, those market risk benefits shall be bundled together as a single compound market risk benefit.

(c) **(LO 1b)** Calculate the following under the non-option method:

    (i) Annual percentage of the account value that will be attributed to the host as fee revenue

    (ii) The value of the MRB at year 4

Show all work.

Commentary on Question:
Candidates generally performed well on this part of the question. Most candidates were able to correctly calculate the locked-in attributed fee at issue based on the combined GMDB and GMAB benefits and the MRB value. Candidates generally had challenges identifying the fee revenue rate attributed to the host.

    (i)   MRB attributed fee is 30% = 4,500/15000.
             Total annual fees are 1.50%
        Annual percentage of the account value that will be attributed to the MRB is 0.45% = 30%*(1.50%)
        Annual percentage of the account value that will be attributed as fee revenue to the host VA contract is 1.05% = 1.50% - 0.45%

    (ii)   The MRB value is equal to the present value of the compounded (GMAB and GMDB) benefits at Year 4, 6,000

     less

4.   Continued
the attributed fee percentage (30%) times the PV of fees collected from the account at year 4 (10,000)

MRB liability = 6,000 - 30% * 10,000 = 3,000

(d) **(LO 1b)** You are given the following at issue:

- A contract holder deposits 50,000 in an index annuity with GMDB rider that provides the contract holder's death benefit be credited at 6% interest compounded annually.
- The fair value of benefit for the GMDB rider to be paid in excess of the account balance is 2,000.
- The fair value of the embedded derivative for index crediting is 8,000.

Describe the calculation needed for each of the following at a future valuation date under the option method:

(i) MRB

(ii) Embedded derivative

(iii) Host

Commentary on Question:
Candidates generally had difficulty with this part of the question. Successful candidates were able to both clearly describe the revaluation using fair value accounting for the MRB and enhanced derivative, as well as the accretion of the initial host discount. Most candidates received partial credit for the components describe.

Model Solution:
(i) The MRB would be revalued at fair value for each period. This can be seen as the amount which is defined as the current price to transfer the liability to a market participant in an orderly transaction.

(ii)   The Embedded derivative should also be revalued to fair value each period.

(iii)   The value at inception of the host needs to be calculated first. This is done by taking the account balance and subtracting the value of the MRB and Embedded derivative. In this case, the amount of the host discount is 10,000 = ([MRB at inception] 2,000 + [Embedded derivative at inception] 8,000), and the initial host is 40,000 = ([the account balance at inception] 50,000 – [host discount] 10,000).
When looking forward to future valuation dates, the host discount of 10,000 will be accreted through the interest credited expense until the discount reaches zero, and the host reaches 50,000.

5. Fall 2022 ILA-LFMU (LO 1b)

Learning Objectives:
1. The candidate will understand and apply U.S. valuation principles and methods applicable to individual life insurance and annuity products issued by U.S. life insurance companies.

Learning Outcomes:
(1b) Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US GAAP framework, including the calculation of reserves and related items (e.g., DAC).

Relevant Sources:
> *US GAAP for Insurers*, Freedman & Frasca, 3rd Edition, 2024:
> - Chapters 1, 3, 4, 5, 7 (sections 1, 2, 5–7), 11, 12
>
> *Implementation Considerations for VA Market Risk Benefits*, Financial Reporter, Sep 2019.
> *Targeted Improvements Interactive Model*.

Commentary on Question:
> *This question tested the candidates' knowledge of ASU 2018-12, also known as Long-Duration Targeted Improvements (LDTI).*

Solution:

(a) **(LO 1b)**   Critique the following statements with regard to ASU 2018-12:

A. *ASU 2018-12 updates the existing guidance to include a provision for adverse deviation for cash flow assumptions, which need to be reviewed on an annual basis.*

B. *Under ASU 2018-12, contracts are grouped in cohorts to measure the liability. These cohorts can include contracts from different issue years.*

C. *(NO LONGER RELEVANT)* ~~Terminal dividend liability is accrued at a constant rate based on the present value of the basis used for the amortization of DAC, which is a straight-line basis for individual contracts.~~

D. *Market risk benefits are measured at fair value. The change in fair value is recognized in other comprehensive income (OCI).*

> **Commentary on Question**:
> *Candidates generally did well on this part of the question. Candidates were expected to identify the validity of the statements or portions of statements and provide the rationale. Some candidates were unclear in statement D as to how to split change in fair value between OCI and net income. Another valid view is change in fair value is recognized in net income, <u>except</u> for the portion attributable to instrument-specific credit risk that is recognized in OCI.*

5.   Continued

A. Cash flow assumptions
- Reviewed at least annually
- No provision for adverse deviation

B. Cohorts
- Contracts can be grouped to measure the liability but cannot include contracts from different issue years

C. ~~Terminal dividend liability~~
- ~~This statement is correct~~

D. Market Risk Benefits (MRB)
- Measured at fair value
- Change in fair value attributed to instrument-specific credit risk recognized in OCI; remainder of change recognized in net income

(b) **(LO 1b)**   Company VLF currently sells fixed indexed annuities (FIA) with a GMWB, which is valued as an embedded derivative under FAS133. Under ASU 2018-12, VLF has concluded that FIA indexed credits and GMWBs are considered market risk benefits because they were previously valued as an embedded derivative, and because they have "other than nominal" capital market risk.

      (i) Critique VLF's conclusion.

      (ii) Describe "other than nominal" capital market risk that is relevant to VLF's FIA product.

Commentary on Question:
Most candidates received partial credit for this part of the question. Part (ii) required an understanding of drivers of "other than nominal" capital market risk applied to the given situation, more comprehensive than reciting part of the flowchart and table included in the study note.

      (i)
- Indexed credits/interest credits and GMWBs are embedded derivatives
- Indexed credits/interest credits and GMWBs include capital market risk that is "other than nominal"
- Indexed credits/interest credits remain an embedded derivative while GMWBs becomes a market risk benefit
- GMWBs are market risk benefits due to transferring a shortfall/loss because when the FIA account value is depleted (reaches 0), insurer continues to pay appropriate GMWB amounts (a transfer from policyholder to insurer)

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5.   Continued

(ii)
- Capital market risks include equity, interest rate and foreign exchange risk
- Other-than-nominal exposure to capital market risk would exist if the net amount at risk (that is, the guaranteed benefit exceeds the account value, cash value or similar amount) varies by more than an insignificant amount in response to capital market volatility, and the exposure to market risk has more than a remote probability of occurring.
- Indexed credits/interest credits and GMWBs are subject to "other than nominal" exposure to capital market risk
- Indexed credits/interest credits are exposed to capital market volatility; if index increases, index credits occur and account value increases; if index decreases, no index credits and account value doesn't change.
- GMWBs have exposure to capital market volatility because the benefit base is related in some way to account value, which moves according to indexed credits that are themselves subject to capital market volatility

(c) **(LO 1b)** Describe the new disclosures with respect to ASU 2018-12 for the following:

(i) liability for policyholder's account balances and additional liability

(ii) market risk benefits

Commentary on Question:
Candidates generally did not do well on this part of the question. Disclosures have only been seen in practice by actuaries working on LDTI implementation projects for 1/1/2023 or 1/1/2025 effective dates and will become more widely known as companies start using them in financial reporting.

(i)
Liability for policyholder's account balances - disaggregated roll forward of the insurance balance. Roll forward presented:
- Reconciliation of the disaggregated roll forwards to the aggregate ending carrying amount of the liability
- Tabular presentation of policyholder's account balances by range of guaranteed minimum crediting rates, and the related range of the difference between rates being credited to policyholders and the respective guaranteed minimums
- Qualitative and quantitative information about adverse development that resulted in a charge to current-period benefit expense because of premium deficiency

5. Continued

(ii)
Market risk benefits - disaggregated roll forward of the liability balance. Roll forward presented:
- Components of the roll forward may include issuances, interest accrual, net assessments collected, benefit payments, derecognition (lapses), experience adjustments, changes in cash flow assumptions, changes in discount rate assumptions and change in the instrument-specific credit risk
- Guaranteed benefit amounts in excess of current account balances
- Reconciliation of the disaggregated roll forwards to the aggregate ending carrying amount of the liability, disaggregated between positions that are in an asset position and those that are in a liability position
- On an annual basis, qualitative and quantitative information about the significant inputs, judgements and assumptions used in measuring the liability, including how they changed and the effects of the changes on the measurement of the liability.

(d) **(LO 1b)** List the disaggregation principles that insurers will need to apply to the new required disclosure under ASU 2018-12.

Commentary on Question:
Candidates generally did not do well on this part of the question. Listing any four of the five disaggregation principles from the study note received full credit.

Disaggregation Principles:
- Disclose information in a manner that allows users to understand the amount, timing and uncertainty of future cash flows arising from the liabilities
- Do not obscure useful information by including a large amount of insignificant detail or aggregating items that have significantly different characteristics
- Consider how information has been presented for other purposes
- Do not aggregate amounts from different reportable segments
- Do not make disclosures for insignificant categories except in the reconciliation

6. Fall 2022 ILA-LFMU (LO 2a)

Learning Objectives:
2. The candidate will understand how to explain and apply the methods, approaches and tools of financial capital management for life insurance company under a US regulatory framework.

Learning Outcomes:
(2a) The Candidate will be able to explain and calculate required capital under a US regulatory framework

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

Commentary on Question:
This question tested the candidates' understanding of capital at the entity and group level. Candidates generally received partial credit on each part. Few candidates received full credit.

Solution:
(a) **(LO 2a)**   Critique the following statements in the context of RBC:

> A. *AIF is not subject to the C-0 requirement if all its subsidiaries are non-insurance entities. If AIF has a life insurance subsidiary, then the C-0 factors of such subsidiary is equal to 30% to 100% of the book value of the subsidiary as reported in the statutory annual statement.*

> B. *For MJE, the RBC interest rate risk factor for the SPDA reserve is determined under the medium category and is required to be increased by 50% due to an asset-liability mismatch. MJE can submit a qualified opinion based on a C-3 significance test to avoid the increase.*

> A. *MJE must perform a trend test. If its RBC ratio falls below the Regulatory Action Level, the commissioner of the state of domicile is required to take actions necessary to protect the best interest of the policyholders and creditors.*

> B. *The C-4 business risk capital for MJE will be 0 because AIF Life will allocate C-4 at Total Company level.*

6.   Continued

        C. The C-2 insurance risk capital for SPDA is typically a percentage of premium and since these are only single premium products, C-2 risk capital is required in the first policy year.

Commentary on Question:
To receive full credit, candidates had to address the validity of each sentence. Some candidates did not. Most candidates received at least partial credit on each statement.

    A. The first sentence is false. AIF **is** subject to the C-0 requirement regardless of whether its subsidiary is a non-insurance entity. The second sentence is also false. If AIF has a life insurance subsidiary, then the C-0 factors of the subsidiary is the subsidiary's risk-based capital requirement.

    B. The first sentence is false. Because MJE's SPDA product does not have a surrender charge, the risk factor is determined under the high risk category and is required to be increased by 50% due to the asset-liability mismatch. The second sentence is also false. MJE can submit an **unqualified** asset adequacy opinion to avoid the increase.

    C. The first statement is true. MJE's RBC ratio = 5.0/2.0 = 250%. The RBC trend test must be performed when the ratio is between 200-300%. So, MJE must perform the trend test. The second statement is false. Once MJE's RBC ratio falls below the Regulatory Action level, it must submit an RBC plan to its insurance commissioner. After examination or analysis, the commissioner will issue an order specifying corrective actions be taken.

    D. This is false. C-4 is intended to cover general business risks such as losses due to fraud and mismanagement. The C-4 factor is based on premium, annuity considerations, and separate account liabilities. For annuities, the RBC factor is 3.08% of annuity considerations, and will be allocated to **both** AIF and MJE.

    E. This statement is false. C-2 is a percentage of statutory reserves, not premium. Because statutory reserves are calculated past the first policy year, C-2 RBC will **not** only apply in the first year.

6.   Continued

(b) **(NO LONGER RELEVANT)** Calculate the Group Capital Ratio for AIF. Show all work.

Commentary on Question:
Most candidates demonstrated how to calculate a group capital ratio. However, few candidates calculated Minimum Regulatory Capital (MRC) correctly, including, but not limited to, the calculations on MRC for Company MJE and Company AIF. Partial credit was received if a group capital ratio formula is correct regardless of the underlying factors.

Available Regulatory Capital (ARC) = 20
Minimum Regulatory Capital (MRC for Company AIF) = 6-(2+3) = 1

*MRC (for Company MJE) = 2*2 = 4. Need to multiply Authorized Capital Level (ACL) by 2 to get Company Action Level (CAL) RBC.*
MRC (for other subsidiaries) = 3.
MRC (total) = 1 + 4 + 3 = 8
Group Capital Ratio = ARC/MRC = 20/8 = 2.5

(c) **(NO LONGER RELEVANT)** Describe two considerations related to a capital adequacy assessment of an insurer that operates under more than one regulatory regime per *ASOP 55 – Capital Adequacy Assessment*.

Commentary on Question:
Few candidates referenced the applicable section of ASOP 55 correctly.

      a.   different regulatory regimes that might apply to different parts of the insurer or different entities (including non-insurance entities) of the **group**, including:

          1.   cooperation and existence or non-existence of memorandums of understanding between regulators;
          2.   differing requirements for **capital**, scenario and stress tests, and financial reporting structures;
          3.   expected regulatory changes;
          4.   differing amounts of regulatory oversight;
          5.   impact of rules, restrictions, and time-lags on **capital** availability;
          6.   differing definitions of "insurance company" and "regulated entity"; and
          7.   differing **valuation bases**; and

      b.   variations in taxation and approaches to litigation in various regulatory regimes.

7. Fall 2022 ILA-LFMU (LO 1b)

Learning Objectives:
1.   The candidate will understand and apply U.S. valuation principles and methods applicable to individual life insurance and annuity products issued by U.S. life insurance companies.

Learning Outcomes:
(1b)   Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US GAAP framework, including the calculation of reserves and related items (e.g., DAC).

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

Commentary on Question:
This question tested the candidates' understanding of the fundamental features of the U.S. and International regulatory framework.

Solution:
(a) **(LO 1b)**   Critique each of the following approaches.

> A. *For long-duration contracts, DAC is amortized on a straight-line basis over the expected term of the related contracts. DAC is not subject to impairment testing. However, the premium deficiency test for long duration insurance contracts will need to include the DAC balance.*

> B. *The test for profits followed by losses may be performed on a grouped contract basis, at grouped contract inception, and is not revisited. When an additional liability is required, it is determined based on a benefit ratio that does not exceed 100%.*

7.   Continued

> C. *Future cash flows used to estimate the liability for future policy benefits for limited-payment contracts must be discounted using an upper medium grade 10-year fixed-income instrument yield. The discount rate is required to be updated annually, with the effect of the discount rate changes on the liability recognized in accumulated other comprehensive income (AOCI).*

> D. *The ceding company may receive a ceding allowance from the reinsurer. The ceding allowance DAC offset must be limited to the amount that represents recovery of acquisition costs deferred by the ceding company. Any excess should be recognized in income at the time of the reinsurance transaction.*

Commentary on Question:
Most candidates did well critiquing statement A, but had difficulty recognizing issues in statement D.

A.   First two sentences are correct. DAC is amortized on a straight-line basis over the expected term of the related contracts and DAC is not subject to impairment testing. However, the last sentence is incorrect. The premium deficiency test for long duration insurance contracts will exclude the DAC balance.

B.   Both sentences are incorrect. The test for profits followed by losses is required to be performed on a contract-by-contract basis, at contract inception, and is not revisited. The benefit ratio determined in ASC 944-40-30-20 may exceed 100%, resulting in a liability that exceeds cumulative assessments.

C.   Both sentences are incorrect. The discount rate is required to be an upper-medium grade (low credit risk) fixed-income corporate instrument yield ("single A") that reflects the duration characteristics of the liability. The discount rate is required to be updated at each reporting date, with the effect of the discount rate changes on the liability recognized in OCI.

D.   First two sentences are correct. In many reinsurance transactions, the ceding company will pay the reinsurer a reinsurance premium for reinsurance coverage, and receive a ceding commission from the reinsurer. The ceding allowance DAC offset is limited to the amount that represents recovery of acquisition costs deferred by the cedant. However, the last sentence is incorrect. Any remaining amount (i.e., the portion of ceding commission above the amount representing recovery of DAC) should be deferred and amortized rather than recognized in income immediately.

7.   Continued

(b) **(LO 1b)**   Calculate GAAP DAC capitalization at issue.

Commentary on Question:
Candidates generally did well calculating the DAC capitalization at issue.

Commission and policy underwriting expenses are deferrable. The first year and present values are equal. Therefore, the total amount is deferrable since there are no renewal commissions.

GAAP DAC capitalization at issue = Commission + Policy underwriting expenses
DAC = 28,000 + 8,000 = 36,000

(c) **(NO LONGER RELEVANT)** ~~Calculate the amount of contractual service margin at issue for this group under IFRS 17.~~

~~**Commentary on Question**:~~
~~*Candidates generally did well calculating the Contractual Service Margin. Partial credit was received if candidates missed one of the components in the risk-adjusted outflow calculation.*~~

~~The contractual service margin (CSM) is the present value of risk-adjusted future cash inflows less the present value of risk-adjusted future cash outflows.~~

~~CSM = PV of Risk-adjusted Inflows – PV of Risk-adjusted Outflows~~
~~CSM = 249,000 – (28,000 + 4,980 + 8,000 + 18,550 + 187,000)~~
~~CSM = 249,000 – 246,530 = 2,470~~

(d) **(NO LONGER RELEVANT)** ~~Determine if this group of contracts is onerous per IFRS 17. Justify your answer.~~

~~**Commentary on Question**:~~
~~*Most candidates received full credit for this part of the question.*~~

~~A group of contracts becomes onerous if its estimated cash outflows exceed its estimated cash inflows, which implies a negative contractual service margin. This group of contacts is not onerous per IFRS 17 since the contractual service margin is positive.~~

(e) **(NO LONGER RELEVANT)** ~~Describe how reinsurance contracts held should be accounted under IFRS 17.~~

~~**Commentary on Question**:~~
~~*Candidates generally struggled to identify the accounting for reinsurance contracts under IFRS 17.*~~

7.   Continued

IFRS 17 generally requires a company to account for reinsurance contracts held using an approach consistent with that for the underlying insurance contracts. Reinsurance contracts held are accounted for using the general accounting model modified for:
(a) recognition date. A group of reinsurance contracts held is recognised from either the beginning of the coverage period of the group of reinsurance contracts or the initial recognition of the underlying insurance contracts, whichever is the later date, or from the beginning of the coverage period if the reinsurance coverage is not for the proportionate losses of a group of underlying insurance contracts.
(b) estimation of the fulfilment cash flows. For reinsurance contracts held, the fulfilment cash flows reflect the risk of non-performance by the issuer of the reinsurance contract.
(c) measurement of the contractual service margin at initial recognition. Any net gain or loss at initial recognition is recognised as a contractual service margin, unless the net cost of purchasing reinsurance relates to past events, in which case the company is required to recognise the net cost immediately in profit or loss.

8. Fall 2022 ILA-LFMU (LO 1a)

Learning Objectives:
1. The candidate will understand and apply U.S. valuation principles and methods applicable to individual life insurance and annuity products issued by U.S. life insurance companies.

Learning Outcomes:
(1a) Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US statutory framework, including the calculation of principles-based reserves and formulaic reserves.

Relevant Sources:
Statutory Valuation of Individual Life and Annuity Contracts, Claire, D., Lombardi, L. and Summers, S., 5th Edition, 2018
*   Chapter 23: VM-20: PBR for Life Products (excluding 23.1)
*   Chapter 24: VM 21: PBR for Variable Annuities
*   Chapter 25: Principle-Based Reserve Report

Commentary on Question:
The question tested the candidates' knowledge of VM-20, VM-21, and policyholder tax requirements of 7702. Candidates generally did well on this question.

Solution:
(a) **(LO 1a)** Critique the following statements:

> A. *A block of business containing universal life with secondary guarantee policies, which were issued in 2020 and 2021, is subject to VM-20.*

> B. *If a group of term life contracts passes the deterministic exclusion test for VM-20, the minimum reserve is the aggregate net premium reserve.*

> C. *To qualify as a clearly defined hedging strategy, the strategy must specify the risks being hedged and instruments used for hedging.*

> D. *If a group of universal life with secondary guarantee policies has a clearly defined hedging strategy, it is subject to the stochastic exclusion test for VM-20.*

8. **Continued**

      E. Disintermediation risk, annuitization risk, and reinsurer default risk should be reflected in the VM-21 reserve calculation.

      F. If the VM-21 total reserve equals the standard scenario amount, there is no need to allocate the results to the contract level.

