CURATED PAST EXAM ITEMS
- Questions -

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

Important Information:

- 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.
- Where an item applies to multiple learning objectives, it has been placed under each applicable learning objective.
- 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.
- 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 The inclusion in these curated past exam questions of material that is no longer current does not bring such material into scope for current assessments.
- 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 Questions

All Learning Objectives

Learning Objective 1: US Financial Reporting Requirements

Learning Objective 2: Capital Management

Learning Objective 3: Management & Evaluation of Life Insurance Risks

Learning Objective 4: Advanced Project Management

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

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

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1. Fall 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)

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

1.

(10 points) For a block of life contingent payout annuities with a 2 year term-certain period, you are given:

- 100 policies were issued in the same year.
- Each policy has an initial premium of 10,000 with a fixed annual annuity benefit of 2,000.
- Commission is 5% of premium and no other expenses.
- The locked-in discount rate is 4.5%.
- Policies in force are used as the DAC amortization basis.
- Annuity benefit payment is used as the deferred profit liability (DPL) amortization basis.
- Benefit payment occurs at the end of the year based on survivorship at the beginning of the year.

(a) **(LO 1b)** (*6 points*) 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

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

(ii) DAC

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

(iii) DPL

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

(b) **(LO 1b)** *(2 points)* 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.

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

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

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

(c) **(LO 1b)** *(2 points)* 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.

ANSWER:

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.

ANSWER:

2. Fall 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:

(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

2.

(*12 points*)

(a) **(LO 1b)** (*4 points*) 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.

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

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

ANSWER:

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

ANSWER:

~~(b)~~ (*4 points*) **(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.*~~

ANSWER:

~~*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.*~~

ANSWER:

~~*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.*~~

ANSWER:

(c) **(LO 1a, 1b)** (*4 points*) 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

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

3. Fall 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.

Relevant Sources:

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

3.

(*8 points*)

(a) **(LO 1a)** (4 *points*) 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.

ANSWER:

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

ANSWER:

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

ANSWER:

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.*

ANSWER:

(b) **(LO 1a)** (4 *points*) 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.

The response for this part is to be provided in the Excel 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)

4.

(*8 points*) Company A is performing margin analysis on their 20-year term life product under VM-20.

(a) **(LO 1a)** (*2 points*) 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

PV(Benefits) for Scenario 09 = 2,500

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

(b) **(LO 1a)** (*3 points*) 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

ANSWER:

(ii) Company C

ANSWER:

(c) **(LO 1a))** (*3 points*) 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%

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

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

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

7.

(*8 points*)

(a) **(LO 2d)** (*3 points*) 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.*

ANSWER:

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

ANSWER:

~~(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.*~~

ANSWER:

(b) **(LO 2d)** (*3 points*) 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.*

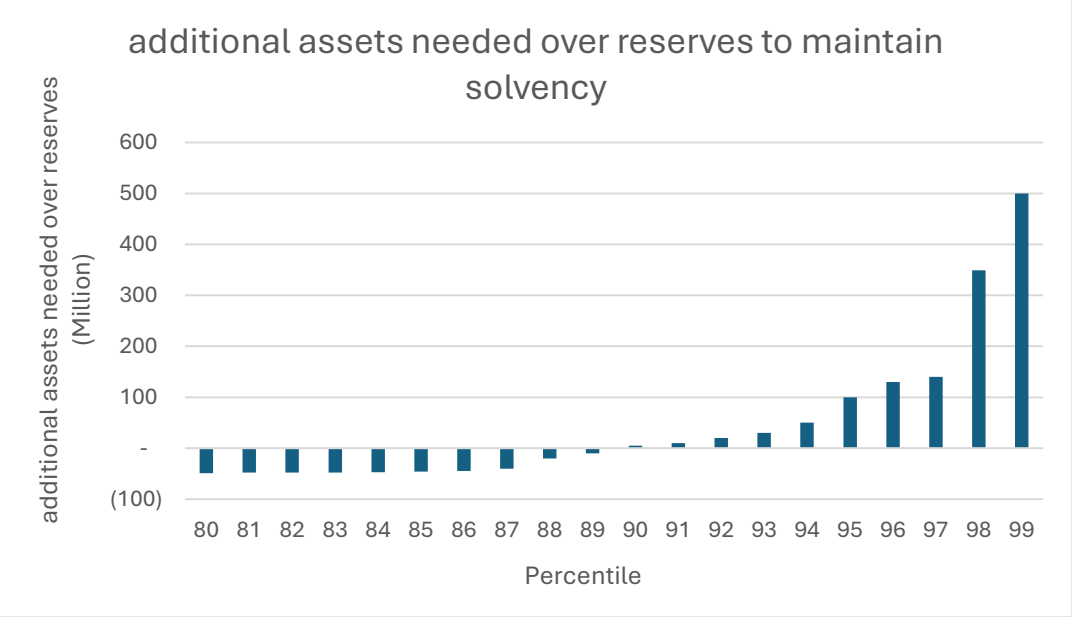
Stakeholder 3: *We need to go above and beyond our minimum requirements. Reducing the risk of insolvency is key to our future success. CJA Life needs to strengthen their credit rating to attract new business.*

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.

(c) **(LO 2d)** (*2 points*) 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.

ANSWER:

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

1.

(*8 points*) XYZ Life sells a variable annuity (VA) with a guaranteed minimum death benefit (GMDB) rider and uses the non-option approach to value the market risk benefit (MRB) on the GMDB rider.

You are given:

- Valuation date is the end of year 2
- Two scenarios are adequate for the calculation of the MRB
- The annuity is assumed to surrender after the 10^{th} year
- Fees are collected at the beginning of each year
- Projected account values and minimum death benefit values are at the end of the year, and all death benefits are paid at the end of the year
- Within the year, mortality is assumed to occur before other decrements are considered
- Persistency shown includes the effect of all decrements
- Data is given in the tables in the Excel spreadsheet

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

ANSWER:

(b) **(LO 1b)** (*5 points*) Calculate the GMDB Market Risk Benefit (MRB) liability at the valuation date. Show all work.

