

ILA LFMU Model Solutions

Fall 2024

1. 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:

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

Sources:

LFM-856-23: US GAAP for Life Insurers, 2022 - Chapter 12: US GAAP - Annuities in Payment Status

LFM-856-23: US GAAP for Life Insurers, 2022 - Chapter 11: US GAAP - Deferred 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) 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 ...)
 $200,000 * (1.045^{-1}) + 160,000 * (1.045^{-2}) + 140,000 * (1.045^{-3}) +$
 $120,000 * (1.045^{-4}) + 100,000 * (1.045^{-5}) + 80,000 * (1.045^{-6}) +$
 $60,000 * (1.045^{-7}) + 40,000 * (1.045^{-8}) + 20,000 * (1.045^{-9}) = \mathbf{788,565.20}$

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, $DAC(t) = DAC(t-1) - \text{prior period inforce} * k \text{ factor}$, where the k factor = $DAC(t-1) / \text{sum of projected inforce as of time } (t-1)$.

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: $DPL(t) = DPL(t-1) * (1 + i) - DPL \text{ amortization percentage} * \text{annuity benefit } (t)$, where i is the locked-in discount rate

Prospective method: $DPL(t) = LFPB(t) * DPL \text{ amortization percentage}$

Under both methods the DPL amortization percentage = initial DPL / time 0 LFPB, where the initial DPL = $\max(0, \text{initial policy count} * \text{initial premium} - \text{time 0 LFPB})$

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: $DPL(1) = 54,004.59 * (1 + 0.045) - 5.71\% * 200,000 =$
45,017.28

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

1. Continued

(b) 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.

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

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

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

Retrospective method:

$$\text{DPL}(1) = 0 * (1 + 0.045) - 0\% * 200,000 = 0$$

$$\text{DPL}(2) = 0 * (1 + 0.045) - 0\% * 200,000 = 0$$

$$\text{DPL}(3) = 0 * (1 + 0.045) - 0\% * 170,000 = 0$$

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

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.

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

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

$$551,059.92 - 528,363.33 = \mathbf{22,697.59}$$

1. Continued

- (c) 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. 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:

- (1a) Describe, apply and evaluate the appropriate valuation methods and techniques and related accounting treatments for reserves and related items (e.g., DAC), and other assets and liabilities for specific insurance products under U.S. GAAP. Further, describe and recommend assumptions and margins appropriate to these GAAP reserves.
- (1c) Describe, apply and evaluate the appropriate accounting treatments for derivatives and hedging arrangements.
- (1d) Describe, apply and evaluate the appropriate valuation methods and techniques and related accounting treatments for Investments held by insurance companies.

Sources:

US GAAP for Life Insurers, 2022:

Chapter 3: US GAAP – Product Classification

Chapter 4: US GAAP – Expenses and Capitalization

Chapter 5: US GAAP – Non-participating Traditional Life Insurance

Chapter 19: US GAAP – Investment Accounting

Chapter 20: US GAAP – Derivatives and Hedging

Commentary on Question:

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

Solution:

- (a) 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 in force.

- (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) 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. This is false. CLT cannot use the AOCI to offset the negative currency exchange impacts from the previous quarters. A hedge relationship must be established before the OCI is accumulated to be recognized.

(c) 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
- Best Estimate Assumptions, and
 - 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
- Prudent Estimate Assumptions, and
 - 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. Learning Objectives:

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

Learning Outcomes:

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

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) 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) 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. Learning Objectives:

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

Learning Outcomes:

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

Sources:

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) 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) 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) 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 $t>0$.

$$IC(0) = IC \text{ Guaranteed}(0) + \text{Option Cost \%}(0) * (1 + \text{Valuation Interest Rate})$$

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%

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

5. Learning Objectives:

1. The candidate will understand and apply U.S. GAAP valuation principles and methods applicable to individual life insurance and annuity products issued by U.S. life insurance companies.
5. The candidate will understand important insurance company issues, concerns and financial management tools.