A. Partly true. The policies were issued in 2020 and 2021 after the 1/1/2017 operative date of VM-20 and after the three year optional transition period. So unless the company can pass the company wide exclusion test the block would be subject to VM-20.

B. False. Neither term life nor secondary guarantee UL are permitted to use the deterministic exclusion test (DET) to avoid computing deterministic reserves. Only "other life" is eligible to take the DET. If the term policies fail the stochastic exclusion test, the minimum reserve will also need to include the excess of the stochastic reserve over the deterministic reserve.

C. Partly True. These are only two out of over a dozen requirements that are needed to qualify as a CDHS.

D. False. Policies with a CDHS cannot avoid stochastic reserves via the stochastic exclusion test. Such policies must go through a stochastic reserve calculation.

E. Partly True. Disintermediation risk and annuitization risk should be reflected. Reinsurer default risk should not be reflected in the VM-21 reserve calculation unless it has actually happened prior to the valuation date.

F. This statement is correct as the contract level results do not need to be allocated since the standard scenario amount is used and is computed at the contract level.

(b) **(NO LONGER RELEVANT)** ~~Identify whether each of the following would increase or decrease due to a change of the 7702 insurance interest rate from 2.0% to 3.0% for a Universal Life contract in a future year:~~

      ~~(i) Seven-pay Premium~~

      ~~(ii) Guideline Level Premium~~

      ~~(iii) Guideline Single Premium~~

8. Continued

      (iv) CVAT Corridor Factor

Justify your response.

Commentary on Question:
Candidates generally identified the interest rate increase from 2% to 3% as leading to a decrease in the 7702 premiums. Some candidates did not adequately explain how the guaranteed interest rate came into play.

(i)   Interest rate used for PV calculation in = Max (contract guarantee rate and 7702 int rate).

If the 7702 insurance interest rate increases from 2% to 3% and the guaranteed crediting rate is less than 3%, then the 7-pay premium interest rate increases to 3% and the 7-pay premium decreases.

If the guaranteed credited interest rate is equal to greater than or equal to 3%, then the 7-pay premium interest rate is equal to the guaranteed credited interest rate and the 7-pay premium is unchanged.

(ii)   Interest rate used for PV calculation in = Max (contract guarantee rate and 7702 int rate).

If the 7702 insurance interest rate increases from 2% to 3% and the guaranteed crediting rate is less than 3%, then the GLP interest rate increases to 3% and the GLP decreases.

If the guaranteed credited interest rate is equal to greater than or equal to 3%, then the GLP interest rate is equal to the guaranteed credited interest rate and the GLP is unchanged.

(iii)   Interest rate used for PV calculation in = Max (contract guarantee rate and 7702 int rate + 2%) = Max(contract guarantee rate and 5%)

If the 7702 insurance interest rate increases from 2% to 3% and the guaranteed crediting rate is less than 5%, then the GSP interest rate increases to 5% and the GSP decreases.

If the guaranteed credited interest rate is equal to greater than or equal to 5%, then the GSP interest rate is equal to the guaranteed credited interest rate and the GSP is unchanged.

8. ~~Continued~~

~~(iv)   If the 7702 insurance interest rate increases from 2% to 3%, and the guaranteed crediting rate is less than 3%, then the interest rate for the NSP's used in the CVAT corridor calculation would increase to 3%. This means the NSP's would decrease and the CVAT corridor factor would increase since the cash value would fund a greater death benefit. (The CVAT corridor factor is the reciprocal of the NSP).~~

~~If the guaranteed crediting rate is greater than or equal to 3%, then the guaranteed crediting rate would continue to be used for the calculation of the CVAT corridor factor and would not change.~~

(c) **(NO LONGER RELEVANT)** ~~Whole life policies were issued at the guaranteed interest rate of 5% in 2021.~~

~~Explain how the changes of the minimum interest rates for CVAT will impact the cash value.~~

~~In 2021, the CVAT minimum interest rate was reduced from 4% to 2%.~~

~~This means cash values on the policy must be less than the NSP calculated using 2%. Previously they had to be less than the NSP calculated using 4%.~~

~~The whole life policies were issued with a guaranteed interest rate of 5%. Since whole life cash values are calculated prospectively, the 5% whole life cash values are lower than the NSP's in either case. Cash values would not change.~~

9. Fall 2022 ILA-LFMU (LO 1b)

Learning Objectives:
1.   The candidate will understand and apply U.S. valuation principles and methods applicable to individual life insurance and annuity products issued by U.S. life insurance companies.

Learning Outcomes:
(1b)   Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US GAAP framework, including the calculation of reserves and related items (e.g., DAC)

Relevant Sources:
US GAAP for Insurers, Freedman, M., and Frasca, R., 3rd Edition, 2024
- Chapter 3: Product Classification and Measurement
- Chapter 11: Deferred Annuities
- Chapter 12: Payout Annuities

Commentary on Question:
This question tested the candidates' understanding of US GAAP accounting for limited-payment annuity contracts with significant and insignificant mortality risk. Candidates were to determine GAAP reserves and profits based on the Constant Yield to Maturity Method for limited-payment annuity contracts with insignificant mortality risk classified as investment contracts.

Solution:
(a) **(LO 1b)** Critique each of the following statements with respect to annuities in payment status:

  A. *A contract whose life contingent payments is 20% of the present value of all payments anticipated under the contract is not considered to have a nominal mortality risk and thus, can be valued as an investment contract.*

  B. *Some companies can group contracts with similar characteristics together when classifying policies for accounting purposes and can change such classification when circumstances change during the contract's lifetime.*

  C. *The concept of loss recognition applies to investment contracts under SFAS97.*

  D. *Once the DAC asset for an investment contract has been written off, the deferral of future losses can be avoided by increasing the benefit reserve.*

  E. *The concept of locked-in assumptions is applicable to investment contracts.*

F. Margins for adverse deviations should be included in setting assumptions for investment contracts.

Commentary on Question:
To receive full credit candidates had to clearly state if the statement was correct or not in addition to the rationale. For several statements, candidates needed to consider both 'nominal' and 'other than nominal' mortality risk to receive full credit. Credit was not received if the candidate simply restated the statement.

(A) False. It is generally accepted that a contract whose life contingent payments exceed 5 to 10% of the present value of all payments anticipated under the contract contains more than a "nominal mortality risk" and therefore should be accounted for as a limited payment insurance contract.

(B) False. Companies can group contracts with similar characteristics together when classifying policies for accounting purposes and such classification must remain in effect for the contract's lifetime.

(C) False. The concept of loss recognition does not apply when accounting for investment contracts under SFAS91 or SFAS97 but if the contract is under SFASF97 limited pay, loss recognition applies.

(D) False. Once the DAC asset for an investment contract is written off, the deferral of a future loss cannot be avoided by increasing the benefit reserve because loss recognition is not a concept recognized in the accounting for investment contracts as it is for insurance contracts.

(E) False. The concept of locked-in assumptions is not applicable to investment contracts.

(F) False. Margins for adverse deviations are applicable to annuities in payment status with more than an insignificant amount of mortality risk. There are no margins for adverse deviations applicable to annuities in payment status with insignificant amount of mortality risk.

(b) **(LO 1b)** You are given the following data for a 5-Year certain annuity contract:

- Premium paid at beginning of policy year 1: 1,400
- Acquisition expenses incurred at beginning of policy year 1: 75
- Policy benefits paid at the end of each policy year 1 to 5: 300
- Maintenance expenses incurred at the end of each policy year 1 to 5: 15
- Investment rate of return in all policy years: 6.50%

9. **Continued**

With respect to the Constant Yield Method:

      (i)   Calculate the discounted interest rate needed to determine the net policy reserves. (Hint: Use IRR function in Excel to determine this interest rate.)

      (ii)   Calculate the GAAP net policy reserves for the end of each policy year 1 through 5.

      (iii)   Determine the GAAP profit for each policy year 1 through 5, assuming actual realized experience match the assumed assumptions.

Show all work.

Commentary on Question:
Candidates generally did well on this part of the questions. To receive full credit on the discount rate calculation candidates had to use the IRR function in Excel as stated in the question.

See Excel version (ILA LFMU Solutions Fall 2022 Question 9) for part b

10. Fall 2022 ILA-LFMU (LO 1a)

Learning Objectives:
1.   The candidate will understand and apply U.S. valuation principles and methods applicable to individual life insurance and annuity products issued by U.S. life insurance companies.

Learning Outcomes:
(1a)   escribe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US statutory framework, including the calculation of principles-based reserves and formulaic reserves.

Relevant Sources:
Statutory Valuation of Individual Life and Annuity Contracts, Claire, D., Lombardi, L. and Summers, S., 5th Edition, 2018
- Chapter 11 – Valuation Methodologies (exclude 11.3.9 to 11.3.11)
- Chapter 13 – Term Life Insurance
- Chapter 23 – PBR for Life Products (exclude 23.1)

Commentary on Question:
This question tested candidates' understanding of U.S. Statutory valuation principles and methods.

Part (b) of the question tests candidates' understanding of the model validation techniques from ASOP 52. Full credits are given only when the model technique is described instead of just listed. Candidates who gave generalized validation techniques outside of the reading did not receive full credits as the question specifies the source reading.

Solution:
(a) **(LO 1a)** You are given:

- a block of 10-year level-premium, level death benefit term insurance policies
- issued to males aged 55
- All cash flows are assumed to occur at the beginning of each year.
- Valuation assumptions correspond to minimum valuation standards as allowed by the Standard Valuation Law.
- Experience data and assumptions are provided in the spreadsheet.

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10.   Continued

With respect to the calculations provided in the spreadsheet:

> (i) Revise the calculations, where necessary, to assure the accurate calculation of pre-PBR CRVM and deficiency reserves.

> (ii) Assume the above policies are issued on January 1, 2022. Calculate the Deterministic Reserve as of December 31, 2022 using the Prospective Method.

Commentary on Question:
Candidates generally did poorly on part (i). This part of the question tested candidates' understanding of calculations for CRVM Reserves, Deficiency Reserves, Adjusted Basic Reserves and Basic Reserves.

Candidates generally identified that the interest rate and mortality rate were incorrect; while many candidates identified an incorrect expense allowance, few candidates properly corrected the formula. Few candidates identified that the CRVM Valuation Net Premium needed to be revised. Most candidates did poorly identifying the Basic Reserve Per Unit Inforce, Adjusted Basic Reserve Per Unity Inforce, and Deficiency Reserve Per Unity Inforce needed modifications. Candidates received credit by identifying whether a column within the calculation is incorrect and making appropriate revisions; and identifying columns that were correct and leaving them as such.

Part (ii) of the question tested candidates' understanding of Deterministic Reserve using Prospective Method. Candidates received full credit by listing out the formula, performing the calculations and obtaining the correct answer.

Candidates generally understood the formula to calculate the Deterministic Reserve using the Prospective Method. Most candidates received partial credit for attempting to calculate the reserve. Common mistakes included: Using the valuation interest rate instead of the net asset earned rate; incorrectly calculating the liability cashflows before FIT; and not calculating the reserve as of the date asked for in the question (December 31, 2022).

For Part (a)(i), the columns below require modifications:
- Premiums Per Unit of 1 for all years in Column C should be replaced with the actual gross premium per unit of 5.20. However, any value can be placed in this column since the calculation of CRVM reserves are not impacted by premiums as long they are level. But, they do impact the calculation of deficiency reserves.

10. Continued

- The net asset rates shown in the Interest Rate column in Column D should be replaced with valuation interest rates allowed by the valuation law.
- The mortality rates shown in the Per $1000 Mortality Rate column in Column E are experience mortality rates and should be replaced with the applicable valuation mortality rates. Statutory valuation reserves are required to use mortality rates from permitted valuation mortality tables.
- The formula for the Expense Allowance in Column R and in the first year for CRVM Valuation Net Premium in Column U includes a full-year interest discount for the tabular cost, which is inconsistent with the assumption for the payment of death benefits that is assume to occur at the beginning of the year. The full-year interest discount should be removed from the formula.
- Typically, curtate CRVM reserves are 0 in the first two policy years. Removal of the full-year interest discount for the tabular cost of insurance in Columns R and U will correct this problem and the CRVM reserves for the first two years will become 0. This is consistent with the beginning of year death benefit payment assumption.
- The formula in Column U for calculating the CRVM Valuation Net Premium is incorrect. The CRVM Valuation Net Premium should equal the Statutory Net Level Premium + annual amount to amortize the expense allowance over the ten-year life of the plan (or Expense Allowance / a-double-dot(55,10)).
- The formula presented in the Column AA for Deficiency Reserve Per Unit Inforce was the formula applicable to the calculation of deficiency reserves prior to the implementation of Triple X, where deficiency reserves were equal to the Present Value of the excess of future Statutory Valuation Net Premiums over Gross Premiums, if any. Current calculation of deficiency reserves requires the calculation of Adjusted Basic Reserves as defined above, which are to be reduced by Basic Reserves, also defined above, to determine deficiency reserves. Since the same valuation assumptions are used to calculate both approaches for the deficiency reserves calculations, the resulting deficiency reserves will be the same.
- Deficiency Reserves = Adjusted Basic Reserves - Basic Reserves, where Adjusted Basic Reserves are equal to Basic Reserves replacing the valuation net premium with the gross premium when it is less than the valuation net premium and Basic Reserves are equal to the minimum reserves falling within the scope of the Valuation of Life Insurance Policies Model Regulation.

For Part (a)(ii), Deterministic Reserve = -1 x PV Liability Cash Flows before FIT.

See Excel spreadsheet for calculation details.

10.   Continued

(b) **(NO LONGER RELEVANT)** Describe 3 model validation techniques as outlined by *ASOP 52 - Principle-Based Reserves for Life Products under the NAIC Valuation Manual on PBR for Life Products.*

Commentary on Question:
There are four model validation techniques listed in the source material. Candidates only need to provide three out of the four techniques to receive full credit. Candidates generally described two of the techniques (static validation and dynamic validation).

Full credit was given when the model technique is described and not just listed. Candidates who described generalized validation techniques outside of the reading did not receive credit as the question specifies the source reading.

    (i) Static validation that confirms that initial values (for example, net premium reserves, face amount, policy count, premium in force, account values, net amount at risk, and other measures of inforce exposure to risk) materially balance to the insurer's records as of the valuation date used to calculate the stochastic reserves and deterministic reserves.

    (ii) Dynamic validation: compare the cash flows produced by the model to the actual historical data to verify, where appropriate, that the model produces results reasonably like those experienced.

    (iii)Consistency of the model results: compare the results of any other existing internal systems that have similar calculations, such as economic capital analysis and cash flow testing analysis.

    (iv)Review model changes: perform an analysis that critically compares the results stemming from the changes made to the prior validated model.

1. Spring 2022 ILA LFMU Exam (LO 2b)

Learning Objectives:

The candidate will understand how to explain and apply the methods, approaches and tools of financial capital management for life insurance company under a US regulatory framework.

Learning Outcomes:

The Candidate will be able to:

b) Describe the purpose and application of economic capital

Relevant Sources:

- *Economic Capital for Life Insurance Companies, SOA Research Paper, Oct 2016 (Sections 2 & 6)*

Commentary on Question:
This question tested candidates' understanding of the Economic Capital framework, and the impact of the mortality assumption on liability cash flow projections. For the EC framework portion of this question, while most candidates were able to describe the main difference of the two approaches and make the correct choice under each scenario, few candidates could demonstrate the in-depth understanding needed for some parts of this question. For the mortality assumption portion, most candidates showed the basic understanding, but failed to demonstrate full knowledge.

Solution:
(a) **(LO 2b)** Compare and contrast the two approaches based on each of the following management considerations:

 (v) We use buy-and-hold strategy for fixed interest investment and intend to closely match assets and liabilities.

 (vi) We want to know how many assets are required to cover liabilities with some degree of security.

 (vii) We closely monitor changes in market conditions and respond accordingly. We want to reflect these actions in the Economic Capital framework.

 (viii) We believe that yield curves eventually go back to normal after extreme market events.

(ix)   We want to be consistent with the reality of capital management and regulatory reporting that requires capital to be calculated on an annual basis.

(x)   We hope to easily calibrate EC to a target security level.

Commentary on Question:
Most candidates were able to demonstrate an understanding of the two approaches when it comes to the basic concepts and generally did well on parts (i), (ii), (v), and (vi).

(i)
- Even a buy-and-hold strategy is regularly monitored and rebalanced.
- A runoff EC model is more appropriately aligned with its long term focus, which would emphasize risks such as defaults over the investment horizon.
- Finite risk horizon approach suggests a strong focus on the tradeable value of the insurance portfolio, suggesting market-based values cannot be ignored, even for buy-and-hold strategies.

(ii)
- Both approaches can achieve that goal
- Run off approach investigates a runoff of the business,
- While the finite risk horizon approach looks at transfers to a third party.

(iii)
- A one-year model using market consistent valuations is inherently more aligned with financial markets and therefore with market-based risk mitigation strategies that can be or are being undertaken, including financial derivatives, reinsurance or securitization transactions
- A runoff approach with no intermediate valuation metrics may become disconnected from financial market conditions. However, it is appropriate where the management action model used is realistic and explicitly tied to a formal business strategy.

(iv)
- Both the adjusted market-based and runoff cash flow methodologies embed strong assumptions about the mean reversion of asset returns after extreme market events.
- A runoff model will typically make an assumption about the expected level of yield curves based on historic experience that is different from the future level implied by the long end of the initial market yield curve. Whereas the Solvency II adjusted market-based model incorporates these effects by ignoring parts of the initial yield curve and extrapolating quickly to real world expectations.
- The effects of both are to introduce a type of mean reversion into the measurement of capital that diverge strict short term market pricing or market implied risk levels.

- The nature of this mean reversion assumption is highly subjective and difficult to reliably estimate. The evidence for these effects is also mixed and dependent on the particular time periods, asset types and economies included.

(v)
- When applied over a one-year time period, the finite risk horizon approach acknowledges this reality and better aligns itself with the actual management of the company.
- In contrast, the liability runoff approach attempts to find the amount of capital today that will provide sufficient protection for the lifetime of the portfolio, thus ignoring the reality that capital levels will be annually reevaluated.

(vi)
- It is generally viewed as easier to calibrate EC to a target security level under a finite risk horizon approach, and there is a significant body of statistics available regarding corporate bond defaults against which a reasonable calibration can be made.
- Calibration of a liability runoff approach to an external data source is more difficult as:
    - The block of business (and therefore the risk exposure) will typically be reducing over time.
    - The projection would typically not include all risks for all time periods; in particular, new business may be included for only a limited time period, if at all.

(b)   **(LO 2b)** Recommend changes to the current liability projection model in order to accomplish ABC's intended objective.

Commentary on Question:
Most candidates pointed out the assumptions based on historical experience may have deviated over time due to various reasons, and provided responses regarding how to fix/improve these assumptions. Some candidates recognized the need to use different discount rates, as well as taking into account of extreme scenarios such as a pandemic. But few candidates touched on other aspects discussed in the source material.

- Volatility can rise from a mismatch between the population used to generate the mortality table and the population of lives in ABC's customers.
- Recommend to review historical deviation of mortality from current table and incorporate volatility in based table projection.
    - May use combination of SS table and company data based on credibility.
- For mortality improvement:
    - Reflected historical levels of correlation by age and genders over time periods.

- o Then project volatility in future mortality improvement in manners consistent with how the factors were derived from the historical data.
- Reflect the possibilities of extreme mortality occurrences, such as a pandemic or earthquakes
- May use different discount rates depending on the asset portfolios, i.e. different asset portfolios may have different asset risk that would need to be reflected in Economic Capital
- Consider using formula based mortality rate depending on market condition for certain products, if historical data shows correlation between them.

2. Spring 2022 ILA LFMU Exam (LO 1a)

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

Learning Outcomes:

The Candidate will be able to:

a) Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US statutory framework, including the calculation of principles-based reserves and formulaic reserves

Relevant Sources:

Statutory Valuation of Individual Life and Annuity Contracts, Claire, D., Lombardi, L. and Summers, S., 5th Edition, 2018

- *Chapter 23: VM-20: PBR for Life Products (excluding 23.1)*
- *Chapter 25: Principle-Based Reserve Report*

Interactive Principle-Based Reserves Model

Commentary on Question:
This question tested the candidates' knowledge of principle-based reserves and the rationale behind the regulations and other professional guidance.

Solution:
(a) **(LO 1a)** Regarding starting assets and the use of a discount rate, describe 2 approaches that can be used to calculate deterministic reserve.

Commentary on Question:
To receive full credit, candidates had to include an accurate description of the scope of cash flows used in each approach, a description of the discount rate used for the PV of cash flows approach, and an indication that all projected benefits and expenses must be liquidated by the end of the projection horizon in the direct iteration method.