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

(c) **(LO 1b)** (*2 points*) Calculate the Accumulated Other Comprehensive Income (AOCI) at the valuation date. Show all work.

The response for this part is to be provided in the 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

2.

(*11 points*) You are a valuation actuary at QWE Life, a company that recently entered into the market for long term care (LTC) products.

(a) **(LO 1.b)** (*4 points*) 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.

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

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

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

(b) **(NO LONGER RELEVANT)** ~~(*3 points*)~~ ~~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.~~

ANSWER:

~~(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.~~

ANSWER:

(c) (*4 points*) 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.

ANSWER:

(ii) Results in the highest GAAP net income.

ANSWER:

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

Justify your answer.

ANSWER:

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)

4.

(*8 points*) ABC Life uses VM-20 for a block of newly issued universal life insurance policies.

(a) **(LO 1.a)** (*2 points*) Critique the following statements:

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

ANSWER:

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.

ANSWER:

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

ANSWER:

(b) **(partially relevant)** (*2 points*) 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

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

(c) **(LO 1.a)** (*2 points*) Describe the steps to determine the prudent estimate mortality assumption given that ABC's mortality experience is only partially credible.

ANSWER:

(d) **(NO LONGER RELEVANT)** (*2 points*) ~~Describe the factors that can impact ABC Life's mortality improvement assumptions under a significant pandemic, such as COVID-19.~~

ANSWER:

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

5.

(*11 points*) PGY Group is a reinsurance company headquartered in the US, with legal entities in other jurisdictions. PGY reinsures business written in North America, Europe, Australia, and Japan. Depending on the location, PGY's entities follow US Statutory Accounting, US GAAP (LDTI), or IFRS 17.

(a) **(LO 1.a & 1.b)** (*4 points*) 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:

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

ANSWER:

(ii) US GAAP Reserve

Justify your answers.

ANSWER:

(b) **(LO 1.a)** (*2 points*) 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].

ANSWER:

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.

ANSWER:

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

ANSWER:

(c) **(NO LONGER RELEVANT)** (*5 points*) ~~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.~~

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

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

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

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

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

~~(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.~~

ANSWER:

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)

6.

(*9 points*)

(a) **(LO 1.a)** (*3 points*) 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.

(b) **(NO LONGER RELEVANT)** (*3 points*) ~~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~~
~~$\ddot{a}_{46:7}$~~	~~6.57~~	~~6.22~~	~~5.89~~

~~Calculate the following:~~

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

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

~~(ii) Guideline Level Premium~~

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

~~(iii) Guideline Single Premium~~

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

~~(iv) 7-Pay Premium~~

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

~~Show all work.~~

(c) **(NO LONGER RELEVANT)** (*3 points*) ~~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.

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

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

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

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

ANSWER:

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

7.

(*7 points*)

(a) **(LO 2.a & 3c)** (*2 points*) 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.

ANSWER:

(b) **(LO 3c)** (*2 points*) 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.*

ANSWER:

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

ANSWER:

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.*

ANSWER:

(c) **(LO 2.a)** (*3 points*) 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%.

ANSWER:

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

ANSWER:

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

ANSWER:

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

8.

(*9 points*) CWY Asset Management is acquiring ELF Insurance Company

(a) **(LO 4d)** (*2 points*) 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.

ANSWER:

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

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

(b) **(LO 4d)** (*5 points*) 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.

List formulas for the following information:

(i) Book profit

(ii) Cost of Capital

(iii) Inforce Business Value

(iv) Calculate Embedded Value

Show all work.

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

(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.

ANSWER:

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

ANSWER:

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

ANSWER:

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.

ANSWER:

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

1.

(*9 points*) MGP is a financial firm that sells term life insurance, life annuities, mutual funds, and segregated funds. They are introducing a risk capital framework to assist their corporate decision making.

(a) **(LO 2d)** (*1 point*) Critique the following statements regarding a risk capital framework:

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.*

ANSWER:

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.*

ANSWER:

(b) **(LO 2d)** (*6 points*) 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) (*2 points*) Calculate the variance of business profits of a portfolio consisting of mutual funds and segregated funds.

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

(ii) (*4 points*) Calculate the proportion of unallocated risk capital for MGP at the end of the second year.

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

(c) (*2 points*) 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.

ANSWER:

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

2.

(*6 points*) MSF Life sells a fixed indexed annuity without a fixed account and without any optional riders.

(a) **(LO 1b)** (*1 Point*) 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.

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

(b) **(LO 1b)** (*5 points*) 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.

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

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

3.

(*12 points*) ALY Life is preparing GAAP financial statements for a block of 1,000 10-year certain and life-contingent SPIA contracts issued on January 1, 2023.

You are given:

- Issue age: 65
- Benefit payment: 110 per year per policy during both life-certain and life-contingent periods
- Benefit payments started on the issue date
- Level maintenance expense: 10 per year per policy
- Initial single premium: 1000 per policy
- Commission rate: 3.0% of premium paid at issue
- Deferrable acquisition expense: 65 per policy
- Non-deferrable acquisition expense: 20 per policy
- Best estimate annual mortality rate

  20% for $65 \leq \text{Age} < 92$

  100% for $\text{Age} = 92$

- Provision for Adverse Deviation (PAD): 10% on mortality
- Annual reserve discount rate = 4.25%
- Assume no Deferred Profit Liability (DPL)

(a) **(LO 1b)** (*5 points*) Calculate the projected Liability for Future Policyholder Benefits (LFPB) at the end of the third policy year.

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

(b) **(LO 1b)** (*4 points*) Calculate the projected DAC at the end of the third policy year using the group contract method.

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

(c) **(LO 1b)** (*3 points*) 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.

The response for this part is to be provided in the 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

5.

(*10 points*) XYZ Life has a block of 20-year level term policies issued in 2018.

(a) **(LO 1a)** (*1 point*) 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.

(b) **(LO 1a)** (*3 points*) 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.*

ANSWER:

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

ANSWER:

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

ANSWER:

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.