Learning Outcomes:

- (1a) Describe, apply and evaluate the appropriate valuation methods and techniques and related accounting treatments for reserves and related items (e.g., DAC), and other assets and liabilities for specific insurance products under U.S. GAAP. Further, describe and recommend assumptions and margins appropriate to these GAAP reserves.
- (5a) The candidate will be able to describe, apply and evaluate considerations and matters related to:
 - Insurance company mergers and acquisitions
 - Management of variable deferred annuities
 - Embedded Value determinations
 - VM-20 financial impacts
 - Rating agency considerations
 - Model Audit Rule and Sarbanes-Oxley Section 404 considerations
 - Source of Earnings analysis

Sources:

LFM-152-22: Introduction to Source of Earnings Analysis (excluding Appendices)

LFM-138-16: Prudential Financial - Stockholder's Equity and Operating Leverage, HBR, 2008

LFM-856-23: US GAAP for Life Insurers, 2022 - Chapter 15: US GAAP – Reinsurance

LFM-856-23: US GAAP for Life Insurers, 2022 - Chapter 4: US GAAP - Expenses and Capitalization

Valuation of Life Insurance Liabilities, Lombardi, Louis J., 5th Edition, 2018, Chapter 22 – Miscellaneous Reserves (exclude 22.3 to 22.4)

Commentary on Question:

This question tested the candidates' knowledge of the U.S. GAAP Source of Earnings and how to calculate shareholder equity.

5. Continued

Solution:

- (a) AXE is analyzing the experience of its ULSG block during the pandemic. You are given:

Planned Margins	
Mortality Margin	1,000
Surrender Margin	350
Expense Margin	1,000
Interest Margin	500

Experience	
AV released on Death	4,900
AV released on Surrender	1,350
COI Charges	1,200
Death Benefit	5,000
Expense charges	1,800
Interest Credited	1,200
Investment Income	2,500
Maintenance Expenses	1,800
Surrender Benefit	1,000

- The planned profit margin is 0.
 - All COIs are used to fund mortality.
 - All expense loads are used to fund expenses.
- (i) Calculate the actual margins for this product. Show all work.
- (ii) Assess whether the experience is more favorable than expectation.
- (iii) Describe the mortality impact the pandemic had on this block.
- (iv) Describe the impact lapse experience had on this block.
- (v) Describe the biggest driver of profit for this block.
- (vi) Describe the impact expense experience had on this block.

Commentary on Question:

Most candidates did well on this part of the question. To receive full credit in part (i) candidates had to accurately calculate the Mortality, Surrender, Expense and Interest Margins. A common mistake was to incorrectly assign COIs to the Expense margin, rather than the mortality margin. Another common mistake was misinterpreting the sign and coming to incorrect conclusions on later parts.

5. Continued

To receive full credit in part (ii) candidates had to comment on the overall experience, rather than comment on each component. Candidates who did the latter received partial credit. The table is not required to receive full credit in the word document, as long as the calculations are shown in the spreadsheet. For parts (iii) through (vi), candidates had to relate the answer back to the amounts calculated in part (ii). Any comments that were provided without additional support did not receive credit.

- (i) See excel file for the solution
- (ii)

Margin	Actual	Expected	Difference
Mortality	+1100	+1000	+100
Surrender	+350	+350	0
Expense	+0	+1000	-1000
Interest	+1300	+500	+800
Total	+2750	+2850	-100

The total variance from the margins is -100. Therefore, experience is less favorable than expected.

- (iii) The mortality margin variance is +100. Given the variance is positive, the mortality impact the pandemic had on the block was positive.
- (iv) The lapse margin variance is 0. Given the variance is 0, lapse experience on the block had no impact to overall profits.
- (v) Out of the 2,750 of actual profit, the largest, positive, component was interest. The interest margin is 1,300.
- (vi) The expense margin variance is -1,000. Relative to the expected expense margin, actual expenses were much higher. The actual expense margin was 0. The overall impact hurt profits.

5. Continued

- (b) You are given the following balance sheet information:

US GAAP	
Total Liability	5000
Common Stock	1
Additional Paid in Capital	399
Common Stock held in Treasury	-250
AOCI	300
Retained Earnings	1000
Shares outstanding (millions)	100
US STAT	
Statutory Policy Reserves	5200
Interest Maintenance Reserve	50
Target RBC	500

All GAAP assets are admitted statutory assets.