Most candidates received at least partial credit by correctly naming each approach. The model solution reflects the approach names used in LFM-143-20, but names from other source material were treated as equivalent such as "Gross Premium Valuation method" and "Prospective method" in lieu of "PV of cashflows," and "Retrospective method" in lieu of "Direct iteration."

Describing the discount rate for the PV of cash flows approach as the net asset earned rate (or NAER for short) was seen as equivalent to the description in the model solution.

Common errors for the PV of cash flows approach included describing the cash flows as either liability only or including inflows from investment income only (i.e., not including premium cash flows). Many candidates also mistakenly described the discount rate as prescribed. Most candidates failed to mention that all policy obligations must be liquidated by the end of the projection period for the direct iteration method, which is a fundamental component of the calculation.

Two approaches- PV of cashflows and direct iteration

PV of cashflows:
DR is APV of benefits, expenses - APV of premiums, less PIMR (pre-tax interest maintenance reserve). Cashflows should also include policy loan, separate accounts, reinsurance, etc. using the path of discount rates for the corresponding model segment.

Direct iteration:
Assigns an amount of starting assets which, when projected along with all premiums and investment income, results in the liquidation of all projected future benefits and expenses by the end of the projection horizon.

(b)   **(LO 1a)** Describe the purpose of the following exclusion tests:

    (i)   Deterministic Exclusion Test (DET)

    (ii)   Stochastic Exclusion Test (SET)

Commentary on Question:
Most candidates received partial credit by explaining that passing each test allows the insurer to avoid calculating the corresponding reserve. Few candidates explained the purpose of the tests, which is to identify cases where the deterministic/stochastic reserves are highly unlikely to exceed the net premium reserve.

Full credit responses also described the property that each test identifies – the sufficiency of premium revenue to fund liabilities in the case of the DET, and the lack of interest rate and asset return volatility sensitivity in the case of the SET. Another acceptable description of the DET is that it is used to demonstrate that the sum of valuation net premiums for all future years is less than the sum of the corresponding guaranteed gross premiums.

    (i)   The deterministic exclusion test (DET) is designed to identify those groups of policies that have anticipated premium revenue that is adequate to fund the

future obligations of the policy group and likely to produce a deterministic reserve that, if calculated, would not provide the basis for the minimum reserve (i.e. would not exceed the net premium reserve).

(ii) The stochastic exclusion test (SET) is intended to identify those groups of policies that are insensitive to interest rate and asset return volatility risk and are likely to produce a stochastic reserve that, if calculated, would not provide the basis for the minimum reserve (i.e. would not be the greatest of the three reserve components).

(c) **(LO 1a)** Critique the following statements:

A. *Term products are eligible for DET while ULSG is not. While premiums are low during the level period, there will always be more than enough premium post level period to fund the policy so that there's no need to calculate a deterministic reserve.*

B. *ALF's term and ULSG products are eligible for SET.*

Commentary on Question:
Most candidates correctly identified that both Term and ULSG products are eligible for DET. The key issue with the statement regarding the post level period is the impact of shock lapse in the post level period. Some candidates attempted to refute the statement by discussing prescribed assumptions and limits from actuarial guideline XXX and/or the net premium reserve rules for VM-20, neither of which are relevant to the accuracy of the statement or the calculation of the deterministic reserve.

No partial credit was received for suggesting that Term or ULSG policies are sometimes eligible for the DET.

Candidates generally did well critiquing statement B. Candidates who confirmed that each product was eligible for the SET but failed to mention that this is due to the lack of a clearly defined hedging strategy received partial credit.

A. Without the consideration of PLT shock lapses and adverse selection, term policies will be able to fund future obligations because the PLT (Post Level Term) premium is much higher than the level term premium. However, a lot of policyholders surrender their policies at renewal due to sharp increase in PLT premium rates, leaving a lot of term products underfunded in later years. In other words, the anticipated premium revenue is inadequate to fund the future obligations. Therefore, it is not eligible for the DET. It is also true that ULSG is ineligible for the DET.

B. True – both products are eligible for SET because there is no Clearly Defined Hedging Strategy.

(d)   **(LO 1a)** You are given one of the projected scenarios from ALF's cash flow model.

Projection period	0	1	2	3	4
Statement value of assets	2,000	400	-200	-650	1,000
One – Year Treasury Rate	N/A	1.00%	1.20%	1.50%	2.00%

Calculate the scenario reserve. Show all work.

Commentary on Question:
To receive full credit, the candidate must calculate the greatest present value of accumulated deficiency (GPVAD) and demonstrate understanding that the reserve is the sum of time 0 asset and the GPVAD. Most candidates successfully calculated the scenario reserve. Some candidates ignored multiplying the treasury rate by the 1.05 factor. Some candidates failed to include the statement value of assets at time 0.

	Period	0	1	2	3	4
1. Statement value of assets		2,000	400	-200	-650	1,000
2. One - Year Treasury Rate			1.00%	1.20%	1.50%	2.00%
3. Negative of the Statement of value of assets		-2,000	-400	200	650	-1,000
4. 105% of 1 year treasury			1.05%	1.26%	1.58%	2.10%
5. Accumulative Discount Factor		1	0.9896	0.977	0.962	0.942
6. Discounted negative accumulated deficiencies		-2,000	-395.84	195.46	625	-942
7. Greatest present value of accumulated deficiency (GPVAD)		625				
Starting Reserve (Time 0 Asset + GPVAD)		2,625.39				

3. Spring 2022 ILA LFMU Exam (LO 2a)

Learning Objectives:

The candidate will understand how to explain and apply the methods, approaches and tools of financial capital management for life insurance company under a US regulatory framework.

Learning Outcomes:

The Candidate will be able to:

a) Explain and calculate required capital under a US regulatory framework

Relevant Sources:

Statutory Valuation of Individual Life and Annuity Contracts, Claire, D., Lombardi, L. and Summers, S., 5th Edition, 2018

- *Ch. 29: Risk-Based Capital*

Commentary on Question:
This question tested candidates' knowledge of the U.S. and international regulatory capital requirements.

Solution:
(a)   Describe how capital for insurance risk should be addressed in the following:

(i)   **(LO 2a)** United States

(ii)   **(NO LONGER RELEVANT)** ~~Canada~~

(iii)   **(NO LONGER RELEVANT)** ~~European Union~~

Commentary on Question:
To receive full credit, candidates had to describe how insurance risk specifically is addressed in the given capital frameworks. Most candidates listed or described broader capital requirements in each governing body, which received partial credit. Candidates generally did not do well on this part of the question.

(i)   Insurance risk is calculated under the U.S. RBC framework within the C-2 component. It is a formulaic approach, where different formulas are utilized for P&C, health, and life insurance companies. For insurance risk,

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a factor is multiplied by the net amount at risk and summed, with a covariance adjustment, across different RBC components.

(ii) ~~Capital for insurance risk in Canada is part of both available capital and the Surplus Allowance. Within the Surplus Allowance, provisions for adverse deviations also account for insurance risk within the total liability. Components related to insurance risk can also be approximated with shocks in assumptions like mortality and lapse for one year.~~

(iii) ~~In the European Union, insurance risk is addressed via a stress approach. The stresses follow a dynamic approach using the IAIG's current balance sheet pre-stress and the IAIG's balance sheet post-stress; changes in net asset value under the stresses are then used as a proxy for changes in capital resources.~~

(b) **(NO LONGER RELEVANT)** ~~Determine whether the Total Ratio and Core Ratio meet the Office of the Superintendent of Financial Institutions (OSFI)'s minimum requirement and supervisory target, respectively. Show all work.~~

~~**Commentary on Question**:~~
~~Candidates generally did well on this part of the question. To receive full credit candidates had to both show and calculate the formulas for the Core and Total Ratio, explain what the minimum and supervisory targets were for each, and conclude whether the calculated ratios met those targets. Candidates were not penalized for assessing whether the targets were met if they wrote the wrong formula or had an arithmetic error.~~

~~Total Ratio~~
$$= \frac{Tier\ 1\ Capital + Tier\ 2\ Capital + Surplus\ Allowance + Eligible\ Deposits}{Base\ Solvency\ Buffer}$$

$$= \frac{1.3 + 1.2 + 0.2 + 0.4}{3}$$

$$= 103\%$$

~~Minimum target = 90%, supervisory target = 100%, so the Total Ratio meets both targets~~

~~Core Ratio~~
$$= \frac{Tier\ 1\ Capital + 70\% * Surplus\ Allowance + 70\% * Eligible\ Deposits}{Base\ Solvency\ Buffer}$$

3. ~~Continued~~

$$= \frac{1.3 + 0.7 * 0.2 + 0.7 * 0.4}{3}$$

$$= 57\%$$

~~Minimum target = 55%, supervisory target = 70%, so the Core Ratio meets the minimum target but not meet the supervisory target.~~

4. Spring 2022 ILA LFMU Exam (LO 1a)

Learning Objectives:

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

Learning Outcomes:

The Candidate will be able to:

a) Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US statutory framework, including the calculation of principles-based reserves and formulaic reserves

Relevant Sources:

Statutory Valuation of Individual Life and Annuity Contracts, Claire, D., Lombardi, L. and Summers, S., 5th Edition, 2018

- Chapter 24: VM 21: PBR for Variable Annuities

Interactive Principle-Based Reserves Model

Commentary on Question:
The question tested the candidates' understanding of the risks underlying a product and how such risks drive costs and reserves.

Solution:
(a)   **(LO 1a)** Critique the following statements:

     A.   *If the assumed volatility increased, the rider cost line would steepen causing the calculated reserve to decrease.*

     B.   *If the corresponding graph was created for the 5% rollup GMDB, both the revenue and cost lines would increase over time due to the higher level of risk.*

     C.   *It is unnecessary to use the full stochastic model to measure the cost of the return of premium GMDB since the guaranteed amount never changes.*

     Commentary on Question:

This part of the question tested the candidates' knowledge of the risks of GMxBs and the implications for costs, revenue and reserves. It requires understanding of the risks of different types of guarantees, and the drivers of costs and reserves.

Candidates generally did well on statement C, but struggled with statements A and B. Common mistakes were related to understanding underlying reasons for the effects of inputs, such as volatility.

A.   When volatility increases, there are more scenarios with higher increases in death benefits. It is correct that the cost curve will steepen. However, because the revenue curve is not as sensitive to volatility, the reserve increases as the cost curve steepens.

B.   It is correct that the 5% rollup GMDB will cause the cost line to increase over time due to the higher level of risk because 5% rollup is more costly than return of premium benefit. However, the revenue line will most likely stay relatively similar to the revenue line for return of premium GMDB, because the GMDB design doesn't affect the account value and corresponding fees (since rider fees are collected as a percentage of account value).

C.   The statement is incorrect. It is important to use full stochastic model to measure the cost of return of premium GMDB. There is a mismatch between revenue and cost of the guarantee, and volatility and policyholder behavior magnify this mismatch. Using a deterministic model based on historical returns would underestimate the cost of the guarantee.

(b)   **(LO 1a)** Describe which factors will cause the following prescribed assumptions in VM-21 to vary with respect to XYZ's VA products with GMDB:

(i)   Full surrender rate

(ii)   Partial surrender rate

(iii)   Mortality rate

Commentary on Question:
This part of the question tested the candidates' knowledge of the principle-based valuation of variable annuities based on the 2019 revisions to VM-21. This part of the question required demonstrating knowledge of the prescribed assumptions to be used in determining the Prescribed Projection Amount.

A common mistake was responses that were not specific to statutory reserving, and more specifically to the prescribed assumptions under VM-21.

(i)   The prescribed full surrender rate is based on a standard table, and will vary with
   • Whether the contract is in the surrender charge period
   • Whether the GMDB is in the money and the level it is in-the-money (ITM)

(ii)   The prescribed partial surrender rate is based on the type of guarantee
   • Return of premium GMDB has no guaranteed growth rate
   • 5% rollup GMDB has a guaranteed growth rate and has a lower prescribed rate

(iii) For GMDB, the mortality factors vary only by attained age.

(c)   **(LO 1a)** Describe two methods that are available to XYZ if they choose not to use the Direct Iteration Method.

Commentary on Question:
This part of the question tested the candidates' knowledge of the different approaches to calculating statutory reserves for variable annuities. It requires understanding of the conditions under which certain methods may be acceptable to use.

It was common for candidates to only list one method.

Given that the products do not contain any guaranteed living benefits, and only contain the GMDBs, they are eligible for an alternative method that is a non-stochastic, factor-based approach under VM-21 as well. This could be computationally simpler than the NAER and direct iteration methods.

The NAER method involves projecting asset and liability cash flows, then discounting them at the net asset earned rate on additional assets.

(d)   **(LO 1a)** You are given the following Standard Projection calculations for five policies at the model point level and at the aggregate level:

	GPVAD	Present value of net liabilities	Cash surrender value
Policy 1	20	210	200
Policy 2	10	190	180
Policy 3	0	200	220
Policy 4	50	295	250
Policy 5	6	155	150
Aggregate	75	1050	1000

Determine which of the two methods for quantifying the impact of aggregation in the standard projection described in the AAA practice note "Implementation of

Requirements for Principle-Based Reserves for Variable Annuities – 2021 Edition of VM-21" has a larger impact.

Commentary on Question:
This part of the question required candidates to understand the Standard Projection and the impact of aggregation, and why different methods may produce different impacts.

The candidates who were successful were able to apply the methods described in this practice note and not just performance of an impact calculation.

Method 1:
Σ GPVAD$_{policy}$ - GPVAD$_{Aggregate}$

Take the sum of the individual GPVAD: $20 + 10 + 0 + 50 + 6 = 86$
Aggregate GPVAD: 75
Impact of aggregation for Method 1 = $86 - 75 = 11$

Method 2:
Σ max(CSV, PV of Net Liab) – Σ PV of Net Liab

For each policy, take the greater of CSV and PV of Net Liability:

CSV	PV of Net Liability	Max(CSV,PV of Net Liabiltiy)
210	200	210
190	180	190
200	220	220
295	250	295
155	150	155
Total	1,050	1,070

Impact of aggregation for Method 2: $1070 - 1050 = 20$
Since $20 > 11$, Method 2 has the greater impact.

7. Spring 2022 ILA LFMU Exam (LO 1a)

Learning Objectives:

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

Learning Outcomes:

The Candidate will be able to:

a) Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US statutory framework, including the calculation of principles-based reserves and formulaic reserves

Relevant Sources:

Statutory Valuation of Individual Life and Annuity Contracts, Claire, D., Lombardi, L. and Summers, S., 5th Edition, 2018

- *Chapter 18: Fixed Deferred Annuities (excluding 18.7.4 & 18.8)*

Commentary on Question:
This question tested the candidates' understanding of key components of CARVM reserve calculation.

Solution:
(a)   **(LO 1a)** Calculate the CARVM reserves, assuming the mortality rate is 0 and no partial withdrawals are available prior to contract maturity. Show your work.

Commentary on Question:
Candidates generally did well on this part of the question. Common errors include using incorrect interest rate for interest accumulation in different periods; incorrect valuation interest rate for discounting of cash surrender value; and not adjusting for the front-end load.

Account Value Rollforward:
Front-End Load (% of Premium) is a one-time expense taken at time 0.
The Account Value accumulate interest each year. The Initial Guaranteed Interest Rate is applied for the first 4 years. The Ultimate Guaranteed Minimum Interest Rate is applied afterwards.
Cash Surrender Value:

To calculate Cash Surrender Value, deduct Surrender Charge from Account Value. The Surrender charge deduction does not reduce the Account Value.

CARVM Reserve:
The Cash Surrender Value of each year is calculated until end of year 7. The Present Value is calculated with interest discounting and survivorship. Since mortality is assumed to be 0, the Statutory Valuation Interest Rate of 3% is used for discounting.
The final CARVM Reserve is the Max Present Value of Cash Surrender Value of all 7 years.

Year	Premium	Load	Account Value	Interest	SC schedule	Cash Surrender Value	Stat Val Rate	Discounted Value	CARVM Reserve
0	10000	1.5%	9,850.00			9,850.00		9,850.00	10,432.07
1			10,342.50	5%	10%	9,308.25	3%	9,037.14	
2			10,859.63	5%	8%	9,990.86	3%	9,417.34	
3			11,402.61	5%	6%	10,718.45	3%	9,808.90	
4			11,972.74	5%	4%	11,493.83	3%	10,212.12	
5			12,212.19	2%	2%	11,967.95	3%	10,323.66	
6			12,456.44	2%	0%	12,456.44	3%	10,432.07	
7			12,705.56	2%	0%	12,705.56	3%	10,330.79	

(b)　**(LO 1a)** The following additional features are being considered for the annuity product:

> A. Policyholder can withdraw a certain portion of their account value each year without penalty
>
> B. An annuitization option that can be exercised based on account value
>
> C. A guaranteed death benefit that equals the account value

With respect to CARVM:

(i)　　Explain how each feature should be modeled.

(ii)　　Explain how incidence rates for each feature should be set.

Commentary on Question:
Full credit was received by demonstrating an understanding of the characteristics of each benefit. Most candidates recognized that CARVM calculation looks for the most conservative assumption for incident rate for feature A and B, and assigns prescribed mortality rate for feature C. Candidates had to recognize that since there is no penalty for withdrawal, the most conservative assumption for benefit A is 100% incident rate. Candidates were expected to mention whether each benefit was elective or non-elective. Some candidates incorrectly referenced CSO, PBR, and VM-21 in their responses.

All three rider benefits should be modelled for CARVM calculation. These benefit streams should be projected in each period and discounted by valuation interest rate and survivorship for the present value calculation.

Benefit A:
Partial withdrawal is an elective benefit. Since there is no penalty for withdrawal each year, the assumption that generates the most conservative CARVM reserve is 100%.

Benefit B:
Annuitization is an elective benefit. Incident rates of 0% and 100% should be tested. The incident rate chosen should generate the most conservative / highest CARVM reserve level.

Benefit C:
Guaranteed Death Benefit is a non-elective benefit. A prescribed mortality rate should be used.

(c)   **(LO 1a)** Critique the following statements about CARVM for fixed annuities:

A. *The statutory valuation rate is set at the product level.*

B. *Non-elective benefits (other than mortality) where the contract holder may have a financial benefit not to report the claim should use an incidence rate of 0%.*

C. *Non-elective benefits are considered in a separate benefit stream.*

D. *For contracts where annuitization is guaranteed at current purchase rates, the basic reserve shall be no less than 93% of the amount used to purchase annuitization benefits at time of valuation.*

Commentary on Question:
No credit was received for contradictory statements.

Statement A:
False
The valuation rate is not only set at the product level; it is also set at the benefit level. Valuation rate varies based on product characteristics such as plan type and interest guaranteed period.

Statement B:
This statement is correct. CARVM assumes the most conservative reserve, and so should reflect the 0% interest rate.

Statement C:
False.
Non-elective benefits need to be considered in each integrated benefit stream.

Statement D:
This statement is correct.

8. Spring 2022 ILA LFMU Exam (LO 1a)

Learning Objectives:

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

Learning Outcomes:

The Candidate will be able to:

a) Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US statutory framework, including the calculation of principles-based reserves and formulaic reserves

Relevant Sources:

Statutory Valuation of Individual Life and Annuity Contracts, Claire, D., Lombardi, L. and Summers, S., 5th Edition, 2018

- *Chapter 24: VM 21: PBR for Variable Annuities*
- *Chapter 25: Principle-Based Reserve Report*

Interactive Principle-Based Reserves Model

Commentary on Question:
This question tested the candidates' understanding of VM-21 and how to appropriately calculate a VM-21 reserve.

Solution:
(a)   **(LO 1a)** Critique the following statements with respect to VM-21:

A. *Annuity contracts with an in-the-money GMWB rider have a higher likelihood to surrender for cash value and thus are projected to have an increased lapse rate.*

B. *Products within the scope of VM-21 include products such as variable deferred annuity contracts with a GMxB, variable immediate annuity without a GMxB, and a separate account product that guarantees an index without a GMxB.*

C. *If the Alternative Method is elected for variable deferred annuity contracts with a GMxB feature, the CTE amount should be floored at the aggregated cash surrender value.*

D. *The projection of accumulated deficiencies should include all the expected cash flows for the entire group of contracts, such as hedging and federal income tax.*

E. *For general account asset projections, the forward interest rates implied by the swap curve in effect as of the valuation date could be used without adjustments to reflect the current market expectations about the future interest rates.*

Commentary on Question:
This part of the question required the candidate to critique statements regarding VM-21. Credit was not awarded for simply restating a statement correctly or only identifying the statement as false. An explanation was required in order to demonstrate an understanding of the topic. Candidates generally struggled with demonstrating sufficient knowledge and only received partial credit. Full credit was not received if the candidate did not clearly address the validity of the statement.