ANSWER:

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.

ANSWER:

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

ANSWER:

(c) **(LO 1a)** (*2 points*) 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

ANSWER:

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

ANSWER:

(d) **(LO 1a)** (*4 points*) 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.

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

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

ANSWER:

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

ANSWER:

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

6.

(*7 points*)

(a) **(LO 1a)** (*2 points*) 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.

ANSWER:

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

ANSWER:

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

ANSWER:

6. Continued

(b) **(LO 1a)** (*5 points*) 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.

The response for this part is to be provided in the 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

7.

(*7 points*) BFB Life Insurance company has a block of universal life (UL) business issued between 2000-2022.

(a) **(LO 1a)** (*2 points*) Compare the following under Universal Life Insurance Model Regulation and VM-20's Net Premium Reserve (NPR).

(i) Guaranteed Maturity Premium

ANSWER:

(ii) r-ratio

ANSWER:

(iii) Reserve calculation assumptions

ANSWER:

(iv) Minimum reserve floor

ANSWER:

(b) **(LO 1a)** (*3 points*) 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%.

ANSWER:

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

ANSWER:

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

ANSWER:

(c) **(LO 1a)** (*2 points*) 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.

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

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

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

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

1.

(*8 points*)

(a) **(LO 3c)** (*1 point*) List the major areas that should be discussed in the Own Risk and Solvency Assessment (ORSA) Summary Report.

ANSWER:

(b) **(LOs 2a, 2b, 2c, 2d)** (*5 points*) 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.*

ANSWER:

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.*

ANSWER:

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

ANSWER:

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.*

ANSWER:

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.*

ANSWER:

1. Continued

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

(i) Capital adequacy

ANSWER:

(ii) Risk appetite

ANSWER:

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

2

(*6 points*)

(a) **(LO 1b)** (*2 points*) 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

ANSWER:

(ii) Embedded derivatives

ANSWER:

2. Continued

(b) **(LO 1b)** (*4 points*) 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.

				Undecremented		Decremented	
Yr	Mortality	Persistency	Index Credit	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

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

(ii) Host value

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

Show all work.

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

3.

(*10 points*) You have been asked to develop a DAC asset schedule for a new level-premium 5-year renewable term product to be issued on January 1, 2024.

You are given the following:

Number of policies issued on January 1, 2024	10,000
Average premium per thousand of insurance issued	1.75
Average policy size	250,000
Commissionable policy fee	50
Inflation per year	2.25%
Percentage of successful sales	40%
For simplicity assume no mortality	

Duration	Termination Rate	Commission as % of Premium	Commission Override as % of Commission	Premium Tax
1	20%	90%	100%	2%
2	10%	20%	25%	2%
3	5%	10%	10%	2%
4	5%	10%	10%	2%
5	100%	5%	10%	2%

Duration	Marketing and Advertising Expenses Per Policy	Issue Expense Per Policy	Underwriting Expense per 1000 of Insurance	Maintenance Expenses Per Policy	Overhead Expense Per Policy
1	45	50	15	50	75
2	0	0	0	50	75
3	0	0	0	50	75
4	0	0	0	50	75
5	0	0	0	50	75

(a) **(LO 1b)** (*2 points*) Calculate the deferrable acquisition expenses per individual policy.

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

(b) **(LO 1b)** (*6 points*) 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

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

(ii) Grouped Contract Approach

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

(c) (LO 1b) Recommend an approach for calculating the DAC asset. Justify your answer

ANSWER:

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

4.

(*10 points*) IKC Life plans to start issuing 10-year term, universal life, and payout products.

(a) **(LO 1b)** (*4 points*) 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.

ANSWER:

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.*

ANSWER:

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.*

ANSWER:

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.*

ANSWER:

(b) **(LO 1b)** (*6 points*) For the 10-year level premium level death benefit term product, you are given:

- All policies are issued on 1/1/2022
- No lapses
- No cash value
- Initial face amount = 1,000,000
- Initial premium = 10,000
- No claim-related expenses

Year	Spot rates as of 1/1/2022	Spot rates as of 1//1/2023	Mortality as of 1/1/2022
1	3%		0.10%
2	3.20%	3%	1.00%
3	3.30%	3.20%	1.2%
4	3.40%	3.40%	1.32%
5	3.50%	3.60%	1.45%
6	3.60%	3.80%	1.60%
7	3.70%	4.00%	1.76%
8	3.80%	4.20%	1.93%
9	3.90%	4.40%	2.13%
10	4.00%	4.60%	2.34%

Calculate the following as of 1/1/2023:

(i) GAAP reserve

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

(ii) Accumulated Other Comprehensive Income

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

Show all work.

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 Valuation 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)

5.

(*10 points*)

(a) **(LO 1a)** (*5 points*) 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)
Valuation mortality	

Age	2012 IAM Male Age Nearest Birthday (1000qx)	Projection Scale G2 Male, Age Nearest Birthday
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%

Full surrender during the guarantee period is allowed, but incurs a surrender charge according to the following surrender charge schedule

Year	Surrender Charge %
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.

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

(b) **(LO 1a)** (*5 points*) 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.

ANSWER:

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.*

ANSWER:

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.*

ANSWER:

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.*

ANSWER:

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.*

ANSWER:

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

6.

(*7 points*) SYL Life uses the Limited Fluctuation method to determine the credibility of its own mortality experience by count. You are given:

- r = 0.10
- z-value = 1.96
- Mortality A/E ratio = 85% by count
- Mortality A/E ratio standard deviation = 0.03 by count
- 2015 VBT

(a) **(NO LONGER RELEVANT)** (*1 point*) ~~Calculate the Limited Fluctuation credibility factor Z. Show all work.~~

(b) **(NO LONGER RELEVANT)** (*3 points*) ~~Describe the considerations for SYL Life to transition to VM-20, with respect to the following credibility methods:~~

~~(i) Limited Fluctuation~~

~~ANSWER:~~

~~(ii) Bühlmann Empirical Bayesian~~

~~ANSWER:~~

(c) **(LO 1a)** (*3 points*) 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.*

ANSWER:

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.*

ANSWER:

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.*

ANSWER:

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

ANSWER:

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.*

ANSWER:

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

7.