- (i) Calculate the GAAP stockholder's equity. Show all work.
- (ii) Calculate the maximum dividend per share AXE Life could pay while meeting its RBC targets. Show all work.

Commentary on Question:

Most candidates did not do well on this part of the question. To receive full credit on part (i) candidates had to appropriately add the correct components that composed of Stockholder's Equity. To receive full credit on part (ii) candidates had to calculate the maximum dividend payable. A common error was to assume the total statutory reserves were the assets and subtracted it against the GAAP liability. Another common error was to assume the common stock was a per share value, rather than the total value of the stock. Candidates received partial credit in these situations. Many candidates also missed Common stock held in Treasury as part of equity. If a candidate calculated an incorrect answer in part (i) and used this answer in part (ii), while getting the remaining steps correct, full credit was received. Many candidates accurately knew that the final surplus had to be in excess of the required surplus, the target RBC, and received partial credit.

- (i) See the excel file for the solution.
- (ii) See the excel file for the solution.

6. Learning Objectives:

3. The candidate will:
- Understand the significant impact on individual life insurance and annuity product design and management of U.S. insurance product taxation rules.
 - Understand and apply the significant rules of U.S. insurance company taxation as they apply to U.S. life insurers.

Learning Outcomes:

- (3b) Describe, apply and evaluate the valuation methods and techniques for specific insurance products under U.S. taxation rules. Further, evaluate and calculate deferred tax items.

Sources:

LFM-845-20: Chapters 1 and 2 of Life Insurance and Modified Endowments Under IRC §7702 and §7702A, Desrochers, 2nd Edition

Commentary on Question:

This question tested the candidates' knowledge of U.S. taxation rules.

Solution:

- (a) You are given the following information about a universal life policy issued to a policyholder aged 45:
- The death benefit is level in all years.
 - The policy is subject to Internal Revenue Code section 7702 interest rates as determined by the Consolidated Appropriations Act of 2020.
 - The policy includes a minimum interest guaranteed rate of 4.0%.
 - The policy was issued during 2022 and the minimum nonforfeiture interest rate was 3.75% for a long duration contract.
 - The policy includes charges for cost of insurance, annual policy fees, per unit charges, and percent of premium expense charge in all policy years.
 - The policy has two riders: a term life insurance benefit on the primary insured's spouse, and a term life insurance benefit on a business partner who is not related to the policyholder.
 - You are given the values about the policy:

	PV@ 3.75%	PV@ 4.00%
Present value of death benefits	288	260
Present value of cost of insurance	250	225
Present value of annual policy fees, per unit charges, and premium expense charges	105	95
Present value of charges for the term rider on the primary insured's spouse	108	98
Present value of charges for the term rider on the business partner	1,250	1,130

6. Continued

Calculate the CVAT Net Single Premium at issue for the policy. Justify your answer.

Commentary on Question:

Candidates generally did well on this part of the question. Full credit was received by justifying what pieces of the given PV table values should or should not be included. The key concepts tested in this question were what interest rate should be selected, what fees if any should be included, and which riders should be included as QABs.

$$\text{CVAT NSP} = \text{PV}(\text{Future Reasonable Charges for Primary Death Benefit}) + \text{PV}(\text{Future Reasonable Charges for QABs})$$

Justification credit was given if candidates wrote the summarized formula above or the explicit calculation formula.

Additional justifications include:

- Cost of insurance is not included in the calculation
- Annual policy fees, per unit charges, and premium expense charges are not included in the calculation
- Only PVs for death benefits and QABs are part of the CVAT
- Endowment values are also included in CVAT, but do not affect this product
- Rider for primary insured is included as a QAB, because family term coverage is explicitly listed as a qualified additional benefit
- Rider for business partner is not an included QAB

The interest rate is an annual effective interest rate of 4 percent or, if greater, the rate or rates guaranteed on issuance of the contract, thus the rate to use is 4.0%

$$\text{Therefore, CVAT NSP} = \$260 + \$98 = \$358$$

(b) Your manager has asked you to look at using GPT instead of CVAT.