Common omissions included not stating the GMWB rider has a higher value than the cash value in statement A; not realizing that a variable immediate annuity without a GMxB is within scope of VM-21 in statement B; not stating that the Alternative Method only applies for variable deferred annuity contracts without a GMxB feature other than a GMDB in statement C; and not explicitly stating that an adjustment would be needed to reflect current market expectations in statement E. Candidates generally received full credit on statement D.

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

A. This is not true. An annuity contract that is in-the-money is less likely to surrender for cash value and thus has a decreased lapse rate. The decrease lapse rate is due to the benefit having value greater than the account value available to the customer.

B. This is not true. The separate account index product without a GMxB is not in scope. Both the variable deferred annuity contracts with a GMxB, and variable immediate annuity without a GMxB are in scope of VM-21.

C. This is not true. The Alternative Methodology is only for variable deferred annuity contracts that contain either no guaranteed benefits or only GMDB's. The CTE amount for the group of contracts to which the Alternative Methodology is applied cannot be less than the aggregate cash surrender value of those contracts.

D. This is not true. Federal income tax should be excluded, however all other cash flows (e.g. hedging) should be included.

E. This is not true. An amount should be deducted to reflect the current market expectations for future interest rates.

(b)   **(LO 1a)** GVB Company has a small block of variable deferred annuities. The total CTE is 840,000. The table below includes the available information for each policy.

Policy ID	Standard projection amount	Cash value
1	26,582	26,850
2	301,438	292,658
3	160,681	159,090
4	742,727	707,359
5	91,148	82,862
6	46,349	45,890

Calculate the VM-21 reserve for each policy.

Commentary on Question:
Candidates generally did well on this part of the question. Common mistakes included neglecting to calculate the allocation factor base; incorrectly applying the block level CTE; and forgetting to add the Standard Scenario to the Allocated CTE.

Policy ID	Standard Scenario	Cash Value	Block Level CTE	Step 1 Allocation Factor Base	Step 2 Allocation Factor	Step 3 CTE Allocated	Step 4 Reserve
1	26,582	26,850	840,000	-	0%	-	26,850
2	301,438	292,658	840,000	8,780	16%	135,365	428,023
3	160,681	159,090	840,000	1,591	3%	24,529	183,619
4	742,727	707,359	840,000	35,368	65%	545,282	1,252,641
5	91,148	82,862	840,000	8,286	15%	127,748	210,610
6	46,349	45,890	840,000	459	1%	7,077	52,967

Step 1: Calculate the allocation base factor as the difference the amount the standard reserve is greater than the cash value
        Example: Policy ID 2: Greater of 0 or 301,438-292,658 = 8,780

Step 2: Calculate the Allocation Factor as the policy level allocation factor base divided by the sum of the block level allocation base:
        Example: Policy ID 2: 8,780 / (Sum of the total in Step 1) = 16%

Step 3: Allocate the CTE by multiplying the allocation factor by the block level CTE
        Example: Policy ID 2: 840,000 X 16% = 133,365

Step 4: Reserve is the greater of CTE Allocated + Standard Scenario, or the Cash Value

Example: Policy ID 2: Greater of 292,658 or 135,365 + 301,438 = 428,023

9. Spring 2022 ILA LFMU Exam (LO 1a)

Learning Objectives:

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

Learning Outcomes:

The Candidate will be able to:

a) Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US statutory framework, including the calculation of principles-based reserves and formulaic reserves

Relevant Sources:

1(a)   Statutory Valuation of Individual Life and Annuity Contracts, Claire, D., Lombardi, L. and Summers, S., 5th Edition, 2018

   o   Chapter 1: Overview of Valuation Concepts (excluding 1.1-1.9)

   o   Chapter 2: Product Classifications (2.2 only)

   o   Chapter 10: Valuation Assumptions (excluding 10.1.3 & 10.3.8)

   o   Chapter 11: Valuation Methodologies (excluding 11.3.9-11.3.11)

   o   Chapter 21: Immediate Annuities

4(e)   FAQ on Certain Insurance Reserves Held by Insurance Companies for the Purpose of Determining U.S. Taxable Income after the Passage of the Tax Cuts and Jobs Act of 2017

Commentary on Question:
This question tested the candidates' knowledge of variable annuity assumption setting and calculation of various reserve values. Candidates who perform well understood the GMIB and how it works as an optional benefit in a deferred variable annuity that becomes a fixed payout annuity after GMIB exercise. Details are provided in the specific commentary for each part.

Solution:
(a)   **(LO 1a)** Describe the considerations in setting the following policyholder behavior assumptions for valuing guaranteed minimum income benefits:

   (i)   Annuitization rates

   (ii)   Lapse rates

   Commentary on Question:
   Candidates generally received partial credit for this part of the question. The intent was to describe considerations in assumption setting for variable deferred

annuities with GMIBs attached, where some may have been exercised. A GMIB exercise is a form of life contingent annuitization; no lapse thereafter (no cash value to surrender after a GMIB exercise). Considerations will relate only to prior to GMIB exercise where both annuitization and lapse might be potential decrements. Prior to GMIB exercise, there are three concurrent values: Continue current deferred contract (account value); Move to a different deferred contract (lapse for cash value); and GMIB exercise in current contract (annuitization, implicitly assuming GMIB exercise benefits exceed regular annuitization benefits in current or competing contract). Some candidates incorrectly answered from a generic GMxB perspective, focused nearly exclusively on the waiting period, or answered lapse is possible after GMIB exercise/annuitization.
Some candidates answered the questions from the assumption review and unlocking perspective and focused on the experience and credibility, instead of the initial assumption setting.

(i)
Annuitization rates (*Annuitization = GMIB Utilization*)

Any four for maximum credit:
1. Policy vs Market performance – If AV recovery unlikely, higher annuitization
2. Volatility – When market volatility high, seek safety of a guaranteed payout
3. Mortality – Poor health/low mortality, lower annuitization
4. Age – Before attained ages with tax effects, lower annuitization
5. Other income sources – When wealthier, lower annuitization
6. Commissions – If commission is paid, higher annuitization
7. Taxes – Benefit amounts > exclusion level are taxed, lower annuitization

(ii)
Lapse rates (*Lapse includes both full surrender and 1035 exchange*)

Any four for maximum credit:
1. Performance/In-the-moneyness (ITM) – If GMIB ITM, lower lapse
2. Surrender charges – Low during surrender charge schedule, shock at end
3. Competitors - Availability & price of contract options/guarantees
4. Contract - Richness of guarantees in existing contract
5. Age - Withdrawal before a certain age of 59.5, Low lapse
6. Distribution channel - Recommendations may be commission-driven
7. Tax - NQ: Tax excess of benefit over net premium, Q: Tax entire benefit
8. Q vs NQ - More restrictions on qualified plans

(b)   **(LO 1a)** Calculate the following reserves for the policy when the policyholder attains age 69.

(i)   **(source partially answers)** US GAAP reserves

(ii)   US statutory reserves

(iii) **(LO 4e source partially answers)** Tax reserves

Commentary on Question:
Most candidates received partial credit for this part of the question. For GAAP reserve, some candidates correctly calculate a benefit reserve and an expense reserve using the 6% GAAP factors. Few candidates correctly calculate a DPL (Deferred Profit Liability) which ensures no gain or loss at issue. Some candidates incorrectly attempt to accumulate a fund value (there is no fund value or cash value after GMIB exercise/annuitization). For STAT reserve, many candidates correctly use only benefits and the 3% statutory factors. For Tax reserve, many candidates correctly use the 92.81% factor. Some candidates use only a 1,000 annual benefit instead of 12x1,000 or 1,000 a month.

(i)

GAAP Reserve

Pol Yr	Age	Premium (BOY)	Benefit (EOY)	Expense (EOY)	Factor @6%	Benefit Reserve	Expense Reserve	DPL	GAAP Reserve
0	65	200,000	0	0	14.76	177,120	739	22,142	200,000
1	66		12,000	50	13.96	167,520	698	20,942	189,160
2	67		12,000	50	13.26	159,120	663	19,892	179,675
3	68		12,000	50	12.56	150,720	628	18,842	170,190
4	69		12,000	50	11.86	142,320	593	17,792	**160,705**

Benefit Reserve (n) = 12,000 * Factor (n)
Expense Reserve (n) = 50 * Factor (n)

DPL (0) = 22,142 = Premium – Benefit Reserve (0) – Expense Reserve (0)
K-Factor = 12.50% = 22,142 / 177,120 = DPL (0) / Benefit Reserve (0)
DPL (n) where n>0 = K-Factor * Benefit Reserve (n)

GAAP Reserve (n) = Benefit Reserve (n) + Expense Reserve (n) + DPL (n)
GAAP Reserve (4) = 160,705 = 142,320 + 593 + 17,792

(ii)

STAT & Tax Reserve

Pol Yr	Age	Benefit (EOY)	Factor @3%	STAT Reserve		Tax Factor	Tax Reserve
0	65	0	16.45	197,400		.9281	183,207
1	66	12,000	15.65	187,800		.9281	174,297
2	67	12,000	14.95	179,400		.9281	166,501
3	68	12,000	14.25	171,000		.9281	158,705
4	69	12,000	13.55	**162,600**		.9281	**150,909**

STAT Reserve (n) = Benefits (n+1) * Factor (n)
STAT Reserve (4) = 162,600 = 12,000 * 13.55

(iii)

Tax Reserve (n) = Tax Factor * STAT Reserve (n)
Tax Reserve (4) = 150,909 = .9281 * 162,600

Note: Immediate annuity has no CV. By using tax factor Tax < STAT.
Reasonableness checks: STAT => GAAP => TAX ✓
Reserves somewhat close to provided fund value ✓

10. Spring 2022 ILA LFMU Exam (LO 4d)

Learning Objectives:

The candidate will understand the fundamentals of value creation and inforce management techniques for life and annuity products.

Learning Outcomes:

The Candidate will be able to:

  d) Describe and apply the methods and principles of embedded value for an insurance enterprise

Relevant Sources:

Embedded Value: Practice and Theory, Actuarial Practice Forum, Mar 2009

Commentary on Question:
This question tested the candidates' knowledge of embedded value. Candidate generally did will on this question.

Solution:

(LO 4d) Critique each statement.

  A. *The traditional, formula-based approaches of US statutory reserving provide a commonly used basis for assessing company solvency, but they fail to distinguish movements in reserve margins from economic earnings in a reporting period.*

  B. *Embedded Value is a more effective accounting basis that addresses the criticisms of current accounting methods.*

  C. *Embedded Value is the same as the actuarial appraisal value of a company when used for mergers and acquisitions.*

  D. *When calculating the Adjusted Net Worth, both the Required Capital and Free Surplus are assumed to earn market rates of return.*

  E. *It is common to use a Risk Discount Rate that is consistent with the reporting entity's cost of equity capital, provided that the rate reflects the risks inherent in the business.*

10. Continued

F. *It is essential to have a clearly defined process for the selection of assumptions in the calculation of the Embedded Value.*

G. *All non-economic assumptions used in the Embedded Value calculation should be based on industry data plus a provision for adverse deviations.*

H. *When calculating the Time Value of Financial Options and Guarantees (TVFOG) using stochastic scenarios, it is recommended to use "real-world" scenarios.*

I. *The accurate calculation of the final Embedded Value is more important to investors than adequate disclosure of the movement.*

J. *There is substantial subjectivity on the part of the company for the disclosure of sensitivity tests for assumptions used in their Embedded Value calculations.*

(A)

Commentary on Question:
Many candidates commented that RBC would be more commonly used to assess solvency than US Stat and received partial credit. Discussing transition to PBR and VM-20 also received partial credit if statements were true and relevant.

This statement is true.

US Stat reserving focuses on cost-based approaches to measuring earnings and does not directly reflect changes in the economic environment (i.e. changes in prevailing interest rates) as economic assumptions are locked in.

(B)

Commentary on Question:
Candidates generally performed well on this part of the question.

This statement is partially true. While EV addresses some of the criticisms of current accounting methods/standards, it also has shortcomings. For example, EV may be difficult to compare between companies or subject to manipulation. EV is not technically an accounting basis but has evolved to embody a codified collection of rules and practices that are almost universally recognized.

10. Continued

(C)

Commentary on Question:
Candidates generally recognized the EV excludes the value of future NB. Some candidates also identified other differences.

This statement is false. EV and AAV differ in three key ways: (1) AAV includes the value of future NB while EV does not; (2) AAV generally uses a higher discount rate; (3) EV and AAV generally use different assumptions. Particularly for expenses, EV assumptions tend to be company-specific while AAV assumption tend to reflect market sentiments.

(D)

Commentary on Question:
Few candidates described the reason for treating FS and RC differently.

This statement is partially true. Two approaches have emerged in practice. Since the entire ANW is not distributable, the literal approach is to use tax-effected marked-to-market only for Free Surplus and use book value for Required Capital (since only FS is distributable). A more practical approach is to use market returns for both.

(E)

Commentary on Question:
Candidates generally did well on this part of the question. Many candidates discussed CAPM or cost of debt capital, which also received credit.

This statement is true. The RDR is often assumed to be consistent with the reporting entity's cost of equity capital. Sometimes the RDR is defined as the Weighted Average Cost of Capital (WACC) as opposed to the equity cost of capital. Sometimes the RDR varies by term and sometimes it is kept constant. It is usual to use different RDRs for each country for multinational companies. RDRs may also vary by product line or inforce/new business.

(F)

Commentary on Question:
Most candidate recognized that the statement is true, but many candidates struggled to explain why.

This statement is true. Selecting appropriate assumptions is one of the most important elements of EV calculation. Because the process involves considerable judgement and subjectivity, a clearly defined process for selecting assumptions is critical to ensure EV remains a reliable measure of performance over time. EV can be very sensitive to key assumption, so even a small shift can have a large impact. Care must be taken to set assumptions properly and consistently.

10. Continued

(G)

Commentary on Question:
Candidate generally did well on this part of the question. The most common error was stating that EV assumptions should include a margin or PfAD.

This statement is false. EV assumptions should be best-estimate (no PfAD) and company-specific. This means that they should reflect management's unbiased estimate of future experience based on the specific circumstances of the company. The assumptions need not be consistent with the market's perception of what such assumptions should be. Observed trends (such as mortality improvement) may be extrapolated, though it is not typically considered appropriate to assume unit expense improvement beyond the valuation date, except for start-up operations.

(H)

Commentary on Question:
Candidates did not need to discuss the CFO Forum's EEV principles to receive full credit. Full credit was received for recommending risk-neutral scenarios to produce market consistent results, relying on the evolution of practice in that direction.

The CFO Forum's EEV principles from 2004 suggest using real-world scenarios. However, actuarial practice has evolved towards valuing TVFOG on a market-consistent basis, using risk-neutral scenarios

(I)

Commentary on Question:
Most candidates recognized that understanding the movement was more important, but many candidates did not explain why. Many candidates did not demonstrate they understood that EV is used externally.

This statement is false. Using EV to assess the performance of an entity requires the observer to have access to the analysis of movement, and that changes to methodology and assumptions are included in such analysis. A single point-in-time value of EV is not usually as useful as understanding how EV emerges over time when evaluating an entity's performance.

(J)

Commentary on Question:
Most candidates understood the important of disclosures, but many candidates did not discuss the subjectivity involved in choosing what to disclose.

10. Continued

This statement is partially true. Different observers will find different disclosures more or less helpful in understanding EV. This is partially down to personal preference. However, in general, items that have the most material impact are most important to disclose. This means that when an assumption is particularly critical, companies should disclose sensitivity testing to enable outside users to draw their own conclusions.

Understanding the sources of these items will lend insight into the comparability of results across companies and across time periods and may provide an indication of how likely a company is to be able to maintain or improve its financial performance, as measured by the change in EV, in the future.

The CFO Forum provides some guidance on sensitivities, however these are not binding. EV is not subject to regulatory requirements.

11. Spring 2022 ILA LFMU Exam (LO 1a)

Learning Objectives:

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

Learning Outcomes:

The Candidate will be able to:

a) Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US statutory framework, including the calculation of principles-based reserves and formulaic reserves

Relevant Sources:

Statutory Valuation of Individual Life and Annuity Contracts, Claire, D., Lombardi, L. and Summers, S., 5th Edition, 2018

- *Chapter 14: Universal Life (excluding 14.4.8, 14.4.9, 14.5.0 & 14.6.2-14.6.6)*

Commentary on Question:
This question tested candidates' understanding of Guarantee Maturity Premium (GMP) and Guideline Level Premium (GLP) for Universal Life product. GMP is a statutory concept, while GLP is used to determine whether an insurance contract can be taxable as insurance rather than an investment. This question required candidates to consider both statutory and tax perspectives.

Solution:
(a)   **(LO 1a)** Explain what conditions must be met in order for the proposal to be valid for the following:

(i)   Interest rate

(ii)   Endowment date

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11. Continued

      (iii)   Cost of insurance
      (iv)   Expenses

Commentary on Question:
To receive full credit candidates had to discuss the different assumptions used in calculating GMP and GLP, and also compare them and discuss the conditions to be met in order for them to be equal. Candidates received no credit for describing considerations of GMP or GLP unrelated to the conditions.

(i)   GMP uses policy guarantee credit interest rates. For GLP, the rate used is the guaranteed rate floored at the applicable accumulation test minimum, which is 2% in 2021 based on 7702. In order for GMP to equal to GLP, the guaranteed rate must be higher than 2%.

(ii)   The GMP endows for the face amount at the latest permissible maturity date under the contract. To compute guideline premium, as defined in section 7702(e)(1), the maturity date assumed can be no earlier than the day on which the insured attains age 95 and no later than the day on which the insured attains age 100. In order for GMP to equal to GLP, the maturity date of the contact must be between the day the insured attains age 95 and age 100.

(iii)   GMP uses guaranteed mortality thus guaranteed COI. GLP should use reasonable mortality. Notice 88-128 does not attempt to define reasonable mortality, instead providing that use of certain safe harbor mortality tables. For contracts entered into after Oct 20, 1988, the safe harbor mortality tables are 1980 CSO. Therefore, in order for GMP to equal to GLP, the guaranteed COI should be lower than COI calculated based on 1980 CSO.

(iv)   GMP uses guaranteed expenses stated in the contract. GLP must use reasonable expenses, which regulation have yet to address. Thus, the guaranteed expenses should equal to reasonable expenses in order for GMP to equal to GLP.

(b)   **(NO LONGER RELEVANT)** ~~Discuss how the increase in face amount will affect each of the GLP and the GMP.~~

    ~~**Commentary on Question**:~~
    ~~Candidates generally did not do well on this part of the question. Candidates generally did not demonstration understanding of the attained age increment and decrement method for GLP. Many candidates failed to identify the face amount increase as structural changes and stated that GMP should always be fixed at issue.~~

11. Continued

The adjustments of the GLP with an attained age layering approach, sometimes referred to as the attained age increment and decrement method. An increase in a contract's face amount is treated separately from the pre-existing guideline premiums: separate guideline premiums are computed to reflect the increase or decrease in face amount. Equivalent "before and after" calculations based on the attained age of the insured at the time of the change can be used to implement this. Under this method, attained age layers of guideline premium values as of year 8 are added to the existing GLP as below:

New GLP_{x+8} = Original GLP_x + GLP(new face)$_{x+8}$ – GLP(original face)$_{x+8}$

For GMP, if there are no structural changes to the policy, then the Guaranteed Maturity Premium and Guaranteed Maturity Fund Values are fixed at issue. If there are structural changes to the policy, such as face amount changes, then the Guaranteed Maturity Premium and Guaranteed Maturity Fund Values are recalculated reflecting the changes. In this case, GMF on the eighth anniversary is used and a new GMP is calculated such that the policy will mature and new GMFs in the future are calculated.

2. Fall 2021 ILA LFMU Exam (LOs 2b, 2c)

Learning Objectives:

The candidate will understand how to explain and apply the methods, approaches and tools of financial capital management for life insurance company under a US regulatory framework.

Learning Outcomes:

The Candidate will be able to:

    b) Describe the purpose and application of economic capital

    c) Explain and evaluate the respective perspectives of regulators, investors, policyholders and insurance company management regarding the role and determination of capital

Relevant Sources:

2(b)   *Economic Capital for Life Insurance Companies, SOA Research Paper, Oct 2016 (Sections 2 & 6)*

2(c)   *A Multi-Stakeholder Approach to Capital Adequacy, Conning Research, Actuarial Practice Forum*

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

Solution:
(a)   **(LO 2b, 2c)** 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)   **(LO 2b, 2c)** (*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.

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)   **(LO 2b, 2c)** 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.

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.

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.

1. Fall 2021 ILA LFMU Exam (LOs 2a, 2d)

Learning Objectives:

The candidate will understand how to explain and apply the methods, approaches and tools of financial capital management for life insurance company under a US regulatory framework.