(*10 points*) MSY Life is preparing the VM-20 valuation.

(a) **(LO 1a)** (*4 points*) 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.

ANSWER:

MSY Life has a UL policy beyond the secondary guarantee period. You are given the following information:

- Issue Age: 35
- Face amount: 1,000,000
- Current fund value at the end of year 5: 5,000
- Guaranteed maturity premium (GMP): 7,500
- Guaranteed maturity fund (GMF) at the end of year 5: 34,350
- No surrender charges

	A_x	$\ddot{a}_x$
35	0.09653	18.9728
36	0.10101	18.8788
37	0.10569	18.7805
38	0.11059	18.6777
39	0.11571	18.5701
40	0.12106	18.4578

(b) **(LO 1a)** (*3 points*) Calculate the Net Premium Reserve under VM-20 (ignoring expense allowance) at the end of year 5. Show all work.

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

(c) **(LO 1a)** (*3 points*) 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

The response for entire part (c) is to be provided in the Excel spreadsheet.

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

10.

(*6 points*)

(a) **(NO LONGER RELEVANT)** (*1 point*) ~~Describe two methods of determining a discount rate when assessing a merger and acquisition transaction.~~

(b) **(LO 4d)** (*5 points*) PDX Life is calculating Embedded Value (EV) on a block of business.

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

ANSWER:

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

ANSWER:

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

ANSWER:

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

ANSWER:

****END OF EXAMINATION****

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

3.

(*10 points*)

(a) **(LO 1a)** *(2 points)* 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

ANSWER:

(ii) Assumptions

ANSWER:

3. Continued

(b) **(LO 1a)** *(4 points)* 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.

ANSWER:

(ii) Historically, sales have been limited to ages 18-50, but have been expanded to include ages 51-65 in the last 3 years.

ANSWER:

(iii) XYZ expects increased deaths from COVID-19 for the next 3 years.

ANSWER:

(iv) XYZ has implemented new underwriting guidelines that it expects to result in future mortality improvement.

ANSWER:

(v) XYZ does not have the capability to model mortality stochastically.

ANSWER:

(c) **(NO LONGER RELEVANT)** ***(4 points)*** ~~Evaluate the following e-mail for~~

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

~~compliance with the NAIC Life Insurance Illustration Model Regulation:~~

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

4.

(*11 points*)

(a) **(LO 1b)** *(3 points)* 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

ANSWER:

(ii) Guaranteed lifetime withdrawal benefit on a fixed-indexed annuity

ANSWER:

(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

ANSWER:

(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

ANSWER:

(b) **(LO 1b)** *(3 points)* 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.

ANSWER:

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.

ANSWER:

C. If a contract contains multiple MRBs, those MRBs shall be bundled together as a single compound MRB in the fair value determination.

ANSWER:

(c) **(LO 1b)** *(3 points)* You are given the following information about a variable annuity contract with a GMAB and GMDB rider:

- Fees of 1.5% of the account value will be deducted from the account balance each year.
- The present value of the benefits to be paid in excess of the account balance using fair value assumptions:

	GMAB only	**GMDB only**	**GMAB and GMDB**
At inception	4,000	1,000	4,500
Year 4	5,000	2,000	6,000

- The present value of fees collected from the account using fair value assumptions:

	PV of fees collected from the account
At inception	15,000
Year 4	10,000

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

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

(ii) The value of the MRB at year 4

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

Show all work.

(d) **(LO 1b)** *(2 points)* 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

ANSWER:

(ii) Embedded derivative

ANSWER:

(iii) Host

ANSWER:

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.

5.

(*11 points*)

(a) **(LO 1b)** *(3 points)* 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.

ANSWER:

B. Under ASU 2018-12, contracts are grouped in cohorts to measure the liability. These cohorts can include contracts from different issue years.

ANSWER:

~~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.*~~

~~ANSWER:~~

D. Market risk benefits are measured at fair value. The change in fair value is recognized in other comprehensive income (OCI).

ANSWER:

(b) **(LO 1b)** *(4 points)* 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.

ANSWER:

(ii) Describe "other than nominal" capital market risk that is relevant to VLF's FIA product.

ANSWER:

(c) **(LO 1b)** *(2 points)* Describe the new disclosures with respect to ASU 2018-12 for the following:

(i) liability for policyholder's account balances and additional liability

ANSWER:

(ii) market risk benefits

ANSWER:

(d) **(LO 1b)** *(2 points)* List the disaggregation principles that insurers will need to apply to the new required disclosure under ASU 2018-12.

ANSWER:

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

6.

(*9 points*) AIF Life is a global insurance group that operates in both the United States and European countries. MJE Life is a US-based subsidiary of AIF that primarily sells Single Premium Deferred Annuity (SPDA) to mid-income households. You are given the following information:

- The SPDA does not have surrender charges
- MJE has an overall asset duration of 10.5 and liability duration of 9.5
- The Authorized Control Level RBC for MJE is 2.0

	AIF	**MJE**	**Total of All Other Subsidiaries of AIF (Non-US)**
Total Available Capital	20.0	5.0	15.0
Minimum Regulatory Capital	6.0	2.0	3.0

(a) **(LO 2a)** (6 points) 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.

ANSWER:

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.

ANSWER:

C. 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.

ANSWER:

D. The C-4 business risk capital for MJE will be 0 because AIF Life will allocate C-4 at Total Company level.

ANSWER:

E. 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.

ANSWER:

~~(b)~~ **(NO LONGER RELEVANT)** ~~Calculate the Group Capital Ratio for AIF. Show all work.~~

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

(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*.~~

~~ANSWER:~~

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

7.

(*9 points*) Company DEF plans to fully adopt ASU 2018-12 by the end of the current year.