(i) Explain the differences between CVAT and GPT.

(ii) You are given for a policy:

- it qualifies as a life insurance contract under IRC 7702.
- it does not have any loans.
- the face amount remains the same.

6. Continued

Describe the circumstances that permit the premium paid to exceed the GPT.

Commentary on Question:

Most candidates received partial credit on this part of the question, but very few candidates received full credit. To receive full credit in part (i) candidates had understand why the differences between the test types are of importance. To receive full credit five differences had to be explained. A common error was to provide characteristics about each test individually and not the differences between the two. For part (ii), candidates generally struggled to identify the unique conditions that could lead to premiums exceeding the GPT. This question was designed to apply candidates' knowledge on what would happen in a potential real world policy scenario.

For part (i), acceptable differences include, but are not limited to:

- CVAT is better for conventional whole life products, while GPT is more appropriate for flexible premium products like universal life
- CVAT is calculated prospectively and the values are set at inception, while the GPT the test can be passed retroactively
- CVAT is only a single limitation, while the GPT has more than one stipulation that needs to be passed
- CVAT is based on the structure of the product at inception, while GPT depends on how the policyholder experience plays out over time
- Correctly listing the formulas for each test and pointing out the differences between the assumptions such as expenses and interest rate
- Noting the difference in administrative complexity between the tests

For part (ii), any two of the following circumstances identified would receive full credit:

- The premium paid into the policy under a guideline premium test may exceed the greater of the guideline single premium or the sum of the guideline level annual premiums if the premium is necessary to keep the policy active
 - The contract will have no cash surrender value at the contract year end
 - Excess premium and interest may be refunded within 60 days following the next policy anniversary
- (c) Your company wants to issue a high face amount, single premium universal life contract.

Describe how this contract will be classified under IRC 7702.

6. Continued

Commentary on Question:

Candidates typically either performed well or poorly on this part of the question. Candidates that did well not only correctly cited the correct testing protocols and how they applied to this product, but also made recommendation as to which category the product would be classified as a result of the tests.

Under 7702, the product will need to pass either the CVAT or the GPT. If the policy is tested using similar assumptions to its pricing assumptions, it will be compliant under the CVAT. If using GPT, the product will likely fail the GLP requirement for the first few years but there is a GSP component to that could affect the passing status as well.

By using the pricing assumptions, under 7702 it is likely that under the CVAT test this product will pass and be classified as a life insurance product.

Next, the product will have to pass the 7-pay test under 7702A. Due to the high amount of premium paid at the product inception, if none of the initial premium is refunded or paid out in some fashion, it is likely to fail the 7-pay test.

As a result, under 7702A this product will likely fail and be classified as a modified endowment contract (MEC).

7. Learning Objectives:

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

Learning Outcomes:

- (4a) The Candidate will be able to describe and evaluate the theory of capital (including economic capital), and evaluate its applicability for various purposes and its value to different stakeholders.

Sources:

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

A Multi-Stakeholder Approach to Capital Adequacy. Conning Research

LFM-852-22: Group Capital Calculation: Public Summary. National Association of Insurance Commissioners, Dec 2020

Commentary on Question:

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

Solution:

- (a) 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) *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.

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) 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) 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.