Learning Outcomes:

The Candidate will be able to:

- a) Explain and calculate required capital under a US regulatory framework
- d) Explain and apply methods in capital management

Relevant Sources:

2(a)   Statutory Valuation of Individual Life and Annuity Contracts, Claire, D., Lombardi, L. and Summers, S., 5th Edition, 2018

         o   Ch. 29: Risk-Based Capital

2(d)   ILA201-800-25: 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)   **(LOs 2a, 2d)** 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)   **(LOs 2a, 2d)** 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.

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.

(c)   **(LOs 2a, 2d)** 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.

Few candidates correctly realized only years 1-3 & 18-20 might contribute to a min PV Surplus as all other years are =>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+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) **(LOs 2a, 2d)** 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

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).

2. Fall 2021 ILA LFMU Exam (LO 1b)

Learning Objectives:

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

Learning Outcomes:

The Candidate will be able to:

    (a) Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US GAAP framework, including the calculation of reserves and related items (e.g., DAC)

Relevant Sources:

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

    • *Chapter 3: Product Classification and Measurement*

Commentary on Question:
This question tested the candidates' knowledge of U.S. GAAP and Tax issues.

Solution:
(a)   **(NO LONGER RELEVANT)** ~~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~~

~~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

(b)   **(LO 1b)** 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:

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

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% x 2022 premium = 0.092 x 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% x 2023 premium = 0.092 x 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)*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.

3. Fall 2021 ILA LFMU Exam (LO 1a)

Learning Objectives:

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

Learning Outcomes:

The Candidate will be able to:

a) Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US statutory framework, including the calculation of principles-based reserves and formulaic reserves

Relevant Sources:

Statutory Valuation of Individual Life and Annuity Contracts, Claire, D., Lombardi, L. and Summers, S., 5th Edition, 2018

- *Chapter 16: Indexed Universal Life (excluding 16.4.2-16.4.3)*

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)   **(LO 1a)** 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

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Show all work.

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:

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

Where PF = participation floor = $(1+1.5\%)^3$ -1 = 0.0457
PC = participation cap = $(1+10\%)^3 - 1 = 0.3310$
PR = participation rate = 75%
PM = participation margin = $(1+0.5\%)^3$ -1 = 0.0151

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

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

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

Where PF = participation floor = $(1+1.5\%)^3$ -1 = 0.0457
PC = participation cap = $(1+10\%)^3 - 1 = 0.3310$
PR = participation rate = 75%
PM = participation margin = $(1+0.5\%)^3$ -1 = 0.0151

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

(iii)   During the initial participation period, the indexed credited interest rate is determined using the following formula:
$$ic_0^{IGRM} = ic_0^{G} + oc_0 \times (1 + Si)$$

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)   **(NO LONGER RELEVANT)** ~~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)   **(NO LONGER RELEVANT)** ~~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.*~~

~~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.*~~

4. Fall 2021 ILA LFMU Exam (LO 1b)

Learning Objectives:

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

Learning Outcomes:

The Candidate will be able to:

b) Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US GAAP framework, including the calculation of reserves and related items (e.g., DAC)

Relevant Sources:

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

- *Chapter 4: Expenses*

Commentary on Question:
This question tested the candidates' understanding of reinsurance and its financial reporting requirements.

Solution:
(a)   **(LO 1b)** 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

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(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) **(NO LONGER RELEVANT)** 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.

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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.

5. Fall 2021 ILA LFMU Exam (LOs 2a, 2b, 2c)

Learning Objectives:

The candidate will understand how to explain and apply the methods, approaches and tools of financial capital management for life insurance company under a US regulatory framework.

Learning Outcomes:

The Candidate will be able to:

    a) Explain and calculate required capital under a US regulatory framework

    b) Describe the purpose and application of economic capital

    c) Explain and evaluate the respective perspectives of regulators, investors, policyholders and insurance company management regarding the role and determination of capital

Relevant Sources:

2(a)   Statutory Valuation of Individual Life and Annuity Contracts, Claire, D., Lombardi, L. and Summers, S., 5th Edition, 2018

        o *Ch. 29: Risk-Based Capital*

2(b)   *Economic Capital for Life Insurance Companies, SOA Research Paper, Oct 2016 (Sections 2 & 6)*

2(c)   *A Multi-Stakeholder Approach to Capital Adequacy, Conning Research, Actuarial Practice Forum*

Commentary on Question:
This question tested the candidates' knowledge of U.S. and international capital standards.

Solution:
(a)   **(LOs 2a, 2b, 2c)** 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

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- 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) **(NO LONGER RELEVANT)** ~~Describe four principles of the NAIC's Solvency Modernization Initiative.~~

~~**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) **(LO 2a, 2b, 2c)** 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.

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

$$ACL = 0.50 \cdot \left[C_0 + C_{4a} + \sqrt{\left(C_{1o} + C_{3a}\right)^2 + \left(C_{1cs} + C_{3c}\right)^2 + C_2^2 + C_{3b}^2 + C_{4b}^2} \right]$$
$$= 6.0267$$

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 actional 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

Continued

     (d)   **(NO LONGER RELEVANT)** ~~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~~

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

6. Fall 2021 ILA LFMU Exam (LO 1a)

Learning Objectives:

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

Learning Outcomes:

The Candidate will be able to:

a) Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US statutory framework, including the calculation of principles-based reserves and formulaic reserves

Relevant Sources:

Statutory Valuation of Individual Life and Annuity Contracts, Claire, D., Lombardi, L. and Summers, S., 5th Edition, 2018

- *Chapter 23: VM-20: PBR for Life Products (excluding 23.1)*

- *Chapter 25: Principle-Based Reserve Report*

Interactive Principle-Based Reserves Model

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

Solution:
(a)   **(NO LONGER RELEVANT)** ~~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.*

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.*

~~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) **(LO 1a)** 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 = NPR + Max[0, DR − (NPR − 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 = NPR + Max[0, DR − (NPR − DDPA)]

  (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.
  Minimum Reserve = NPR + Max[0, Max(DR, SR) − (NPR − DDPA)]

(c) **(LO 1a)** 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.

	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.

7. Fall 2021 ILA LFMU Exam (LOs 1a, 1b)

Learning Objectives:

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

Learning Outcomes:

The Candidate will be able to:

a) Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US statutory framework, including the calculation of principles-based reserves and formulaic reserves

Relevant Sources:

Statutory Valuation of Individual Life and Annuity Contracts, Claire, D., Lombardi, L. and Summers, S., 5th Edition, 2018

- Chapter 11: Valuation Methodologies (excluding 11.3.9-11.3.11)
- Chapter 12: Whole Life
- Chapter 23: VM-20: PBR for Life Products (excluding 23.1)
- Chapter 25: Principle-Based Reserve Report

Interactive Principle-Based Reserves Model

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

Solution:
(a)   **(NO LONGER RELEVANT)** ~~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.~~

(b) **(LO 1a)** 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 Pay) = A1:19/a1:19 = 365.14/7.79 = 46.87
EA (Policy: 10-pay) = A1:19/a1:10 = 356.14/13.67 = 26.71
COI (alpha) = A1 = 1.21
Minimum = EA 10 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/a10 = 25.50/8.52 = 2.99

The Net Level Premium for the Benefit (PB) is solved for as
PB = Ax/a10 = 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.

At time 5: A5 – PBxa5 – PExa5 = 412.33-41.50x4.64-2.99x4.64=205.89
At time 6: A4 – PBxa4 – PE xa4 = 424.62-41.50x3.78-2.99x4.64=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.

Mean Reserve = 50% x (V5 + PB + PE) + 50% x V6
= 0.5 x (205.89+41.50+2.99)+0.5 x 256.44 =253.41
For 250,000 we get 250 x 253.41 = 63,352.51

(c) **(LO 1a)** 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 Benefits + PV Expenses + PV Commissions – PV 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 = MAX(NPR, DR, SR) OR NPR + MAX(0, MAX(DR,SR)-NPR)
   SR is applicable only for ULSG that fail SET.
   Use CTE 70

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. Fall 2021 ILA LFMU Exam (LO 1a)

Learning Objectives:

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

Learning Outcomes:

The Candidate will be able to:

a) Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US statutory framework, including the calculation of principles-based reserves and formulaic reserves

Relevant Sources:

Statutory Valuation of Individual Life and Annuity Contracts, Claire, D., Lombardi, L. and Summers, S., 5th Edition, 2018

- *Chapter 23: VM-20: PBR for Life Products (excluding 23.1)*

- *Chapter 24: VM 21: PBR for Variable Annuities*

- *Chapter 25: Principle-Based Reserve Report*

Interactive Principle-Based Reserves Model

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

Solution:
(a)   **(LO 1a)**
   (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).

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.

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.

(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

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) **(LO 1a)**
  (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
- 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
= CTE70(best efforts) + E x Max(0, CTE70(adjusted) - CTE70(best efforts))
= 1,710 + 30% x Max(0, 1,770 - 1,710)
= 1,728

Prescribed Projection Amount
= CTEPA70 (since using CTEPA instead of CSMP)
= 1,860

Unbuffered Addtl Std. Proj Amount
= Prescribed Projection Amount - CTE70(adj)
= 1,860 – 1,770
= 90

Addtl Std. Projection Amount
= Unbuffered Addtl. Std. Proj Amount - Buffer
　　　　　where Buffer = CTE70(adj) - CTE65(adj)
= 90 - (1,770 – 1,740)
= 60

VM21 Reserve

= Max(CSV, Stochastic Reserve + Additional Std. Proj Amount - PIMR + Alt Reserve Meth)

= Max(1,675, 1,728 + 60 - 100 + 0)

= 1,688

(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.

2. Spring 2021 ILA LFMU Exam (LOs 2b, 2c, 2d)

Learning Objectives:

The candidate will understand how to explain and apply the methods, approaches and tools of financial capital management for life insurance company under a US regulatory framework.

Learning Outcomes:

The Candidate will be able to:

    b) Describe the purpose and application of economic capital

    c) Explain and evaluate the respective perspectives of regulators, investors, policyholders and insurance company management regarding the role and determination of capital

    d) Explain and apply methods in capital management

Relevant Sources:

Economic Capital for Life Insurance Companies, SOA Research Paper, Oct 2016 (Sections 2 & 6)

A Multi-Stakeholder Approach to Capital Adequacy, Conning Research, Actuarial Practice Forum

ILA201-800-25: Theory of Risk Capital in Financial Firms

Commentary on Question:
This question tested the candidates' understanding of the Economic Capital Liability Runoff approach.

Solution:
(a)   A life insurance company is currently developing an Economic Capital model for its life in-force block, which includes UL, term and whole life products, using the Liability Runoff Approach. The intended applications of the model are for establishing the risk management and risk appetite.

        Critique each of the following proposed approaches. Recommend improvements where applicable.

        A. **(LO 2c, 2d)** *The liability runoff approach is being performed using a stochastic simulation with 3,000 real world economic scenarios. The scenarios being used were originally developed in the context of Variable Annuity Pricing.*

B. **(LO 2c, 2d)** *The current valuation assumptions consist of best estimate assumptions plus margins for adverse deviations. Risk driver categories are aligned with these margins, covering a variety of economic and non-economic assumption sub-categories.*

C. **(LO 2c, 2d)** *Current inforce data is used to generate projected liability cash flows. Lapse assumptions vary by scenario for UL products. Mortality and expense assumptions for all products and lapse assumptions for non-UL products are on a best estimate basis and do not vary by scenario, with the exception of expense inflation, which is scenario-dependent.*

D. **(LO 2c, 2d)** *Projected asset cash flows are generated for each scenario, such that the level of assets required at the beginning of a given scenario satisfies key obligations including paying policyholder cash flows, debt payments, and dividends.*

E. **(LO 2b, 2c, 2d)** *The required assets at the valuation date are ranked to form a distribution. The plan is to use a CTE99 metric applied to the distribution, based upon the segregated fund pricing methodology which uses CTE.*

F. **(LO 2b, 2c, 2d)** *The economic capital is defined by applying the CTE99 metric to the total assets required and deducting the current statutory liabilities.*

G. **(LO 2b, 2c, 2d)** *It has been suggested that the development team use a correlation matrix approach to calculate the between-risk diversification benefits.*

Commentary on Question:
Candidates generally did not do well on this part of the question, especially with respect to statements A, B, and D. Some candidates critiqued the approach without providing justification or just rephrased the question by rearranging some words. To receive full credit, candidates had to provide valid reasons to support the critique.

Common errors include the following:
Statement A (Economic Scenarios) – Candidates suggested using more scenarios or not appropriate because it is developed in the context of Variable Annuity Pricing.

Statement B (Risk Driver) –The question stated the current valuation assumption includes a Margin for Adverse Deviation. The question did not state economic capital assumptions are padded. Candidates mis-interpreted the question and answered to use best estimate assumptions for economic capital. This was not the focus of the question.

Statement D (Asset cash flow) –Candidates failed to identify the assumptions or types of cash flow missing in the approach.

A Economic Scenario – It is good to use 3,000 scenarios as the paper suggests to use 1000 or more scenarios. The scenario distribution is a realistic assessment of the future risks and returns. Since the scenarios were originally developed for pricing, they represent a "best view" and are appropriate to use.

B Risk Driver – Company needs to select the risk drivers that represent the key risks. The process involves understanding of risk drivers and their relationship. It may be appropriate for practical reasons to use Valuation PfADs but they should be assessed whether it makes sense to look at things on a more aggregate or more granular level. Example, if mortality PfADs combine base or improvement, should the risk driver look at them separately?

C Liability Cash flow – If the company is writing significant new business, it is necessary to include new business in the projection. It is good that the approach vary lapse assumptions by scenario for key products. This will help to better understand the tail risk. However, the current approach did not quantify capital for mortality and expense risks. One approach is to develop stress test on these assumptions to determine the associated amount.
In addition, the liability cash flows should consider including realistic management actions.
Company can also develop a fully integrated stochastic model incorporating non-economic assumptions (example mortality, policyholder behavior) to better understand interaction between risks.

D Asset Cash flow – The cash flow should include investment returns earned on those assets (including investment strategy and re-investment considerations)

E CTE Metric – CTE is effective for capturing tail risks, especially if there are extreme edge case scenarios. The shortcoming of using CTE metric over VAR is that it is more difficult to communicate the results to senior management, and it may be more difficult to work with from a practical perspective.
Risk appetite statements and fundamental corporate philosophies should ultimately drive the decision of selecting a confidence level. It would be good to understand the chosen level of confidence relative to Valuation and Capital calculations.
CTE99 is likely too conservative as compared to Var99.5.

F Valuation of liabilities – The most important measure is the total assets required. This would be higher than the liabilities. Hence, the split of required assets between liabilities and economic capital is not important from this perspective.
Economic Capital = Total assets required – current value of liabilities (mean of the distribution or best estimate liabilities)

G Correlation matrix – Under the correlation matrix approach, standalone capital is calculated for individual risk factors and then aggregated by multiplying the capital results through a correlation matrix. The advantage of this approach is its ease of calculation. Another approach is to use scenario aggregation which involves the use of integrated scenarios containing multiple risk factors (example

economic assumptions and lapse assumptions). This would implicitly account for correlation.

(b)   Describe ways that Economic Capital can be applied in the following areas:

    (i)   **(LO 2b, 2d)** Capital Adequacy

    (ii)   **(LO 2b, 2d)** Performance Measurement

Commentary on Question:
Candidates generally did well on this part of the question.

    (i)   Capital adequacy is the core use of Economic Capital to provide a measure of capital that captures the risk of the insurer's own portfolio. Effective use of Economic Capital requires the Economic Capital to be integrated into the capital management process. Acceptance of the Economic Capital by regulators and rating agencies is necessary for achieving its business benefits.

    (ii)   In order to use Economic Capital to measure performance, it needs to be incorporated in some related measure of return. One approach involves using Economic Capital as a denominator to calculate the return on risk-adjusted capital (RORAC). An alternative approach involves the inclusion of Economic Capital as the measure of required capital within a value-based measure, such as embedded value (EV).

3. Spring 2021 ILA LFMU Exam (LO 1a)

Learning Objectives:

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

Learning Outcomes:

The Candidate will be able to:

a) Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US statutory framework, including the calculation of principles-based reserves and formulaic reserves

Relevant Sources:

Statutory Valuation of Individual Life and Annuity Contracts, Claire, D., Lombardi, L. and Summers, S., 5th Edition, 2018

- Chapter 23: VM-20: PBR for Life Products (excluding 23.1)
- Chapter 25: Principle-Based Reserve Report

Interactive Principle-Based Reserves Model

Commentary on Question:
This question tested the candidates' knowledge of principle-based reserves. Candidates generally did well on this question. For the Stochastic Exclusion Ratio Test, partial credit was received if margins were applied to assumptions to perform the test instead of using the best estimated assumption.

Solution:
(a)   **(LO 1a)** You are given the following model output for a block of life insurance as of the valuation date:

Scenario	NPR	COI	Due & Deferred Premium Asset	PV With Margins				Reinsurance Reserve Credit (with Margins)	PV With No Margins				Reinsurance Reserve Credit (without Margins)
				Benefits	Premiums	Taxes	Expenses		Benefits	Premiums	Taxes	Expenses	
1	310	70	45	800	200	-57	150	480	760	202	-51	143	456
2	310	70	45	828	200	-59	151	497	787	202	-54	144	472
3	310	70	45	882	204	-63	151	529	838	206	-57	144	503
4	310	70	45	824	202	-59	152	494	782	204	-53	144	469
5	310	70	45	843	203	-60	153	506	801	205	-55	145	480
6	310	70	45	802	200	-57	152	481	762	202	-52	144	457
7	310	70	45	854	202	-61	150	513	812	204	-55	143	487
8	310	70	45	869	200	-63	151	521	825	202	-57	144	495
9	310	70	45	836	204	-59	152	502	794	206	-54	145	477
10	310	70	45	854	200	-61	151	512	811	202	-56	143	487
11	310	70	45	840	200	-60	152	504	798	202	-55	145	479
12	310	70	45	847	202	-61	152	508	804	204	-55	145	483
13	310	70	45	870	201	-63	151	522	826	203	-57	143	496
14	310	70	45	854	203	-61	152	512	811	205	-55	144	487
15	310	70	45	802	202	-57	153	481	761	204	-52	145	457
16	310	70	45	861	200	-62	152	517	818	202	-57	144	491
Baseline	310	70	45	836	204	-59	152	502	794	206	-54	145	477
Deterministic	310	70	45	847	202	-61	152	508	804	204	-55	145	483
CTE70				861	203	-62	152	517	818	205	-56	145	491
CTE90				873	204	-63	153	524	829	206	-57	145	498
CTE95				880	204	-63	153	528	836	206	-58	145	502

(i)   Assess whether a Stochastic Reserve component is necessary for this block using the Stochastic Exclusion Ratio Test. Show all work.

(ii)   Calculate the minimum reserves required. Show all work.

(i)
Stochastic Exclusion Ratio (SER) Test is passed, if

$$(b - a) / c < 6\%$$

where,
    b = greatest adjusted deterministic reserve (DR) of SET scenarios = 273
    a = adjusted deterministic reserve (DR) for baseline scenario = 257
    c = PV benefits net of reinsurance = 318

| Scenario | PV without margin | | | | Adjusted DR = PV(Benefits) + PV(Expense) - PV(Premium) - PV(Reinsurance Credit) without margin |
	Benefits	Premiums	Expenses	RI reserve credit	
1	760	202	143	456	245
2	787	202	144	472	256
3	838	206	144	503	273
4	782	204	144	469	253
5	801	205	145	480	261
6	762	202	144	457	247
7	812	204	143	487	264
8	825	202	144	495	271
9	794	206	145	477	257
10	811	202	143	487	266
11	798	202	145	479	261
12	804	204	145	483	262
13	826	203	143	496	271
14	811	205	144	487	264
15	761	204	145	457	245
16	818	202	144	491	270
Max					273
Baseline	794	206	145	477	257
Deterministic	804	204	145	483	262
CTE70	818	205	145	491	267
CTE90	829	206	145	498	271
CTE95	836	206	145	502	274

In this case, SER is

$$(b - a) / c = 5.22\% < 6\%$$

Therefore, the Stochastic Exclusion test is passed, and Stochastic Reserves are not required.

(ii)

Minimum Reserves under PBR, if stochastic reserves are not required:

NPR + Max(0, DR - (NPR - DDPA))

where

NPR = 310
DDPA = 45
DR = PV(Benefits) + PV(Expense) - PV(Premium) - PV(Reinsurance Credit)
   [All with margins]
   = 847 + 152 - 202 – 508
   = 289

Therefore, Minimum Reserves = 310 + Max(0, 289 - (310 - 45)) = 334

COI floor of 70 is less than NPR.

(b)   **(LO 1a)** Describe how VM-20 and VM-31 have impacted mortality assumption considerations and disclosures.