(a) **(LO 1b)** *(4 points)* Critique each of the following approaches.

i. *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.*

ANSWER:

ii. *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%.*

ANSWER:

iii. *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).*

ANSWER:

iv. *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.*

ANSWER:

You are also given the following information for a group of life insurance policies sold by Company DEF in a month:

	First Year Cashflow	**Risk-adjusted PV at issue**
Premium	28,000	249,000
Commission	28,000	28,000
Premium tax	560	4,980
Policy underwriting expense	8,000	8,000
Policy service expense	1,000	18,550
Policy benefits	1,030	187,000

Assume risk-adjusted PV are calculated using current assumption at issue.

These policies are in the same GAAP cohort / IFRS 17group.

(b) **(LO 1b)** *(1 point)* Calculate GAAP DAC capitalization at issue.

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

(c) **(NO LONGER RELEVANT)** ~~*(2 points)* Calculate the amount of contractual service margin at issue for this group under IFRS 17.~~

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

(d) **(NO LONGER RELEVANT)** *(0.5 points)* ~~Determine if this group of contracts is onerous per IFRS 17. Justify your answer.~~

~~ANSWER:~~

(e) **(NO LONGER RELEVANT)** *(1.5 points)* ~~Describe how reinsurance contracts held should be accounted under IFRS 17.~~

~~ANSWER:~~

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

You are also given the following information for a group of life insurance policies sold by Company DEF in a month:

	First Year Cashflow	**Risk-adjusted PV at issue**
Premium	28,000	249,000
Commission	28,000	28,000
Premium tax	560	4,980
Policy underwriting expense	8,000	8,000
Policy service expense	1,000	18,550
Policy benefits	1,030	187,000

Assume risk-adjusted PV are calculated using current assumption at issue.

These policies are in the same GAAP cohort / IFRS 17group.

(b) (*1 point*) Calculate GAAP DAC capitalization at issue.

The response for this part is to be provided in the Excel document.

(c) (*2 points*) Calculate the amount of contractual service margin at issue for this group under IFRS 17.

The response for this part is to be provided in the Excel document.

(d) (*0.5 points*) Determine if this group of contracts is onerous per IFRS 17. Justify your answer.

ANSWER:

(e) (*1.5 points*) Describe how reinsurance contracts held should be accounted under IFRS 17.

ANSWER:

8.

(*11 points*)

(a) **(LO 1a)** *(6 points)* 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.*

ANSWER:

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.*

ANSWER:

C. *To qualify as a clearly defined hedging strategy, the strategy must specify the risks being hedged and instruments used for hedging.*

ANSWER:

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.*

ANSWER:

E. *Disintermediation risk, annuitization risk, and reinsurer default risk should be reflected in the VM-21 reserve calculation.*

ANSWER:

F. *If the VM-21 total reserve equals the standard scenario amount, there is no need to allocate the results to the contract level.*

ANSWER:

(b) **(NO LONGER RELEVANT)** ~~*(4 points)* 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~~

~~ANSWER:~~

~~(ii) Guideline Level Premium~~

~~ANSWER:~~

~~(iii) Guideline Single Premium~~

~~ANSWER:~~

~~(iv) CVAT Corridor Factor~~

~~ANSWER:~~

~~Justify your response.~~

(c) **(NO LONGER RELEVANT)** *(1 point)* ~~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.~~

~~ANSWER:~~

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

9.

(*11 points*)

(a) **(LO 1b)** *(5 points)* 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.

ANSWER:

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.

ANSWER:

C. The concept of loss recognition applies to investment contracts under SFAS97.

ANSWER:

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.

ANSWER:

E. The concept of locked-in assumptions is applicable to investment contracts.

ANSWER:

F. Margins for adverse deviations should be included in setting assumptions for investment contracts.

ANSWER:

(b) **(LO 1b)** *(6 points)* 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%

With respect to the Constant Yield Method:

(i) *(2 points)* Calculate the discounted interest rate needed to determine the net policy reserves. (Hint: Use IRR function in Excel to determine this interest rate.)

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

(ii) *(1 point)* Calculate the GAAP net policy reserves for the end of each policy year 1 through 5.

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

(iii) *(3 points)* Determine the GAAP profit for each policy year 1 through 5, assuming actual realized experience match the assumed assumptions.

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

Show all work.

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)

10.

(*13 points*)

(a) **(LO 1a)** (10 points) 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.

With respect to the calculations provided in the spreadsheet:

(i) *(8 points)* Revise the calculations, where necessary, to assure the accurate calculation of pre-PBR CRVM and deficiency reserves.

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

(ii) *(2 points)* Assume the above policies are issued on January 1, 2022. Calculate the Deterministic Reserve as of December 31, 2022 using the Prospective Method.

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

(b) **(NO LONGER RELEVANT)** ~~*(3 points)* 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*.~~

ANSWER:

****END OF EXAMINATION****

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)*

(10 points) ABC Life Insurance is building an Economic Capital (EC) framework. Management is having a discussion regarding whether to use the finite risk horizon approach or the liability run off approach.

(b) **(LO 2b)** (*6 points*) Compare and contrast the two approaches based on each of the following management considerations:

(i) We use buy-and-hold strategy for fixed interest investment and intend to closely match assets and liabilities.

ANSWER:

(ii) We want to know how many assets are required to cover liabilities with some degree of security.

ANSWER:

(iii) We closely monitor changes in market conditions and respond accordingly. We want to reflect these actions in the Economic Capital framework.

ANSWER:

(iv) We believe that yield curves eventually go back to normal after extreme market events.

ANSWER:

(v) We want to be consistent with the reality of capital management and regulatory reporting that requires capital to be calculated on an annual basis.

ANSWER:

(vi) We hope to easily calibrate EC to a target security level.

ANSWER:

ABC has a liability cash flow projection model for reserve calculation. The model uses a population mortality table plus a PAD as base mortality table; it uses average historical mortality improvement derived from data from the past century. The discount rate is prescribed by regulation.

ABC observes mortality volatilities from various sources and decides to modify this model to do a stochastic projection for economic capital.

(b) **(LO 2b)** (*4 points*) Recommend changes to the current liability projection model in order to accomplish ABC's intended objective.