7. Continued

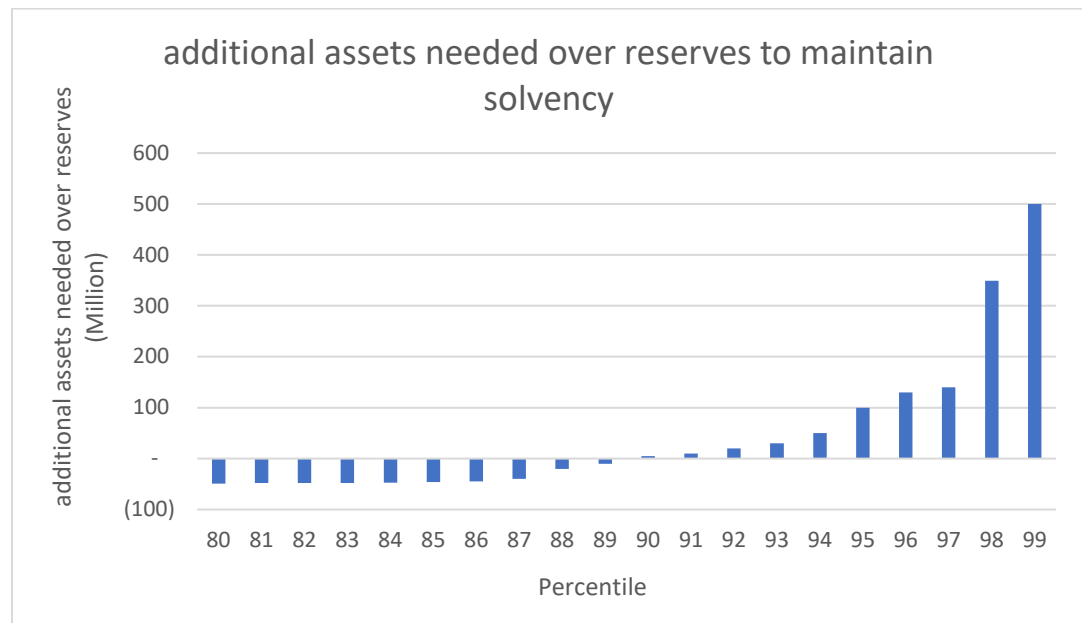
Stakeholder 1 prefers Option B – 400% RBC Level. Stakeholder 1 wants the company to hold enough capital to maintain the operation of the company through unexpected shocks. This is generally aligned with the objectives of policyholders and debtholders. Higher capital levels desired by Stakeholder 1 give 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 capital 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) You are given:



- 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.

8. Learning Objectives:

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

Learning Outcomes:

- (5a) The candidate will be able to describe, apply and evaluate considerations and matters related to:
- Insurance company mergers and acquisitions
 - Management of variable deferred annuities
 - Embedded Value determinations
 - VM-20 financial impacts
 - Rating agency considerations
 - Model Audit Rule and Sarbanes-Oxley Section 404 considerations
 - Source of Earnings analysis

Sources:

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

Commentary on Question:

This question tested the candidates' understanding of the valuation of life insurance companies.

Solution:

- (a) Describe three methods used to value an insurance company.

Commentary on Question:

This part of the question tested the candidates' understanding of the three common valuation methods. To receive full credit candidates had to state the method and provide a brief description. Candidates who did not do well on this part of the question simply listed the three methods instead of describing them. Some candidates chose to describe the embedded value and actuarial appraisals which are valuation metrics as opposed to methods.

The solution below accounts for various alternative solutions. Full credit was received for any reasonable description of the criteria used to identify comparable companies/transactions, calculating statistics, and applying the range of multiples to the company valuation. Credit was received for discussing the 'change of control premium'.

For the discounted cashflow method candidates were expected to discuss after-tax cashflows, dividend payout projections, terminal values and quote an appropriate discount rate.

8. Continued

The 3 methods to value an insurance company are:

- 1) **Comparable company analysis** – This method uses various financial statistics for the industry or similar companies to value the insurance company XYZ. The financial statistics are applied to the company “multiples” in order to generate a range of valuations.

The first step is to choose a peer group of companies similar to the insurance company XYZ. The peer group should be large enough to be statistically significant. The following factors are considered while selecting “similar companies”, so that they are as close as possible to company XYZ.

- Companies should comply with the same regulatory, accounting and tax requirements
- Companies should be similar enough in terms of financial and operating performance. Some aspects are:
 - geographical locations where the products are sold
 - credit ratings
 - distribution channels
 - Revenue/Market capitalization
 - Risk profile (financial leverage, reliance on reinsurance)
- If the insurance company is well-diversified, we must attempt to choose a peer group which is at least similar to the company’s core business.
- For publicly traded companies, various factors related to the stock are examined to choose comparable companies. These include:
 - Relative stock price performance
 - Average daily volume
 - Liquidity

Once similar companies have been chosen, the next step is to review the financial, operational and market metrics and choose market multiples (For e.g. Price/Earnings ratio, book value) that are most significant for the insurance industry.