Under PBR, mortality is based on company experience.

In contrast, CRVM uses prescribed CSO Mortality Tables, which varies by issue year.

The company specific mortality experience could be reflected in the x-factors.

VM 31 requires the following considerations be disclosed:
* Grading decisions from experience to industry tables
* Details on Mortality Segmenting Decisions, with evidence that mortality is not lower
* Justification of any adjustments to company experience
* Details on Source of Data when company experience not used
* Details on margins assumed for company mortality
* Pre PBR Disclosure is not as extensive, although details are included in Exhibit 5

5. Spring 2021 ILA LFMU Exam (LO 1a)

Learning Objectives:

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

Learning Outcomes:

The Candidate will be able to:

a)   Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US statutory framework, including the calculation of principles-based reserves and formulaic reserves

Relevant Sources:

Statutory Valuation of Individual Life and Annuity Contracts, Claire, D., Lombardi, L. and Summers, S., 5th Edition, 2018

- Chapter 18: Fixed Deferred Annuities (excluding 18.7.4 & 18.8)

Commentary on Question:
This question tested the candidates' knowledge of U.S. Statutory valuation principles and methods. The question was generally well done. Many candidates received at least partial credit for each part of the question and demonstrated a general knowledge of the concepts being tested. Common errors were not providing justification for a response and miscalculations.

Solution:
(a)   **(LO 1a)** You are given:

- 5-year CMT rate is 2.00%
- No premium taxes
- The GLWB is elected in the first policy year

Calculate the NAIC nonforfeiture value for the first 5 years. Show all work.

Commentary on Question:

Candidates generally did well on this part of the question. Candidates were generally able to correctly identify and apply the formulas. The GLWB amount was often miscalculated and, in many cases, omitted altogether.

Standard Non Forfeiture Law (SNFL) i = MIN(3%, MAX(1%, 5yr CMT - 1.25%)), rounded to the nearest 1/20th of 1%
$SNFL_t$ = $(SNFL_{t-1}$ + 87.5% considerations – contract charge - premium tax) * (1+i) - policy loans and withdraws

SNFL i = MIN(3%, MAX(1%, 2% - 1.25%)) = 1.00%
GLWB payment = AV_0*GLWB % = 100,000*4% = 4,000

Year	Premium	Annual Contract Charge	GLWB Payment	SNFL
1	100,000	50	4,000	84,324.50
2		50	4,000	81,117.25
3		50	4,000	77,877.92
4		50	4,000	74,606.20
5		50	4,000	71,301.76

(b)   **(LO 1a)** You have been asked to consider the implications of the Standard Nonforfeiture Law interest rate floor changing to 0.15%.

(i)   Justify why this could be an appropriate measure for insurers.

(ii)   Evaluate the change in the interest rate floor from the policyholder perspective.

Commentary on Question:
Generally, candidates could identify one reason/consequence for each of part (i) and part (ii) but very few candidates provided justification.

(i)   A lower floor is appropriate for insurers as they may not be able to invest appropriately to back a 1% interest rate guarantee. Insurers may face solvency issues if they cannot afford a 1% guarantee.

(ii)   The decrease in interest rate floor will negatively affect the policyholder by decreasing the guaranteed minimum nonforfeiture value. The SNFL is in place to protect policyholders who surrender their policies and maintain equity between those who surrender and those who remain. Lowering the interest rate floor could create an inequality between these groups.

(c)   **(LO 1a)** Describe how the Commissioners Annuity Reserve Valuation Method (CARVM) would be performed on this type of GLWB policy.

Commentary on Question:

Generally, candidates defined CARVM as a worst-case scenario and received partial credit, although few candidates provided detail on how to perform the full process.

Step 1: Project the fund value on a guaranteed basis and determine all future guaranteed benefits. Guaranteed benefits in this case include death benefits, annuitization benefits, GLWB payments and surrender benefits.
Step 2: Calculate the present value for each future guaranteed benefit stream using the prescribed valuation rates. Rates can vary by elective and non-elective benefits. Non-elective benefits for this policy are death benefits. Elective benefits include annuitization, GLWB payments and surrender benefits. The projected payment streams for each benefit will be integrated together. For elective benefits all possible incidence rates between 0%-100% must be considered. All future election points for annuitization must be tested to determine the greatest present value.
Step 3: The greatest present value of all integrated benefit streams will be used for the CARVM reserve.

(d)   **(LO 1a)** Calculate the maximum present value of each of the following 4 CARVM benefit streams individually over the first 5 years of the policy assuming no mortality:

    (i)   Surrender benefits assuming GLWB election in the first policy year

    (ii)   Surrender benefits assuming GLWB election in the fifth policy year

    (iii)   GLWB payment stream assuming election in the first policy year

    (iv)   GLWB payment stream assuming election in the fifth policy year

Commentary on Question:
This part of the question was generally done well. Common errors include miscalculating or forgetting the GLWB payment and missing the annual contract charge.

$i = 2.00\%$
AV End of Year (EOY) = (AV Beginning of Year + Premium) * $(1+ i)$ – Annual Contract Charge – GLWB payment
CSV = AV EOY * (1 – Surrender Charge)
CARVM Discount rate = 3.00%, surrender and GLWB are elective

(i) GLWB payment = AV_0*GLWB % = 100,000*4% = 4,000

Year	Premium	Annual Contract Charge	GLWB Withdrawal	Guaranteed AV EOY	Surr Chg	CSV	Disc CSV
1	100,000	50	4,000	97,950.00	6%	92,073.00	89,391.26

2		50	4,000	95,859.00	4%	92,024.64	86,742.05
3		50	4,000	93,726.18	3%	90,914.39	83,199.55
4		50	4,000	91,550.70	2%	89,719.69	79,714.78
5		50	4,000	89,331.72	1%	88,438.40	76,287.74

Max(Disc CSV) = 89,391.26

(ii) GLWB payment = AV_4*GLWB % = 108,037.14*4% = 4,321.49

Year	Premium	Annual Contract Charge	GLWB Withdrawal	Guaranteed AV EOY	Surr Chg	CSV	Disc CSV
1	100,000	50		101,950.00	6%	95,833.00	93,041.75
2		50		103,939.00	4%	99,781.44	94,053.58
3		50		105,967.78	3%	102,788.75	94,066.26
4		50		108,037.14	2%	105,876.39	94,069.80
5		50	4,321.49	105,826.39	1%	104,768.13	90,373.91

Max(Disc CSV) = 94,069.80

(iii) GLWB payment = AV_0*GLWB % = 100,000*4% = 4,000

Year	Premium	Annual Contract Charge	GLWB Withdrawal	Disc GLWB	Sum Disc GLWB
1	100,000	50	4,000	3,883.50	3,883.50
2		50	4,000	3,770.38	7,653.88
3		50	4,000	3,660.57	11,314.45
4		50	4,000	3,553.95	14,868.39
5		50	4,000	3,450.44	18,318.83

Max(Sum Disc GLWB) = 18,318.83

(iii) GLWB payment = AV_4*GLWB % = 108,037.14*4% = 4,321.49

Year	Premium	Annual Contract Charge	GLWB Withdrawal	Disc GLWB	Sum Disc GLWB
1	100,000	50			
2		50			
3		50			
4		50			
5		50	4,321.49	3,727.75	3,727.75

Max(Sum Disc GLWB) = 3,727.75

(e)   **(LO 1a)** Combine the 4 individual benefit streams in part (d) into 2 appropriately integrated benefit streams.

Identify the election timing option which should be used to set the CARVM reserve. Justify your answer.

Commentary on Question:
Few candidates recognized they were to fully integrate the benefit streams. Many candidates had an improper summation of CARVM results from part (d) which received partial credit. Credit was not lost for an error carried over from part (d).

Integrating (i) and (iii), election in year 1:

Disc CSV	Sum Disc GLWB	Integrated Stream
89,391.26	3,883.50	93,274.76
86,742.05	7,653.88	94,395.93
83,199.55	11,314.45	94,514.00
79,714.78	14,868.39	94,583.18
76,287.74	18,318.83	94,606.57

Max (Integrated Stream) = 94,606.57

Integrating (ii) and (iv), election in year 5:

Disc CSV	Sum Disc GLWB	Integrated Stream
93,041.75		93,041.75
94,053.58		94,053.58
94,066.26		94,066.26
94,069.80		94,069.80
90,373.91	3,727.75	94,101.66

Max (Integrated Stream) = 94,101.66

The CARVM reserve for this policy should be based on election in year 1 as this creates the greatest present value of the integrated benefit stream.

6. Spring 2021 ILA LFMU Exam (LOs 1a, 4e)

Learning Objectives:

1(a)   The candidate will understand and apply U.S. valuation principles and methods applicable to individual life insurance and annuity products issued by U.S. life insurance companies.

4(e)   The candidate will understand the fundamentals of value creation and inforce management techniques for life and annuity products.

Learning Outcomes:

The Candidate will be able to:

1a)   Describe, apply and evaluate the appropriate valuation methods, requirements, techniques and related under the US statutory framework, including the calculation of principles-based reserves and formulaic reserves

The Candidate will be able to:

4e)   Describe and calculate reserves under US Company Tax rules

Relevant Sources:

1(a)   *Statutory Valuation of Individual Life and Annuity Contracts*, Claire, D., Lombardi, L. and Summers, S., 5th Edition, 2018

        o   Chapter 11: Valuation Methodologies (excluding 11.3.9-11.3.11)

        o   Chapter 13: Term Life Insurance

4(e)   FAQ on Certain Insurance Reserves Held by Insurance Companies for the Purpose of Determining U.S. Taxable Income after the Passage of the Tax Cuts and Jobs Act of 2017

Commentary on Question:
This question tested candidates' knowledge of the valuation methods and techniques. Candidates generally did not do well on this question.

Solution:

(a)   **(LO 1a)** You are given the following information on a 5-year term policy that automatically expires after 5 years without a maturity benefit:

Issue date	1/1/2016
Face amount	100,000
Valuation interest rate	4.50%
EA under FPT for a 20-pay limited-payment life contract	50

	2016	2017	2018	2019	2020
Premium rate	0.011	0.011	0.011	0.011	0.011
Valuation mortality rate	0.009	0.0099	0.0109	0.012	0.0132

Calculate the statutory reserve for this policy at 12/31/2017 assuming that premiums are paid at the beginning of the year and death benefits are paid at the end of the year. Show all work.

Commentary on Question:
Candidates generally did not do well on this part of the question. Common errors included (1) not calculating the level premium and calculating the reserve using projected premiums instead; (2) incorrectly calculating the decrements, and not adjust the survivorship for the previous year's mortality; (3) calculating the reserve for the incorrect year; (4) calculating the reserve for each year but not identifying which calculation was the final answer; (5) not justifying only using one segment; and (6) not calculating a deficiency reserve.

First, we need to determine if more than one segment is needed. Since the premium is flat it will not increase by more than the mortality rate, so only one segment is required.

To begin the calculation, we need to calculate the PV of Future Benefits and a level annuity at time 0 to calculate the net level premium:

Time	Mortality	Survivorship	v	PV of Expected Benefit
0	0.00%	100%	1.00	-
1	0.90%	99.1%	0.96	861
2	0.99%	98.1%	0.92	898
3	1.09%	97.0%	0.88	937
4	1.20%	95.9%	0.84	977
5	1.32%	94.6%	0.80	1,016
Comment	Given	$=p_{x-1}*q_x$	$=1/(1+4.5\%)^t$	$=100,000*survivorship_{t-1}*Mortality*v_t$

Using the table above, AB = sum of PV of Expected Benefits
$$=861+898+937+977+1016$$
$$=\$4689$$

$a=v_0*Survivorship_0+ v_1*Survivorship_1+ v_2*Survivorship_2+ v_3*Survivorship_3+ v_4*Survivorship_4$
$=4.501$

To calculate the net level premium, we divide AB by a:
$PB=\$4689/4.501=\$1041.71$

Since gross premiums ($1100) are greater than net premiums ($1041.71), no deficiency reserve is required.

Next we need to calculate the expense allowance under FPT for comparison to 50 provided to determine which is lower and should be used going forward. To do this we take:
$PB-v*q_x*FaceAmount=180.47$

Since 50 is less than 180.47, the expense allowance we will be using is 50.

This needs to be amortized over 5 years, so the annual contribution will be:
$PE=50/a=50/4.501=11.11$

Now we need to calculate the reserve at the end of 2017. Using the same approach as above we generate the following table:

Time	Mortality	Survivorship	v	PV of Expected Benefit
0	0.00%	100%	1.00	-
1	1.09%	98.9%	0.96	1,043
2	1.20%	97.7%	0.92	1,087
3	1.32%	96.4%	0.88	1,130
Comment	Given	$=p_{x-1}*q_x$	$=1/(1+4.5\%)^t$	$=100,000*survivorship_{t-1}*Mortality*v_t$

$AB=SumPVofExpectedBenefit=1043+1087+1130=3260.33$
$a=v_0*Survivorship_0+ v_1*Survivorship_1+ v_2*Survivorship_2=2.841$

$VB=AB-a*PB=3260.33-2.841*1041.71=300.42$
$VE=a*PE=11.11*2.841=31.56$

Combining the two, we have $V=VB-VE=300.42-31.56=268.87$

The statutory reserve at December 31, 2017 is $268.87.

(b) **(LO 1a)** You are given the following balances (in millions) as of 12/31/2018 on GHI's entire block of term life policies:

Total Statutory Reserve	250
Statutory Basic Reserve	200
Statutory Deficiency Reserve	40
Asset Adequacy Reserve	10
Impact of Contract-Level Net Surrender Value Floor	5

Calculate the tax reserve. Show all work.

Commentary on Question:
Candidates were generally able to apply the correct factor to the reserve (92.81%), and most realized that the Deficiency Reserve should be deducted for calculating the tax reserve. Candidates generally did not demonstrate that there is a cap on the tax reserve equal to the statutory reserve, and that the Asset Adequacy Reserve should also be excluded from the calculation of the tax reserve.

Tax Reserve is floored at the Net Surrender Value and capped at the Total Statutory Reserve. So Tax Reserve is equal to:
Min[StatRes,Max{CSV,92.81%*(StatRes-DeficiencyRes-AssetAdeRes)}]

StatRes-DeficiencyRes-AssetAdeRes=200

92.81%*(StatRes-DeficiencyRes-AssetAdeRes)=185.62

Impact of CSV Floor is 5, so tax reserve = 185.62+5=190.65

This is less than the total statutory reserve, so the final tax reserve is 190.65.

(c) **(LO 4e partially)** With respect to GHI's term insurance products:

(i) Describe the impact of the four major changes in the 2017 Tax Cuts and Jobs Act on profitability.

(ii) Propose a strategy that GHI could use to offset some of the tax burden from the 2017 Tax Cuts and Jobs Act. Justify your response.

Commentary on Question:
Candidates generally did well on part (i). Some candidates did not describe the capital implications, but generally described the other three impacts.

Candidates generally did not do well on part (ii). Many candidates provided additional commentary on the changes in the Act instead of providing strategies.

The solution below contains three different possibilities; however, only one was required for full credit. Strategies not included below generally received credit if proper justification was provided.

(i) The four main changes from the 2017 Tax Cuts and Job Act and their impact on profitability are:
   a. Decreased tax rate from 35% to 21%. This increases profitability since a lower tax rate results in a lower tax obligation.
   b. Tax reserve methodology has changed, with a major change being the tax reserve being set to 92.81% of the statutory reserve (subject to some constraints). Generally, this will result in a lower tax reserve which increases tax payable, decreasing profit.
   c. Tax DAC capitalization rates increased from 7.7 to 9.2 with amortization increased from 10 to 15 years. This will decrease profitability due to a higher capitalization and longer amortization period.
   d. Updated RBC factors due to the lower tax rate resulting in higher capital requirements due to a higher post-tax base. This will decrease profitability.
   c

(ii) Possible strategies to offset some of the tax burden from the 2017 Tax Cuts and Job Acts include:
   a. Increase premiums in order to reduce the deficiency reserve so that the statutory reserve is closer to the tax reserve.
   b. Use reinsurance to reduce RBC requirements. A properly designed reinsurance treaty can reduce required capital, lowering the return required to meet the company's target ROE
   c. Redesign asset management strategy to reduce required capital on assets. Care would need to be taken to ensure that the new asset strategy maintains appropriate matching and that any reduction in yields doesn't hurt income more than the reduced capital benefits it.

7. Spring 2021 ILA LFMU Exam (LO 1a)

Learning Objectives:

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

Learning Outcomes:

The Candidate will be able to:

a) Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US statutory framework, including the calculation of principles-based reserves and formulaic reserves

Relevant Sources:

Statutory Valuation of Individual Life and Annuity Contracts, Claire, D., Lombardi, L. and Summers, S., 5th Edition, 2018

- Chapter 10: Valuation Assumptions (excluding 10.1.3 & 10.3.8)

- Chapter 11: Valuation Methodologies (excluding 11.3.9-11.3.11)

- Chapter 12: Whole Life

- Chapter 13: Term Life Insurance

- Chapter 23: VM-20: PBR for Life Products (excluding 23.1)

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

Solution:
(a)   **(LO 1a)** List four responsibilities or requirements of the Appointed Actuary role.

-Appointed Actuary must meet the educational requirements and have at least 3
 years of relevant experience
-must state in his opinion, whether the assets make sufficient provision for the
 obligations of the company
   -in this regard – must perform cash flow testing to ensure sufficiency of assets

(b)   **(LO 1a)** Describe the type of statutory reserve standards and components that may be applicable to the following cohorts of YUL's business:

(i)   Universal Life with Secondary Guarantee issued in 2015

(ii)   10YR Level Term issued in 2018

(iii)   Whole Life issued in 2019

(iv)   Indexed UL with Clearly Defined Hedging Strategy (CDHS) issued in 2020

Commentary on Question
Candidates generally did well on this part of the question. Common errors include confusing statutory reserving with GAAP reserving and missing the optionality of the transition period.

(i)   Universal Life with Secondary Guarantee issued in 2015
        -prior to operative date of 1/1/2017 so SVL (CRVM) applies
        -using guaranteed maturity premium and guaranteed maturity fund
          Approach
        -note Actuarial Guidance 38 (AXXX)
(ii)   10YR Level Term Issued in 2018
        -after operative date but still within 3-year transition period
          -can use PBR method or CRVM
            -PBR – need NPR and Deterministic Reserve (DR)
                -may test if Stochastic Reserve (SR) needed
            -if CRVM – need to follow XXX re deficiency reserves
(iii)   Whole Life Issued in 2019
        -similar to (ii) – still in transition period (PBR or CVRM)
        -PBR – calculate NPR (and DR and SR if tests failed
(iv)   Indexed UL with Clearly defined Hedging Strategy (CDHS) issued in 2020
        -no option – must use PBR
        -as CDHS present must calculate NPR, DR and SR – no exclusions
         permitted

(c)   **(LO 1a)** Critique the following statements:

A.   *YUL's statutory reserves on business issued in 2015 continues to increase each year since the valuation interest rate is a function of the rolling average of corporate bond yields published by Moody's which has been decreasing each year.*

B.   *The main difference between a CRVM and NLP reserve for Whole Life under Standard Valuation Law (SVL) is the additional conservatism built into the*

CRVM method.

C. *The standard non-forfeiture calculation under SNFL uses the same mortality, interest, and expense allowance as SVL for policies issued before 1/1/2017.*

D. *YUL uses mean reserves because they are higher and thus a more conservative basis for setting up a liability.*

Commentary on Question:
A common error with statement A is not dealing with clearly defined 2015 issues. A lack of a clear critique resulted in less than full credit.

A. Not accurate – 2015 valuation rates were locked in at issue so subsequent interest trends have no effect on the reserves

B. Inaccurate – CRVM includes an expense allowance (capped at that for a 20 pay policy) that reduces the NLP reserve

C. Not totally accurate – mortality stays consistent – but expense allowances are defined differently – and interest is 1.25 x the SVL rate

D. Not accurate – Mean reserves might be higher but are adjusted downwards by a Deferred Premium Asset
Goal is to be practical – not to add conservatism

8. Spring 2021 ILA LFMU Exam (LOs 1a, 2a, 2b)

Learning Objectives:

1(a) The candidate will understand and apply U.S. valuation principles and methods applicable to individual life insurance and annuity products issued by U.S. life insurance companies.

2(a) The candidate will understand how to explain and apply the methods, approaches and tools of financial capital management for life insurance company under a US regulatory framework.