ANSWER:

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

(*8 points*) ALF Life is transitioning its term and ULSG blocks of business to calculate reserves using VM-20. ALF does not have a clearly defined hedging strategy on these products.

(a) **(LO 1a)** (*2 points*) Regarding starting assets and the use of a discount rate, describe 2 approaches that can be used to calculate deterministic reserve.

ANSWER:

(b) **(LO 1a)** (2 *points*) Describe the purpose of the following exclusion tests:

(i) Deterministic Exclusion Test (DET)

ANSWER:

(ii) Stochastic Exclusion Test (SET)

ANSWER:

(c) **(LO 1a)** (*2 points*) 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.

ANSWER:

B. ALF's term and ULSG products are eligible for SET.

ANSWER:

(d) **(LO 1a)** (*2 points*) 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.

The response for this part is to be provided in the Excel document.

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*

(*7 points*) BBA Life insurance company is a multinational corporation.

(a) (*4 points*) Describe how capital for insurance risk should be addressed in the following:

(i) **(LO 2a)** United States

ANSWER:

(ii) **(NO LONGER RELEVANT)** ~~Canada~~

ANSWER:

(iii) **(NO LONGER RELEVANT)** ~~European Union~~

ANSWER:

You are given the following for the Canadian entity (in billions):

Tier 1 Capital	1.3
Tier 2 Capital	1.2

Surplus Allowances	0.2
Eligible Deposits	0.4
Base Solvency Buffer	3.0

~~(b)~~ **(NO LONGER RELEVANT)** ~~(*3 points*) 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.~~

~~*The response for this part is to be provided in the Excel document.*~~

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:

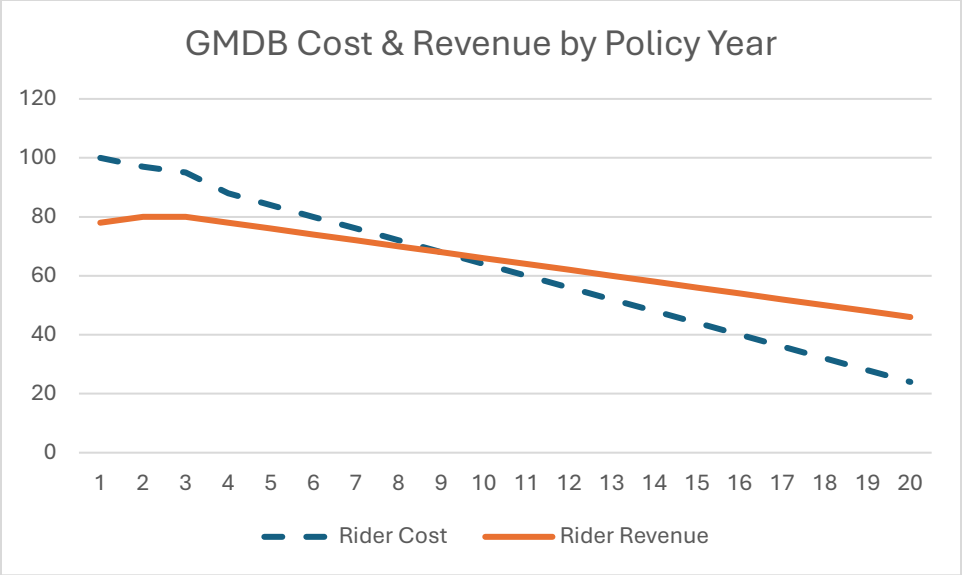
Statutory Valuation of Individual Life and Annuity Contracts, Claire, D., Lombardi, L. and Summers, S., 5th Edition, 2018

- *Chapter 24: VM 21: PBR for Variable Annuities*

Interactive Principle-Based Reserves Model

(*11 points*) XYZ Life, a US based company, started selling variable annuity (VA) products with guaranteed minimum death benefits (GMDB) in 2010. They currently offer two versions of the GMDB riders: a 5% roll-up guarantee and a return of premium guarantee. No other GMxBs are offered on XYZ's VA products. Rider fees are collected as a constant percent of account value.

(a) **(LO 1a)** (*3 points*) You are given the following graph of expected rider revenues and cost by policy year for the return of premium GMDB.



Critique the following statements:

A. *If the assumed volatility increased, the rider cost line would steepen causing the calculated reserve to decrease.*

ANSWER:

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.*

ANSWER:

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.*

ANSWER:

XYZ needs to update their statutory reserve calculations to meet the requirements for the 2020 revisions to VM-21.

(b) **(LO 1a)** (*3 points*) 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

ANSWER:

(ii) Partial surrender rate

ANSWER:

(iii) Mortality rate

ANSWER:

(c) **(LO 1a)** (*2 points*) Describe two methods that are available to XYZ if they choose not to use the Direct Iteration Method.

ANSWER:

(d) **(LO 1a)** (*3 points*) 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.

The response for this part is to be provided in the Excel document.

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)*

(*10 points*) You are given for a Single Premium Fixed Deferred Annuity:

Item	**Value and Units**
Single Premium	10,000
Initial Guaranteed Interest Rate	5%
Initial Guaranteed Rate Term	4 years
Ultimate Guaranteed Minimum Interest Rate	2%
Surrender Charge by policy year	10%, 8%, 6%, 4%, 2%
Front-End Load (% of Premium)	1.5%
Statutory Valuation Interest Rate	3%
Contract expires after 7th anniversary	

(a) **(LO 1a)** (*3 points*) Calculate the CARVM reserves, assuming the mortality rate is 0 and no partial withdrawals are available prior to contract maturity. Show your work.

The response for this part is to be provided in the Excel document.

(b) **(LO 1a)** (*4 points*) 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.

ANSWER:

(ii) Explain how incidence rates for each feature should be set.

ANSWER:

(c) **(LO 1a)** (*3 points*) Critique the following statements about CARVM for fixed annuities:

A. The statutory valuation rate is set at the product level.

ANSWER:

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%.

ANSWER:

C. Non-elective benefits are considered in a separate benefit stream.

ANSWER:

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.