Statistics such as mean, median and quartiles are calculated to analyze the performance of the peer group. This analysis identifies the high and low value multiples.

This range of multiples is then applied to the actual earnings/projections of the company being valued to calculate an implied range. (Company valuation X high and low values of multiples from the comparable company analysis.)

8. Continued

The next step is to evaluate the amount of premium ('change of control premium') that buyers are willing to pay over the company's valuation, in order to obtain a final valuation for XYZ.

- 2) **Comparable transaction analysis** – This method is similar to the comparable company analysis, except that it looks at the financial data for recent insurance transactions/mergers between similar sized deal values involving companies in similar sectors/subsectors/lines of business.

The financial advisor attempts to ascertain what the buyers have paid in arm's length transactions.

Other considerations when identifying comparable transactions are accounting and tax treatment, stock or cash paid, post-transaction price adjustments etc. After identifying these transactions, the financial advisor calculates price multiples to the book value/embedded value/EBITDA. These multiples are then applied to the valuation estimate of the insurance company being valued, similar to the comparable company analysis.

- 3) **Discounted cashflow method (DCF)** – This method calculates the present values of future streams of after-tax cashflows in the foreseeable future (5 years), using an appropriate discount rate. The discount rate is typically the WACC (Weighted average cost of capital)

This method is a variant of the actuarial appraisal method.

A DCF analysis must factor in:

- a projected dividend payout rate (assuming the company is public and has paid out historic dividends or plans future payouts)
- Earnings estimates derived from management's projections
- Ultimate book value as of terminal date which will be used in the projections. The terminal value is calculated for the final year as:
 - Seller's projected earnings for the terminal year X P/E multiple
 - Seller's GAAP book value X P/B value multiple

These multiples are derived from the comparable transaction analysis.

The projection cashflows and terminal value are discounted using the WACC to calculate a net present value.

A sensitivity analysis can also be done to show different net present values under a range of discount rate scenarios.

8. Continued

(b) ABC Life is acquiring XYZ Life. XYZ has the following financial information:

Capital and surplus	50,000,000
Asset valuation reserve	2,500,000
Interest maintenance reserve (undiscounted)	1,500,000
Interest maintenance reserve (discounted)	1,000,000
Book value of assets	100,000,000
Market value of assets	90,000,000
Value of inforce business	75,000,000
Value of future business	40,000,000
Intrinsic value of brand name	20,000,000

Calculate the following:

- (i) Adjusted Book Value
- (ii) Embedded Value
- (iii) Actuarial Appraisal Value
- (iv) Total Company Value

Show all work.

Commentary on Question:

This part of the question tested the application of different components of an actuarial appraisal to a practical numerical scenario. The adjusted book value calculation was the most complex part of the calculation and received the most credit. Most candidates did not do well on this part. Candidates excluded several parts of the ABV calculation or were subtracting the components instead of adding them.

Full credit was received for later parts of the question, even if they got the previous parts incorrect if they demonstrated sound knowledge of the theory behind the calculation. Most candidates did better on the later parts of the question. The candidates who did not do well were subtracting the components instead of adding them.

8. Continued

- (i) **Adjusted Book Value (ABV)** = Net worth of insurance company on a statutory basis i.e. the excess of statutory assets over statutory liabilities with adjustments for liabilities or non-admitted assets that are in the nature of surplus.

$$\begin{aligned} \text{ABV} = & \text{Capital \& Surplus} + \\ & \text{Asset Valuation Reserve (AVR)} + \\ & \text{Interest Maintenance Reserve (IMR) discounted} + \\ & \text{Deferred Tax Asset} + \\ & \text{Non-admitted Assets} + \\ & \text{Surplus Notes} + \\ & \text{Mark-to-Market on assets allocated to ABV} \end{aligned}$$

$$\begin{aligned} \text{ABV} = & 50,000,000 + \\ & 2,500,000 + \\ & 1,000,000 + \\ & 0 + 0 + 0 + \\ & (90,000,000 - 100,000,000) \\ = & 43,500,000 \end{aligned}$$