Learning Outcomes:

The Candidate will be able to:

1(a) Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US stay framework, including the calculation of principles-based reserves and formulaic reserves

The Candidate will be able to:

2(a) Explain and calculate required capital under a US regulatory framework

2(b) Describe the purpose and application of economic capital

Relevant Sources:

1(a) *Statutory Valuation of Individual Life and Annuity Contracts*, Claire, D., Lombardi, L. and Summers, S., 5th Edition, 2018

   o Chapter 3: NAIC Annual Statement

   o Chapter 11: Valuation Methodologies (excluding 11.3.9-11.3.11)

2(a) *Statutory Valuation of Individual Life and Annuity Contracts, Claire, D., Lombardi, L. and Summers, S., 5th Edition, 2018*

   o Ch. 29: Risk-Based Capital

2(b) Economic Capital for Life Insurance Companies, SOA Research Paper, Oct 2016 (Sections 2 & 6)

Commentary on Question:

The question was testing the candidates' understanding of NAIC required capital, including its shortcomings, strengths and use. Candidates generally performed well on this question.

Solution:
(a)   **(LOs 2a, 2b)** Describe two reasons why the NAIC might be interested in international perspectives regarding insurance regulation.

Commentary on Question:
Full credit was received for describing two reasons. Below are a sample of acceptable reasons. Other appropriate reasons not listed received full credit.

- To identify potential improvements in U.S. regulation that have inherent merit
- Might feel pressure to adopt certain methods/practices to meet international standards or forestall conflicts over regulatory equivalency
- To avoid further federal intrusions into state regulation by adopting reforms that are reasonably consistent with international standards and address perceived deficiencies in the current U.S. regulatory system

(b)   **(LO 2a, 2b)** With respect to the NAIC's approach to determining RBC requirements as described in *The Modernization of Insurance Company Solvency Regulation in the US*:

(i)   Describe two criticisms of the approach.

(ii)   Describe the NAIC's response to each criticism above.

Commentary on Question:
Full credit was received for describing two criticisms and the NAIC's response to them. Generally, candidates performed better on part (i) than on part(ii). Shown below are a sample of criticisms that received full credit.

(i)
- Lack of Group level supervision; Walls and Windows approach not performing well for insurance companies
- Static formulas don't adequately measure some risks
- Mis-sizes risk at the company level because it is not geared to individual company characteristics
- Omits some risks that are quantifiable

(ii)
- Group level supervision: Walls and Windows approach proved to work as designed during the 2008 crisis
- Static formulas: will consider refinements to asset, investment and credit risk charges

- Mis-sizing: lower priority and generally opposed to any solution requiring dynamic modeling
- Omissions: will consider addition of an explicit risk charge for property-casualty catastrophe risk

(c) **(LOs 2a, 2b)** Describe two positive outcomes and two negative outcomes that could potentially occur if the NAIC decided to increase RBC requirements.

Commentary on Question:
Full credit was received for describing two positive outcomes and two negative outcomes. *Shown below are a sample of the outcomes that received full credit.*

Potential positive outcomes:
- Fewer insolvencies
- Increased consumer confidence in the insurance industry
- Increased investor confidence in the insurance industry
- Potential negative outcomes:
- Higher costs or reduced benefits for consumers
- Inefficient use of capital
- Unwarranted company and regulatory actions

(d) **(LOs 1a, 2a)**
(i) Calculate the ACL RBC for MSP. Show all work.

(ii) Describe the regulatory action triggered by MSP's RBC ratio. Show all work.

Commentary on Question:
On part (i), candidates generally struggled with determining the correct NAR for the C2 calculation and the correct reserve risk classifications (low/medium/high) for the C3a calculation. On part (ii), p*artial credit was received if the candidate made errors in part (i) but determined the RBC ratio and corresponding regulatory action using the correct formula and the calculated ACL RBC from part (i).*

(i)
C0 = Asset Risk Affiliated = 2 million

C1CS = Asset Risk Unaffiliated = 10 million

C1o = Asset Risk Other = 5 million

NAR = Net Amount at Risk =
   Amount of insurance in force for ordinary life - Reserves for ordinary life =
   7,500 million - 500 million = 7,000 million

C2 = Insurance Risk =
  MIN [500 million, NAR] x 0.0023 +
  MAX [0, MIN (4,500 million, NAR - 500 million)] x 0.0015 +
  MAX [0, MIN (20,000 million, NAR - 5,000 million)] x 0.0012 +
  MAX [0, NAR - 25,000 million] x 0.0009 =
  (500 x 0.0023) +
  (4,500 x 0.0015) +
  (2,000 x 0.0012) +
  (0 x 0.0009) =
  10.3 million

Low Risk Reserves =
  Reserves for ordinary life +
  Reserves for annuity contracts with a market value adjustment =
  500 million + 200 million = 700 million

Medium Risk Reserves = 0

High Risk Reserves =
  Reserves for annuity contracts with a book value withdrawal
  and no surrender charge = 100 million

C3a = Interest Rate Risk =
  (Low Risk Reserves x 0.0077) +
  (Medium Risk Reserves x 0.0154) +
  (High Risk Reserves x 0.0308) =
  (700 x 0.0077) +
  (0 x 0.0154) +
  (100 x 0.0308) =
  8.47 million

C3b = Health Credit Risk = 0 (MSP has no health products)

C3c = Market Risk = 0 (MSP has no variable products)

C4a = Business Risk = 10 million

C4b = Health Administrative Expense Risk = 0 (MSP has no health products)

ACL RBC =
  0.5 x {2 million + 10 million +
        [(5 million + 8.47 million)^2 + (10 million + 0)^2 +
        (10.3 million)^2 + 0^2 + 0^2]^0.5} =
  15.84 million

(ii)

RBC ratio = TAC / ACL RBC = 40 million / 15.84 million = 2.52

A common alternative formula not discussed in the source material uses Company Action Level (CAL) RBC in the denominator instead of ACL RBC. Credit was awarded for either definition. Under the alternative definition:

RBC Ratio = TAC / CAL RBC =
   TAC / (2 x ACL RBC) = 40 million / 31.69 = 1.26

A trend test is triggered when TAC is at least 200% but less than 300% of ACL RBC (or, alternatively, at least 100% but less than 150% of CAL RBC)

MSP must perform a trend test

10. Spring 2021 ILA LFMU Exam (LO 1b)

Learning Objectives:

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

Learning Outcomes:

The Candidate will be able to:

  b) Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US GAAP framework, including the calculation of reserves and related items (e.g., DAC

Relevant Sources:

Implementation Considerations for VA Market Risk Benefits, Financial Reporter, Sep 2019

Targeted Improvements Interactive Model

Commentary on Question:
This question tested the candidates' understanding of U.S. GAAP valuation principles and methods.

Solution:
(a)   **(LO 1b)** Critique the following statements regarding LDTI:

  A. *Because XYZ's GMDB protects the value of a death benefit, it will not be considered a Market Risk Benefit*

  B. *The requirement to adjust DAC for unrealized gains and losses on available for sale assets (shadow DAC adjustment) is eliminated. Therefore, changes in asset values will only affect the DAC balance when gains or losses are realized.*

  C. *If the calculated market risk benefit amount is negative, it needs to be floored at zero to avoid being reported shown in an asset position.*

D. *Assumptions for mortality and lapses will no longer be needed for DAC calculations since it will be based on a straight-line basis.*

E. *An own credit adjustment is used to account for when a company cannot fulfill its obligations, which will increase the fair value liability due to this non-performance risk.*

F. *All changes in fair value related to market risk benefits shall be recognized in net income.*

Commentary on Question:
Most candidates knew the basics of the new DAC amortization method under LDTI and were able to least obtain partial credit based on that knowledge.

A – statement is false. The exemption from MRB for protecting a death benefit only applies to insurance contracts and not annuities

B – While the first sentence is true the conclusion is false. DAC amortization is based on the expected life of a group of contracts or straight line on an individual contract. But changes in asset values don't affect amortization.

C – statement is false. An asset position is allowed when PV attributed fees > PV expected benefits

D – statement is false. These assumptions are needed to project inforce to determine DAC amortization pattern.

E – statement is false. The own credit adjustment increases the discount rate which will decrease the fair value liability

F – statement is false. All the changes in fair value related to market risk benefits shall be recognized in net income, with the exception of fair value changes attributable to a change in the instrument-specific credit risk of market risk benefits in a liability position, which should be recognized in the OCI

(b)   **(LO 1b)** For a single premium variable deferred annuity with a Guaranteed Minimum Withdrawal Benefit (GMWB), the only fees charged are the M&E fees. XYZ decided to use the non-option method to value the Market Risk Benefit (MRB) for the GMWB.

You are given the following risk-neutral scenario projections for a single policy:

Projection date: At-issue	Projection date: 1 year after issue,	Projection date: 1 year after issue,

Discount rates: risk-neutral interest rates plus the instrument specific credit risk			Discount rates: updated risk-neutral interest rates plus the at-issue instrument specific credit risk			Discount rates: updated risk-neutral interest rates plus updated instrument specific credit risk		
Scenario	PV of M&E Fees	PV Of GMWB Excess Benefits	Scenario	PV of M&E Fees	PV Of GMWB Excess Benefits	Scenario	PV of M&E Fees	PV Of GMWB Excess Benefits
1	100	20	1	94	17	1	93	16
2	93	26	2	87	25	2	86	25
3	95	29	3	91	30	3	90	29
4	107	10	4	102	11	4	101	10
5	102	15	5	98	15	5	97	15
6	97	30	6	91	29	6	90	29
7	92	40	7	87	41	7	86	41
8	108	20	8	104	21	8	103	21
9	106	18	9	102	16	9	101	16
10	100	22	10	94	25	10	93	24

(i)   Calculate the MRB fair value 1 year after issue. Show all work.

(ii)   Calculate the amount recognized in Other Comprehensive Income (OCI) in the first year of the policy. Show all work.

Commentary on Question:
Candidates generally did not do well on this part of the question. Candidates who demonstrated understanding of the MRB calculations performed well on this part of the question.

The Attributable Fee % = Min(100%,Avg PV of Excess Bens / Avg PV of Fees)
AF% = 23 / 100 = 23%

MRB_1=(Avg PV of excess benefits) – AF% X Avg PV of Fees
(calculated using right most columns)
=22.6 – 23% X 94 = 0.98.

Amount recognized in OCI = change in MRB due to change in instrument specific credit risk

So now calculate MRB at end of year 1 with original credit risk
MRB = 23.0 – 23% X 95=1.15

So the reduction in the MRB from 1.15 to 0.98 = 0.17 is recognized in OCI.

1. Fall 2020 ILA LFMU Exam (LOs 2b, 2d, 3b)

Learning Objectives:

2   The candidate will understand how to explain and apply the methods, approaches and tools of financial capital management for life insurance company under a US regulatory framework.

3   The candidate will understand types of life insurance risks, the impacts of diversification, crediting rating agency frameworks, and the assessment of risk management.

Learning Outcomes:

2   The Candidate will be able to:

      a) Explain and calculate required capital under a US regulatory framework

      b) Describe the purpose and application of economic capital

      d) Explain and apply methods in capital management

3   The Candidate will be able to:

      b) Understand the role and framework used by credit rating agencies for evaluating life insurance companies

Relevant Sources:

2(b)   Economic Capital for Life Insurance Companies, SOA Research Paper, Oct 2016 (Sections 2 & 6)

2(d)   ILA201-800-25: Theory of Risk Capital in Financial Firms

3(b)   Rating Agency Perspectives on Insurance Company Capital, SOA Research Institute, Aug 2023 (excluding Appendices)

Commentary on Question:
This question tested the candidates' knowledge of economic capital and financial management.

Solution:

(a)   With regard to solvency regulation:

    (i)   **(LO 3b)** List two reasons U.S. regulators would be interested in international regulatory developments.

    (ii)   **(NO LONGER RELEVANT)** ~~Explain the shortcomings of the U.S. RBC factor-based approach compared to Solvency II's model-based approach.~~

    Commentary on Question:
    Candidates generally answered this part of the question well. Candidates who listed any two of the three items below in part (i) received full credit.

    (i)
- U.S. regulators might be interested in international developments to identify potential improvements in U.S. regulation that they believe have merit.
- U.S. regulators may feel pressure to adopt certain methods to meet international standards or to prevent conflicts over "regulatory equivalency".
- U.S. regulators may wish to avoid federal intrusions into state regulation by adopting reforms that are reasonably consistent with international standards and address any perceived deficiencies in the current regulations.

    (ii)
- The RBC approach is a one-size-fits-all approach, whereas a model-based approach can be tailored towards individual company characteristics.
- The RBC formula omits some risks, such as catastrophe and operational, that could be better quantified using a model.
- A model-based approach compels insurers to take a more forward-looking and comprehensive view of their risk and they can determine a regulatory capital amount that is more suited to their circumstances.
- The vast majority of U.S. insurance companies have regulatory capital significantly greater than the minimum amount that would require RBC action levels to be triggered; this calls into question how accurately the RBC formulas are actually measuring companies' financial risks.

(b)   **(LOs 2b, 2d)** Describe the advantages and disadvantages of LHR operating at an economic capital ratio of 150% compared to 400%.

    Commentary on Question:
    Candidates generally answered this part of the question well.

- 150% Pros: increases the return on capital by reducing the denominator.

- 150% Pros: Operating at this capital level ratio shows some level of capital efficiency if returns are commensurate
- 150% Cons: Mildly adverse performance may cause the insurer to breach the requirement over the next year and suffer the associated frictional costs and loss to franchise value
  - 400% Pros: May increase the franchise value by attracting a greater amount of profitable business
- 400% Pros: Helps protect or enhance the interest of a number of stakeholders and to increase shareholder returns by avoiding costs of failure to meet the company's objectives
- 400% Cons: Can be seen as having a cost to the business relating to tax, investment costs and potentially agency effects, thus reducing shareholder value

(c) **(LOs 2b, 2d)** LHR is considering ways to reduce the economic capital being held for its block of Single Premium Immediate Annuities (SPIAs). Evaluate the effectiveness of each of the following techniques:

(i) Diversification of risk through issuance of life insurance policies

(ii) Securitization of longevity risk through issuance of a 10-year longevity bond

Commentary on Question:
For part (i) credit was received for any evaluation on how mortality risks of a life vs. annuity block could be mismatched. Candidates generally did not do well on part (ii).

(i) Life insurance issuance - mostly ineffective.
Diversification can provide some capital relief. But negatively correlated risks are rarely perfectly matched.
Overall changes in mortality may affect life blocks differently from annuity blocks.

(ii) Securitization through longevity bonds - should be effective.
If the economic liability is below the attachment point, the insurer will not need to repay some of the principal. In fact, if the economic liability reaches the exhaustion point, the insurer would not need to repay any principal.
While such a bond is an out-of-the-money risk to the investor, it can immediately reduce an insurer's economic capital.
While not stated explicitly in the text, it is clear from the text example that the reduction in economic capital is a function of reduction of tail risks in longevity. Credit is given for coherent discussion of this concept.

(d)   **(LOs 2b, 2d)** Critique the following statements:

> A. *Unit X is the least profitable business unit due to its large risk capital requirement. If LHR decides to eliminate a business unit, it should eliminate X.*
>
> B. *The required risk capital of the combined X+Y+Z should be allocated across the business units.*
>
> C. *Having unallocated risk capital would indicate LHR is not covering all of its risks.*

Commentary on Question:
Candidates generally critiqued statements A and B well. For statement C, candidates generally neglected to discuss the extreme case of perfect correlation between business units.

A.   This is false; you must consider the correlation of risks amongst the units (the combination of units is 700, which is less than adding all 3 units, indicating there is some diversification benefit). A business that is unprofitable on a stand-alone basis may be profitable when there is other business with offsetting risks.

Calculating the marginal risk capital shows unit Z actually has the highest marginal capital. This indicates that eliminating unit Z would actually reduce required risk capital the most.

Unit	Marginal Risk Capital
X	180
Y	100
Z	240
Sum of Marginal Risk Capital	520

B. This is false; the total amount of capital allocated should be 520, the sum of the marginal capital amounts. Allocating all of the risk capital is usually not feasible and it can distort the profitability of each unit.

C. This is false; having unallocated capital indicates that the profitability of the business units is not perfectly correlated. Only in the extreme case of perfect correlation will all capital be allocated. Since not all of LHR's capital is allocated, this indicates a diversification benefit amongst the business units; this diversification actually makes the company less risky than if the units were perfectly correlated.

4. Fall 2020 ILA LFMU Exam (LO 1a)

Learning Objectives:

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

Learning Outcomes:

The Candidate will be able to:

a) Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US statutory framework, including the calculation of principles-based reserves and formulaic reserves

Relevant Sources:

Statutory Valuation of Individual Life and Annuity Contracts, Claire, D., Lombardi, L. and Summers, S., 5th Edition, 2018

- Chapter 23: VM-20: PBR for Life Products (excluding 23.1)

Interactive Principle-Based Reserves Model

Commentary on Question:
This question tests the candidates' understanding of U.S. Statutory valuation principles and methods applicable to individual life insurance products, in particular VM-20.

Solution:
(a)

(i) **(LO 1a)** Describe two reasons why the credibility of a company's mortality experience is important under VM-20.

(ii) **(NO LONGER RELEVANT)** ~~List the advantages and disadvantages of the Limited Fluctuation credibility method and the Bühlmann Empirical Bayesian credibility method.~~

Commentary on Question:
Candidates generally did well on this part of the question. For part (ii), some candidates only discussed one of the two methods.

(i)
Reason 1:
Credibility of experience mortality will determine the mortality margin
  - Higher credibility will result in a lower margin

Reason 2:
Credibility of experience mortality will determine the schedule for grading into the industry table
  - Higher credibility will result in grading starting at a later duration

(ii)
Limited Fluctuation
Advantages:
  - only requires data from the company
  - relatively easy to understand, implement and interpret
Disadvantages:
  - does not specify procedures to estimate certain parameters (overcome in VM-20 by prescribed values)
  - only considers the accuracy of the company's experience and does not consider any relationship to industry experience
  - no quantities can be optimized in the calculation due to an a priori assumption that the data is normally distributed

Buhlmann Empirical Bayesian
Advantages:
  - systematic approach with assumptions and optimizations defined, with no need to arbitrarily select parameters
  - reflects the accuracy in both company and industry data through two variance calculations
Disadvantages:
  - hard to interpret and explain
  - requires the company to rely on statistical agents for industry data (overcome in VM-20 by a formulaic approximation)

(b)   **(NO LONGER RELEVANT)** You are given the following credibility factor:

        $Z = \min [1, (0.025 * m) / (2.24 * \sigma)]$

    where

        - m = estimated mortality ratio (actual to expected)
        - σ = standard deviation of the estimate
        - $P(X > 2.24) = 0.0125$, where X is a standard normal variable with mean equal to 0 and standard deviation equal to 1

(i)   Identify the credibility method.

(c)   **(LO 1a, partially)** Critique the following statements regarding the development of the VM-20 prudent estimate mortality assumption:

> A. *Mortality trends expected to continue beyond the date of valuation should be reflected in the assumption.*
>
> B. *A company may change credibility methods without obtaining permission from the commissioner.*
>
> C. *If company experience is 100% credible, then no margin is required since there is no uncertainty.*
>
> D. *If there is no difference in mortality experience between amount and count, then credibility should be measured by count since measuring by amount will only add noise, not accuracy, to the measurement.*
>
> E. *If a company retains historical mortality experience for 15 years, then the company should include all 15 years in the exposure period to maximize credibility.*
>
> F. *When measuring credibility, it would be appropriate to combine simplified issue experience with fully underwritten experience.*

Commentary on Question:

Candidates generally did not do well on this part of the question. Full credit was only awarded to candidates who provided adequate rationale.

A.
The actuary should consider reflecting these trends if and only if they would produce a larger reserve.

B.
- If using 2015 VBT as the industry table, changing methods requires permission from the commissioner.
- If using 2008 VBT as the industry table, changing methods does not require permission from the commissioner.

C.
False. Even if company experience is fully credible, there is still uncertainty and margins would still be applied.

D.
This statement is true, except for the fact that VM-20 requires credibility to be measured by amount when using 2015 VBT as the industry table.

E.
False. The exposure period is limited to between 3 and 10 years.

F.
It would be appropriate to combine the blocks for purposes of measuring credibility if and only if the prudent estimate mortality assumption for each block was derived from combined experience.

(d)　**(LO 1a)** You are given the following VM-20 information for an individual term life policy:

Policy Level	
Net premium reserve (NPR)	245
Product Group Level	
Deterministic reserve (DR)	4,100
Sum of policy NPRs	3,280

Assume:

- The product group passes the stochastic exclusion test
- There is no reinsurance

Calculate the VM-20 reserve for the policy.

Show all work, including writing out relevant formulas used in any calculations.

Commentary on Question:
Candidates generally did well on this part of the question.