ANSWER:

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

(a) **(LO 1a)** (*4 points*) 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.

ANSWER:

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.

ANSWER:

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.*

ANSWER:

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.*

ANSWER:

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.*

ANSWER:

(b) **(LO 1a)** (*3 points*) 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.

The response for this part is to be provided in the Excel document.

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

- *Chapter 1: Overview of Valuation Concepts (excluding 1.1-1.9)*
- *Chapter 2: Product Classifications (2.2 only)*
- *Chapter 10: Valuation Assumptions (excluding 10.1.3 & 10.3.8)*
- *Chapter 11: Valuation Methodologies (excluding 11.3.9-11.3.11)*
- *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*

(*7 points*) DJS Life insurance company sells variable deferred annuities with a Guaranteed Minimum Income Benefit (GMIB) rider which has a waiting period of 10 years. Some policyholders have exercised their options and annuitized their contracts.

You are given the following information for a policyholder at the time of annuitization:

- Year of annuitization: 2016
- Age at annuitization: 65
- Fund available for annuitization: 200,000
- Benefit payment: 1,000 per month
- Acquisition expense: 0
- Maintenance expense: 50 per year
- Best-estimate mortality: A2000
- Prescribed mortality: 1994 GAR

- Statutory interest rate: 3.0%
- Current portfolio yield: 6.0%

Annual annuity factors table:

Age	GAAP factors		Statutory factors	
	@ 3%	@ 6%	@ 3%	@ 6%
65	15.00	14.76	16.45	16.15
66	14.20	13.96	15.65	15.35
67	13.50	13.26	14.95	14.65
68	12.80	12.56	14.25	13.95
69	12.10	11.86	13.55	13.25
70	11.40	11.16	12.85	12.55

(a) **(LO 1a)** (*2 points*) Describe the considerations in setting the following policyholder behavior assumptions for valuing guaranteed minimum income benefits:

(i) Annuitization rates

ANSWER:

(ii) Lapse rates

ANSWER:

(b) **(LO 1a)** (*5 points*) Calculate the following reserves for the policy when the policyholder attains age 69.

(i) **(source partially answers)** US GAAP reserves

The response for this part is to be provided in the Excel document.

(ii) US statutory reserves

The response for this part is to be provided in the Excel document.

(iii) **(source partially answers)** Tax reserves

The response for this part is to be provided in the Excel document.

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

(LO 4d) (*10 points*) A consultant is developing a proposal to use embedded value analysis for explaining the value of the company's business. The following statements from the consultant have been highlighted for your review before they will be included in the report to the company's CFO.

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.

ANSWER:

B. Embedded Value is a more effective accounting basis that addresses the criticisms of current accounting methods.

ANSWER:

C. Embedded Value is the same as the actuarial appraisal value of a company when used for mergers and acquisitions.

ANSWER:

D. When calculating the Adjusted Net Worth, both the Required Capital and Free Surplus are assumed to earn market rates of return.

ANSWER:

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.

ANSWER:

F. It is essential to have a clearly defined process for the selection of assumptions in the calculation of the Embedded Value.

ANSWER:

G. All non-economic assumptions used in the Embedded Value calculation should be based on industry data plus a provision for adverse deviations.

ANSWER:

H. When calculating the Time Value of Financial Options and Guarantees (TVFOG) using stochastic scenarios, it is recommended to use "real-world" scenarios.

ANSWER:

I. The accurate calculation of the final Embedded Value is more important to investors than adequate disclosure of the movement.

ANSWER:

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.*

ANSWER:

11. 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 14: Universal Life (excluding 14.4.8, 14.4.9, 14.5.0 & 14.6.2-14.6.6)*

(*9 points*) A life insurance company is developing its first universal life policy with no secondary guarantees and no riders in 2022. To simplify the calculations, a proposal has been submitted to use the guaranteed maturity premium (GMP) as the guideline level premium (GLP).

(a) **(LO 1a)** (*6 points*) Explain what conditions must be met in order for the proposal to be valid for the following:

(i) Interest rate

ANSWER:

(ii) Endowment date

ANSWER:

(iii) Cost of insurance

ANSWER:

(iv) Expenses

ANSWER:

At contract issue, the GLP and GMP are identical, however the face amount is increased on the eighth anniversary.

~~(b)~~ **(NO LONGER RELEVANT)** ~~(*3 points*) Discuss how the increase in face amount will affect each of the GLP and the GMP.~~

~~ANSWER:~~

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*

(*9 points*) PCLC Life Insurance Company is currently an A-rated company by S&P. The company has recently implemented economic capital models in order to explore the implications of various capital levels on multiple key business objectives.

The following information is provided:

- Risk threshold by financial variables

Financial Variable	**Risk Threshold-Name**	**Risk Threshold-Quantity**	**Company Rating**
RBC Ratio	Default	100% of authorized level	D or Below
S&P Capital Adequacy Ratio (CAR)	One-Notch Downgrade	150%	BB or Below

- Simulated capital information

	RBC Default	**S&P CAR**

Probability of One-Notch downgrade or default over 1 year	0.05%	2%
Value at Risk (VaR) of RBC or S&P CAR	160%	190%
Mean of risk capital	650,000	740,000
Annual Discount Rate	3%	4%

(a) **(LO 2b, 2c)** (*2 points*) Calculate the amount of RBC and S&P capital available for release for year 1. Show all work.

The response for this part is to be provided in the Excel document.

(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.

The response for this part is to be provided in the Excel document.

(c) **(LO 2b, 2c)** (*5 points*) Critique the following statements:

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

ANSWER:

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.

ANSWER:

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.

ANSWER:

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

ANSWER:

3. 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

- *Ch. 29: Risk-Based Capital*

2(d) ILA201-800-25: Theory of Risk Capital in Financial Firms

(*7 points*) XBM Insurance Company sells guaranteed investment contracts (GICs).

You are given:

- XBM's GICs are fixed rate contracts with no withdrawal benefits before maturity
- Their corporate bond portfolio includes 1,000 different bonds that were issued by 500 different issuers.