- (ii) **Embedded Value** = Adjusted Book Value + Value of Inforce Business

$$\text{Embedded Value} = 43,500,000 + 75,000,000 = 118,500,000$$

- (iii) **Actuarial Appraisal Value** = Embedded Value + Value of Future New Business

$$\text{Actuarial Appraisal Value} = 118,500,000 + 40,000,000 = 158,500,000$$

- (iv) Total Company Value is the appraisal value, plus additional adjustments such as brand value/market position/buyer's synergies or general market conditions. These adjustments are for items that are not included in the financial statements.

$$\text{Total Company Value} = \text{Actuarial Appraisal Value} + \text{Intrinsic Value of Brand Name}$$

$$\text{Total Company Value} = 158,500,000 + 20,000,000 = 178,500,000$$

8. Continued

- (c) Explain the impact of the following items on the purchase price of XYZ:
- (i) The level of confidence in the underlying assumptions used to calculate the value of inforce and value of future business.
 - (ii) The degree of urgency associated with the sale of XYZ.
 - (iii) Rising interest rate environment.
 - (iv) Concerns that XYZ's target market is becoming saturated or oversold.

Commentary on Question:

This part of the question tested the application of concepts to different scenarios. It tested the candidates' ability to carefully consider the impact on XYZ's valuation and describe their rationale. Full credit was received for explicitly stating the impact on the price and appropriate explanation. Most candidates did better on the later parts. Most candidates received partial credit for part (i) as candidates did not explicitly mention the provisions for adverse deviation. For part (ii) appropriate credit was received for recognizing the buyer/seller perspectives. Several candidates discussed these perspectives but did not explicitly state the price impact, for which partial credit was received. In part (iii) several candidates did not mention the required rate of return by the buyer, for which credit was not received. In part (iv) several candidates did not mention the impact on future new business.

- (i) The greater the uncertainty (lower confidence) around assumptions, the higher the volatility and therefore higher PADs (provisions for adverse deviations) are required. These PADs are not used directly in the best estimate valuation of the business, but are considered for the overall price.

ABC would require a lower price to reflect this uncertainty.

- (ii) The greater the urgency to sell, the lower the price.

Urgency signals financial distress on XYZ's end.

As XYZ is in a hurry to sell, they might take less time to do the due diligence. ABC might view a rushed due diligence as a risk, and therefore require a lower purchase price.

8. Continued

- (iii) In a rising rate environment, the buyer would naturally desire a higher rate of return.

A higher rate of return would increase the discount rates at which future cashflows from XYZ's business are discounted, to calculate the present value.

This would lower the profitable value of inforce and new business.

The buyer would require a lower price to accommodate this.

- (iv) If the market in which XYZ sells products becomes saturated, it could potentially lower future new business sales estimates.

This would in turn, decrease the value of future new business.

The buyer would require a lower price to accommodate this.

9. Learning Objectives:

6. The candidate will understand the fundamental features of the U.S. and International regulatory framework.

Learning Outcomes:

- (6a) The features of the U.S. regulatory regime and the forces which are shaping the evolution of the regime.
- (6b) The features of the emerging International regulatory framework, and its development in Canada.

Sources:

Regulatory Capital Adequacy for Life Insurance Companies: A Comparison of Four Jurisdictions (including spreadsheet)

LFM-847-20: Life Insurance Regulatory Framework, OSFI, 2012

LFM-144-20: The Modernization of Insurance Company Solvency Regulation in the US, Klein, Networks Financial Institute Policy Brief, 2012 (exclude Sections 7 and 9)

Commentary on Question:

This question tested the candidates' understanding of different regulatory regimes. Candidates had to identify areas where the provided statements were true and address areas that needed to be altered. Partial credit was received where appropriate. Candidates that simply answered "True" or "False" received limited credit and did poorly on this question.