Step 1: calculate excess of DR over NPR at product group level
820 = 4100 – 3280

Step 2: divide Step 1 by NPR at product group level
0.25 = 820 / 3280

Step 3: multiply the policy's NPR by Step 2
61.25 = 245 x 0.25

Step 4: calculate the policy's VM-20 reserve by adding Step 3 to the policy's NPR
306.25 = 61.25 + 245

6. Fall 2020 ILA LFMU Exam (LO 1a)

Learning Objectives:

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

Learning Outcomes:

The Candidate will be able to:

a) Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US statutory framework, including the calculation of principles-based reserves and formulaic reserves

Relevant Sources:

Statutory Valuation of Individual Life and Annuity Contracts, Claire, D., Lombardi, L. and Summers, S., 5th Edition, 2018

- Chapter 23: VM-20: PBR for Life Products (excluding 23.1)

Interactive Principle-Based Reserves Model

Commentary on Question:
This question tested the candidates' knowledge of VM-20.

Solution:
(a) **(NO LONGER RELEVANT)** ~~Critique the following statements about VM-20:~~

~~A. The following are covered by VM-20:~~

- ~~Group life insurance policies that include long-term care benefits~~
- ~~Group and individual health insurance policies~~
- ~~Riders and supplemental benefits attached to individual life insurance policies~~
- ~~Waiver of premium claim reserves~~

~~B. A company is required to calculate all three components (net premium reserve, deterministic reserve and stochastic reserve) when determining the minimum reserve.~~

(b)   **(LO 1a)** You are given the following information for a single scenario from the VM-20 stochastic reserve model:

- Product: 5-year nonrenewable term insurance
- One-year Treasury rate: 5%
- Starting assets: 10,000

Projection Year	0	1	2	3	4	5
Statement Value of Assets (end of year)	10,000	5,000	1,000	-290	-300	250

Calculate the scenario reserve utilizing the Greatest Present Value of Accumulated Deficiency method.

Show all work, including writing out relevant formulas used in any calculations.

Commentary on Question:
Candidates generally did well on this part of the question. Candidates who did not do well used the wrong interest rate or did not discount correctly.

Projection Year	0	1	2	3	4	5
Statement Value of Assets	10,000	5,000	1,000	-290	-300	250
One-Year Treasury Rate		5%	5%	5%	5%	5%
Negative of the Statement	-10,000	-5,000	-1,000	290	300	-250

Value of Assets						
Discount Rate		5.25%	5.25%	5.25%	5.25%	5.25%
Discount Factor	1.000	0.950	0.903	0.858	0.815	0.774
Discounted Negative Accumulated Deficiency	-10,000	-4,751	-903	249	244	-194

Discount Rate = 105% of One-Year Treasury Rate

Discount Factor = (1 + Discount Rate) ^ (-1 x Projection Year)

Discounted Negative Accumulated Deficiency =
  (Negative of the Statement Value of Assets) x Discount Factor

Greatest Present Value of Accumulated Deficiency =
  GPVAD =
  MAX [Discounted Negative Accumulated Deficiency] = 249

Scenario Reserve = Starting Assets + GPVAD = 10,000 + 249 = 10,249

8. Fall 2020 ILA LFMU Exam (LOs 1a, 1b, 4e)

Learning Objectives:

1(a)   The candidate will understand and apply U.S. valuation principles and methods applicable to individual life insurance and annuity products issued by U.S. life insurance companies.

4(e)   The candidate will understand the fundamentals of value creation and inforce management techniques for life and annuity products.

Learning Outcomes:

The Candidate will be able to:

1(a)   Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US statutory framework, including the calculation of principles-based reserves and formulaic reserves

1(b)   Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US GAAP framework, including the calculation of reserves and related items (e.g., DAC)

The Candidate will be able to:

4(e)   Describe and calculate reserves under US Company Tax rules

Relevant Sources:

1(a)   Statutory Valuation of Individual Life and Annuity Contracts, Claire, D., Lombardi, L. and Summers, S., 5th Edition, 2018

- Chapter 5: The Valuation Manual (excluding 5.4)

- Chapter 11: Valuation Methodologies (excluding 11.3.9-11.3.11)

- Chapter 18: Fixed Deferred Annuities (excluding 18.7.4 & 18.8)

- Chapter 21: Immediate Annuities

4(e)   FAQ on Certain Insurance Reserves Held by Insurance Companies for the Purpose of Determining U.S. Taxable Income after the Passage of the Tax Cuts and Jobs Act of 2017

Commentary on Question:

This question tested the candidates' knowledge of U.S. Statutory and Tax regulation principles as applicable to life and annuity products.

Full credit was awarded to candidates who provided adequate rationale for their responses. Candidates generally did well on statement G. Candidates generally did not do well on statements B and H.

Solution:
Critique the following statements regarding statutory and tax reserve valuations:

A. ***(LO 1a)*** *The Standard Valuation Law (SVL) only applies to life insurance and annuity contracts, and it provides consistent statutory reserve valuation requirements across all states.*

B. ***(LO 1a)*** *The SVL requires an annual asset adequacy analysis of reserves for all products where a company is holding less than the minimum prescribed statutory reserve amount. If the analysis shows that reserves are deficient for a particular product, an additional reserve must be established to eliminate the deficiency.*

C. ***(LO 1a)*** *The SVL is intended to account for and address all product features and situations that influence statutory reserving. Absent explicit guidance from the SVL, a company should follow management's prudent judgment.*

D. ***(LO 1a)*** *For fixed deferred annuities, setting the statutory reserve equal to the account value always satisfies CARVM minimum requirements. For immediate annuities, the mortality table used to calculate the minimum reserve under CARVM is either the 1983 IAM, 2000 IAM or 2012 IAM table, depending upon issue year and length of the certain period, with no mortality improvement projected beyond the date of valuation.*

E. ***(LO 1b, 4e)*** *Under the Tax Cuts and Jobs Act of 2017 (TCJA), for life insurance and annuity contracts in force as of December 31, 2017, there are no changes to the DAC tax amortization period. However, for these contracts, the DAC tax capitalization percentage applied to future net premiums is increased.*

F. ***(LO 1b, 4e)*** *Under TCJA, if the statutory reserve for a whole life policy is calculated using the net level premium method, then the tax reserve equals 92.81% of the statutory reserve excluding any deficiency reserve.*

G. ***(LO 1b, 4e)*** *Under TCJA, the tax reserve for a variable annuity contract equals the CARVM separate account reserve plus 92.81% of the excess of the CARVM reserve for the entire contract over the net surrender value.*

H. **(LO 1b, 4e)** *Under TCJA, there have been no changes to tax reserves for annuity contracts not involving life contingencies.*

A. **(LO 1a)** The SVL also applies to other types of contracts such as health and deposit-type contracts. While specific valuation requirements can vary from state to state, all states have adopted some form of the NAIC model SVL.

B. **(LO 1a)** The SVL requires an asset adequacy analysis of reserves for all products regardless of statutory reserves held. Companies are required to meet statutory minimum requirements in all situations. Deficiencies in individual components of the reserves may be offset by margins in other components, subject to specific state requirements.

C. **(LO 1a)** The SVL does not account for all product features. It provides broad guidance and is supplemented by Actuarial Guidelines to provide direction in situations where more specific guidance is required. In situations where the guidance is unclear, then the company should rely on the judgment of the appointed actuary, not management's judgment, since it is the appointed actuary's responsibility to opine on the appropriateness of the reserves.

D. **(LO 1a)** For fixed deferred annuities, setting the statutory reserve equal to account value is not always appropriate, since CARVM requires that the reserve be set equal to the greatest present value of all possible future benefit streams.

For immediate annuities, there are also other mortality tables prescribed for contracts issued before 1985. The mortality table is chosen based on issue year only and does not take into account the length of the certain period. Mortality improvement is required and prescribed for 2012 IAM.

E. **(LO 1b, 4e)** Under TCJA, for life insurance and annuity contracts in force as of December 31, 2017, the amortization period for DAC tax amounts capitalized after 12/31/2017 was increased from 10 years to 15 years. For unamortized balances as of 12/31/2017, there were no changes to the amortization period. The DAC tax capitalization percentage applied to future net premiums was increased.

F. **(LO 1b, 4e)** Under TCJA, the tax reserve equals 92.81% of the statutory reserve calculated by the CRVM method and excludes any deficiency reserve, reserve attributable to deferred/uncollected premiums if the premiums are not included in taxable income and excess interest reserve. The reserve is also floored at the net surrender value.

G. **(LO 1b, 4e)** Under TCJA, the tax reserve for a variable annuity contract equals the greater of the net surrender value and the CARVM separate account reserve PLUS 92.81% of the excess of the CARVM reserve for the entire

contract over the greater of the net surrender value and the CARVM separate account reserve.

H. *(LO 1b, 4e)* Under TCJA, the tax reserve is the greater of the contract's net surrender value or 100 percent of the discounted value of the obligations using the highest discount rate or rates permitted by the NAIC as of the date when the reserve is determined.

9. Fall 2020 ILA LFMU Exam (LO 1a)

Learning Objectives:

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

Learning Outcomes:

The Candidate will be able to:

a) Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US statutory framework, including the calculation of principles-based reserves and formulaic reserves

Relevant Sources:

Statutory Valuation of Individual Life and Annuity Contracts, Claire, D., Lombardi, L. and Summers, S., 5th Edition, 2018

- Chapter 14: Universal Life (excluding 14.4.8, 14.4.9, 14.5.0 & 14.6.2-14.6.6)

- Chapter 25: Principle-Based Reserve Report

Interactive Principle-Based Reserves Model

Commentary on Question:
This question tested the candidates' knowledge of the valuation of universal life secondary guarantees.

Solution:

(a)   **(LO 1a)** Compare and contrast these two ULSG designs: stipulated premium design and shadow account design.

   Commentary on Question:
   Candidates were generally able to identify one similarity (provide guarantee that the policy stays in force) and one difference (stipulated premium design requires to pay stipulated premium and shadow account design requires shadow account AV>0). Some candidates mentioned the assumption for both designs were different from base and established at issue. Few candidates mentioned the

design was provided for a definite time period or expiry date for partial withdrawal and loan.
Similarity:
i. They both provide guarantees that the universal life policy will not terminate.
ii. The input/assumption used for calculations for both of these designs (such as interest rate, charges) are established when the policy is issued.
iii. It's common to see both designs providing coverage for a defined time period, i.e. first 20 policy years.

Differences:
i. The benefit trigger/base are different--one is contingent on stipulated premium being paid periodically, and the other one is contingent on shadow account remain positive.
ii. The stipulated premium design expires when partial withdrawal or loans are taken, while the shadow account design does not.
iii. Benefit trigger/base used for stipulated premium design (premium paid) is also used for death benefit or CSV calculation. However, benefit trigger/base used for the shadow account design (shadow account value) is not used for death benefit or CSV calculation.
iv. A policy could have multiple shadow account coverages over different guaranteed periods. However, it is not common to have multiple stipulated premium coverages.

(b)   **(LO 1a)** On the valuation date, ABC will follow Actuarial Guideline 48 for the first time. You are given the following values as of the valuation date:

UL CRVM	2,400
AG 38	4,500
Actuarial Method Reserve	1,350
Economic Reserve	980

Calculate the impact on:

(i)   Reserve credit
        Show all work, including writing out relevant formulas used in any calculations.

        The response for this part is to be provided in the Excel document.

(ii)   Redundant Reserve (Financed Reserve)
        Show all work, including writing out relevant formulas used in any calculations.

Commentary on Question:
Candidates generally did not do well on this part of the question. Common errors include:

- *Determining that moving to AG48 has impact on reserve credit.*
- *Not mentioning pre AG 48 and post AG 48 for part ii*
- *Only calculating Post AG 48 or Pre AG 48 redundant reserve for part (ii).*
- *Mixing up the formula between reserve credit and redundant reserve.*

i. Reserve credit = ceded reserve = AG 38 - UL CRVM

The calculation method is the same pre and post AG 48.

Therefore, moving to AG 48 has no impact on reserve credit calculation.

ii.
Pre AG 48
Redundant Reserve = AG 38 - UL CRVM - Economic Reserve

= 4500 - 2400 - 980
= 1120

Post AG 48
Redundant Reserve = AG 38 - UL CRVM - Actuarial Method Reserve

= 4500 - 2400 - 1350
= 750

The impact = 750 - 1120
= -370
The impact is a reduction on redundant reserve of $370.

c) **(LO 1a)** Critique the following statements related to ULSG:

(i) AG 48 only applies to ULSG carriers utilizing captive reinsurance.

(ii) Actuarial Method Reserve is calculated as VM-20 Reserve.

(iii) Other security assets used to back the excess of AG 38 reserve over AG 48 reserve cannot be used as primary security assets to back AG 48 reserve, and vice versa.

(iv) For AG48, no exclusions are permitted from the Stochastic Reserve only.

Commentary on Question:
Full credit was awarded to candidates who provided adequate rationale for their responses.

For part (i) most candidates realized that AG 48 is not limited to carriers with captive structures

For part (iii) some candidates incorrectly explained the different types of security assets.

Candidates generally did well in parts (ii) and (iv).

(i)   AG 48 is not limited to carriers with captive structures.

Reinsurers does not meet the specified exemptions reinsures policies with Regulation XXX/AG 38 reserves will be subject to AG 48 as well.

(ii)   It is calculated as modified VM-20 reserve where when calculating the net premium reserve component, a factor is applied when calculating actuarial method reserve for AG 48 purpose.   Modified VM-20 reserve = max(NPR*factor, Deterministic Reserve, Stochastic Reserve).

(iii)   The former is correct- other security cannot be used as primary security.

However, primary security can be used as other security, so the latter part is incorrect.

(iv)   Exclusions are also not permitted for Deterministic reserve.

Stochastic exclusion may be allowed for the current AG48.

10. Fall 2020 ILA LFMU Exam (LO 1b)

Learning Objectives:

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

Learning Outcomes:

The Candidate will be able to:

b) Describe, apply and evaluate the appropriate valuation methods, requirements, and techniques and related under the US GAAP framework, including the calculation of reserves and related items (e.g., DAC)

Relevant Sources:

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

- Chapter 1: US GAAP Objectives and their Implications to Insurers
- Chapter 3: Product Classification and Measurement
- Chapter 4: Expenses
- Chapter 5: Nonparticipating Traditional Life Insurance
- Chapter 7: Universal Life Insurance (only sections 1, 2, 5-7)

Targeted Improvements Interactive Model

Commentary on Question:
The question tested the candidates' knowledge of the full retrospective method and the DAC changes under LDTI.

Solution:
(a) **(LO 1b)** Describe the data requirements necessary for a company to implement a full retrospective transition to ASU 2018-12.

Commentary on Question:
This part of the question tested the candidates' knowledge of the data needed for a full retrospective method calculation. Any four of the five points listed would have received full credit.

- Elect only when actual historical information for an issue year cohort is available for all periods back to inception for all applicable products entity wide. Cannot use estimates
- Apply entity-wide for that issue year and all subsequent issue years
- Need information on terminated policies
- Need information on all periods back to contract inception
- Need consistent historical information for both reserves and DAC

(b)   **(LO 1b)** Assume BLL has all the necessary data requirements discussed in part (a) for a full retrospective transition with a transition date of 1/1/2020.

    (i)   Calculate the DAC balance as of 1/1/2020 under ASU 2018-12 using a full retrospective approach.
Show all work, including writing out relevant formulas used in any calculations.

    (ii)   Recommend either the full retrospective or modified retrospective approach for BLL. Justify your answer.

Commentary on Question:
Candidates generally were able to create the in-force schedule from the provided data. Some candidates applied a cumulative persistency amount against each year's in-force amount, which will greatly over-decrement the in-force. Cumulative persistency amounts had to be multiplied against the original 5,000 amount. The table shows the method of applying each year's persistency against each in-force amount and 2023 is shown to indicate values go to zero. A few candidates didn't use the 2022 year even though the year starts with some in-force and ends at zero.

Candidates generally used the correct Deferred Acquisition Expenses to calculate amortization rates. A few candidates added the two years together or added the previous method DAC balances in with the Deferred Acquisition Expenses. Some candidates calculated the amortization factor as the first-year face amount over the PV face amount.

Candidates usually found a reasonable amortization amount using the sum of the in-force amounts as the basis for amortizing DAC. A few candidates took the concept of "straight-line amortization" too literally and amortized an equal amount each year. Some candidates amortized against the PV face amount, instead of the face amount at the corresponding period.

For part (ii), the highest available DAC balance of 344.82 was greater than the prior method of 300; thus, the full retrospective method is the recommendation since DAC is an asset for the companies and the data is fully available. Some candidates provided other recommendations which received credit based on the

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validity of the justification provided. For example, some candidates argued that companies should take modified retrospective due to fewer data needs, even though for this question all data was available.

(i)

	2017	2018	2019	2020	2021	2022	2023
Assumed Mortality Rate	10%	10%	10%	10%	10%	100%	---
Inforce Amount (BOY)	5000.00	4500.00	4050.00	3645.00	3280.50	2952.45	0.00
Amortization Rate	2.1342%	3.4908%	3.4908%	3.4908%	3.4908%	3.4908%	---
Deferred Acquisition Expenses	500	250	0	0	0	0	0
Amortization	-106.71	-157.09	-141.38	-127.24	-114.52	-103.07	0.00
DAC (BOY)	0	393.29	486.20	**344.82**	217.58	103.07	0.00

Amort Rate is only calculated when new Deferred Acquisition Expenses occur.
Amort Rate = (DAC + Deferred Acquisition Expenses) / Sum In-force
Amort Rate2017=2.1342%=(0+500)/(5000+4500+4050+3645+3280.50+2952.45)
Amort Rate2018=3.4908%=(393.29+250)/(4500+4050+3645+3280.5+2952.45)

Amortization $_n$ = - In-force Amount $_n$ * Amort Rate $_n$

$DAC_n = DAC_{n-1}$ + Deferred Acquisition Expenses $_{n-1}$ + Amortization $_{n-1}$
DAC (2020) = **344.82**

(ii)
Recommend using full retrospective method. At 1/1/2020 the existing DAC balance is 300 under the old method (as given), thus full retrospective will have a higher DAC balance which is favorable as DAC is an asset.

(c)   **(LO 1b)** You are given the following updated information:

- Actual mortality experience for 2017 was consistent with expected.
- Actual mortality rate in 2018 was 25%.
- BLL made no adjustments to mortality assumptions in years 2019 and later.

(i)   Recalculate the DAC balance as of 1/1/2020 under ASU 2018-12 using a full retrospective approach.

Show all work, including writing out relevant formulas used in any calculations.

(ii)   Describe if the change in mortality experience alters the recommendation in part (b)(ii).

Commentary on Question:
Amortization is based on expected in-force amounts, and if in-force amounts change beyond the expected amount an experience adjustment is calculated as an additional reduction in the DAC balance. In this case, the amortization amounts by year change due to the different in-force amounts but not due to a change in amortization rate. The experience adjustment was the most challenging part. A few candidates re-calculated the amortization rates and DAC balance from the issue when the amortization rates and DAC in the past should not be changed.

For part (ii) the highest available DAC balance of 287.35 was less than the prior method of 300; thus, the modified retrospective method is the recommendation.

(i)

	2017	2018	2019	2020	2021	2022	2023
Assumed Mortality Rate	10%	10%	10%	10%	10%	100%	---
In-force Amount (BOY)	5000.00	4500.00	4050.00	3645.00	3280.50	2952.45	0.00
Additional Terminations	0%	15%	0%	0%	0%	0%	---
Updated In-force (BOY)	5000.00	4500.00	3375.00	3037.50	2733.75	2460.38	0.00
Amortization Rate	2.1342%	3.4908%	3.4908%	3.4908%	3.4908%	3.4908%	---
Deferred Acquisition Expenses	500	250	0	0	0	0	0
Amortization	-106.71	-157.09	-117.82	-106.03	-95.43	-85.89	0.00
Experience Adjustment	0	**-81.03**	0	0	0	0	0
DAC (BOY)	0	393.29	405.17	**287.35**	181.32	85.89	0.00

Amort Rate is only calculated when new Deferred Acquisition Expenses occur.
Amort Rate = (DAC + Deferred Acquisition Expenses) / Sum In-force
Amort Rate 2017 = 2.1342% *(no change)*
Amort Rate 2018 = 3.4908% (*no change*)

Amortization $_n$ = - In-force Amount $_n$ * Amort Rate $_n$

$DAC_n = DAC_{n-1}$ + Deferred Acquisition Expenses $_{n-1}$ + Amortization $_{n-1}$

Experience Adjustment = Amort Rate * (Sum PV In-force Difference 2019-2022)
Experience Adjustment = **-81.03** = 3.4908% * 2,321.32

DAC (2020) = **287.35**

(ii)
Recommend using modified retrospective method. At 1/1/2020 the existing DAC balance is 300 under the old method (as given), thus modified retrospective will have a higher DAC balance than the full retrospective method.