Solution:

Critique the following statements:

- A. *Canadian life insurance companies should set their capital level equal to the minimum capital requirements set forth in OSFI's regulatory framework.*
- B. *ORSA in the US is very prescriptive and is a good replacement for the regulatory financial examinations conducted by the state regulators on their domiciled insurance companies.*
- C. *The two levels of capital requirements under Solvency II are the Solvency Capital Requirement and Minimum Capital Requirement.*
- D. *When the liability mix changes from a majority of term products to a majority of payout annuity products, the insurance risk capital will be higher under the US and Canada jurisdictions.*

9. Continued

- E. *All of Risk Based Capital (RBC), Life Insurer Capital Adequacy Test (LICAT), Solvency II and Bermuda Insurance Solvency (BIS) frameworks use a combination of model-based and factor-based approaches. RBC and LICAT are primarily factor-based, while Solvency II and BIS are primarily model based.*
- F. *All of RBC, LICAT, Solvency II and BIS are calculated on a net of reinsurance basis. For companies ceding business to reinsurers under YRT and coinsurance, amounts of both the assets and liabilities are excluded from the capital calculations.*
- G. *RBC, LICAT, Solvency II and BIS all consider liability/insurance risks, asset/investment risks, and operational risks.*
- H. *Under BIS, the Economic Balance Sheet liability is equal to the best estimate liability using the fair value approach.*
- I. *For RBC, both C-3 Phase I and C-3 Phase II need to be calculated using a stochastic approach for variable annuities.*
- J. *Bermuda companies are required to calculate a Target Capital Level (TCL) and a Minimum Margin for Solvency (MSM). The definition of available capital is based on the Economic Balance Sheet for both TCL and MSM.*

A: The statement is incorrect. Companies should not simply rely on the minimum regulatory capital requirements established by OSFI. Instead, companies should hold higher levels of capital than the minimum level. Some reasons for holding a higher level of capital than the minimum requirements are provide below:

- Each company has its own unique risk appetite
- Companies should ensure they are well in excess of these ratios as breaching these will trigger OSFI to take regulatory control of the company

B: The statement is incorrect. ORSA is not very prescriptive in the US. The ORSA manual offers insurers flexibility on the preparation of their ORSA reports. ORSA doesn't replace, but complements the financial examination.

C: This statement is True. The Solvency Capital Requirement (SCR) is the level of capital at which a company would be expected to be solvent over the next year with a 99.5% (1-in-200) probability. The Minimum Capital Requirement (MCR) is the level of capital under which the regulator would have to intervene, that is set at a level where the company would be expected to remain solvent over the next year with 85% probability.

9. Continued

D: This statement is False. In the US, the shift in product mix could provide a large positive impact on the capital requirement ratio because payout annuities have lower capital requirement due to lower C2 insurance risk. C2 is likely to be lower for payout annuities than term life because C2 is based on net amount at risk (NAR) and NAR is lower for payout annuities than term products. In Canada insurance risk encompasses both mortality and longevity risk and thus insurance risk impacts could vary.

E: It is true that all of Risk Based Capital (RBC), Life Insurer Capital Adequacy Test (LICAT), Solvency II and Bermuda Insurance Solvency (BIS) frameworks use a combination of model-based and factor-based approaches. However, LICAT, Solvency II, and BIS generally require modeling of assets and liabilities to determine required capital and may also involve some factor-based components. NAIC RBC is primarily factor-based, with some model-based components.

F: It is true that all of RBC, LICAT, Solvency II and BIS are calculated on a net of reinsurance basis and for companies ceding business under coinsurance, amounts of both the assets and liabilities are excluded from the capital calculations as they no longer retain either assets or the liabilities on their books. However, for companies ceding business under YRT, only amount of liabilities is excluded from the capital calculations, as the assets remain with the company but the ceded liability risk does not.

G: This statement is True. All of RBC, LICAT, Solvency II and BIS considered consider liability/insurance risks, asset/investment risks, and operational risks, and most of these risks are further subdivided.

H: The EBS liability should equal to Best Estimate Liability plus Risk Margin, though it is true that it is using a fair value approach.

I: It is true that both C3 Phase I and C3 Phase II use stochastic processing. However, C3 Phase I applies to certain fixed annuity products and C3 Phase II applies to variable annuity products, thus only C3 Phase II is needed for variable annuities.

J: It is true that Bermuda companies are required to calculate a Target Capital Level (TCL) and a Minimum Margin for Solvency (MSM). However, the MSM's definition of available capital is based on the Bermuda Statutory financial statements and the TCL's definition of available capital is based on the EBS financial statements.