RBC size factors:

Issuers	Size Factors
First 50	2.5
Next 50	1.3
Next 300	1.0
Over 400	0.9

(a) **(LOs 2a, 2d)** (*1 point*) Calculate the risk-based capital (RBC) weighted size factor for XBM's bond portfolio. Show all work.

The response for this part is to be provided in the Excel document.

(b) **(LOs 2a, 2d)** (*2 points*) Describe how XBM should evaluate each of the RBC C-3 risks for its GICs.

ANSWER:

(c) **(LOs 2a, 2d)** (*2 points*) 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.

The response for this part is to be provided in the Excel document.

(d) **(LOs 2a, 2d)** (*2 points*) 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.

The response for this part is to be provided in the Excel document.

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 3: Product Classification and Measurement*

(*10 points*)

~~(a)~~ **(NO LONGER RELEVANT)** ~~(*4 points*) 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.~~

~~*The response for this part is to be provided in the Excel document.*~~

(b) **(LO 1b)** (*6 points*) QRS Life is a U.S. life insurance company. You are given the following information for a block of level premium term life policies issued by QRS at the beginning of 2022:

- Projected values

Year	Premium	Insurance In Force at Beginning of Year
2022	15,000	1,500,000
2023	14,700	1,470,000
2024	14,400	1,440,000
2025	14,100	1,410,000
⋮	⋮	⋮
Total	**250,000**	**25,000,000**

- First year commission: 15% of premium
- Renewal year commission: 3% of premium
- All other expenses are a level percentage of premium

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.

The response for this part is to be provided in the Excel document.

(ii) Calculate the expected amount of DAC Tax amortization in 2023. Show all work.

The response for this part is to be provided in the Excel document.

5. 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)*

(*11 points*)

(a) **(LO 1a)** (*6 points*) You are given the following for an indexed universal life insurance policy issued on 12/31/2016:

Participation Rate (PR)	75%
Participation Cap (PC)	10%
Participation Floor (PF)	1.5%
Participation Margin (PM)	0.5%
Option cost on the issue date (expressed as a percentage of the indexed portion of the fund value**)**	3.0%
Historical moving average option cost (expressed as a percentage of the indexed portion of the fund value)	2.5%
Statutory valuation interest rate	4.0%
Actuarial Guideline 36 reserve method	Implied Guaranteed Rate Method (IGRM)

The S&P 500 Index had the following values on the shown dates:

12/31/2016	2,252
12/31/2017	2,684
12/31/2018	2,791
12/31/2019	3,231
Maximum between 12/31/2016 and 12/31/2019	3,248
Minimum between 12/31/2016 and 12/31/2019	2,245

Calculate the following rates to be applied to the indexed portion of the fund balance:

(i) Indexed credited interest rate applied at the end of 2019 using the Point-to-Point Method with a 3 year participation period.

(ii) Indexed credited interest rate applied at the end of 2019 using the High-Water Mark Method with a 3 year participation period.

(iii) Indexed credited interest rate applied during the initial participation period in the calculation of the guaranteed maturity fund values

(iv) Indexed credited interest rate applied after the initial participation period in the calculation of the guaranteed maturity fund values

Show all work.

The response for this part is to be provided in the Excel document.

~~(b)~~ **(NO LONGER RELEVANT)** ~~(*1 point*) List four of the "Hedged as Required" criteria that must be met for the Implied Guaranteed Rate Method in Actuarial Guideline 36.~~

~~ANSWER:~~

~~(c)~~ **(NO LONGER RELEVANT)** ~~(*4 points*) 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.*~~

~~ANSWER:~~

~~*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.*~~

~~ANSWER:~~

~~*C. The valuation of embedded derivatives requiring bifurcation should be based on assumptions about the future performance of the equity index. These assumptions can be obtained from any reliable source and do not necessarily have to be based on current market conditions.*~~

~~ANSWER:~~

~~*D. The valuation of embedded derivatives requiring bifurcation should consider the credit risk of the insurance company issuing the policy as well as the credit risk of the insurance company's counterparties.*~~

~~ANSWER:~~

6. 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*

(*9 points*) You are given the following negotiated terms and assumptions about a level premium non-participating whole life insurance product to be reinsured:

- Ceding company: JKC
- Reinsurer: BJF
- Premiums are paid at the beginning of the year
- Death benefits paid in the middle of the year.

Coinsurance rate	75%
Face amount	1000
1st year mortality rate	0.008
Investment Rate	4%
JKC's benefit reserve before reinsurance	5
JKC's 1 year NAR	200
1st year YRT rate (per 1000)	1.5
Present value of mortality expense reimbursed / present value of ceded premium income	0.7

(a) **(LO 1b)** (*3 points*) Calculate the FAS60 ceded benefit reserve at the end of year 1 on the following alternative reinsurance arrangements:

(i) Coinsurance

The response for this part is to be provided in the Excel document.

(ii) YRT

The response for this part is to be provided in the Excel document.

Show all work.

~~(b)~~ **(NO LONGER RELEVANT)** ~~(*6 points*) 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.*~~

~~ANSWER:~~

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.*~~

~~ANSWER:~~

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.*~~

~~ANSWER:~~

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.*~~

~~ANSWER:~~

E. ~~*Compared to YRT, ceded reserves are lower for a coinsurance structure, and first year profits are generally higher for coinsurance.*~~

~~ANSWER:~~

F. ~~*Both a YRT and a coinsurance arrangement can result in profits, net of reinsurance, that are a level percentage of premiums.*~~

~~ANSWER:~~

7. 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*

- *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*

(*9 points*) LGA Life is a US based insurer with a diverse book of business.

(a) **(LOs 2a, 2b, 2c)** (*1 point*) Describe how existing US capital standards differ from an International alternative such as Solvency II.

ANSWER:

(b) **(NO LONGER RELEVANT)** ~~(*2 points*) Describe four principles of the NAIC's Solvency Modernization Initiative~~.

ANSWER:

(c) **(LOs 2a, 2b, 2c)** (*4 points*) You are given the following information on LGA's Year End balance sheet entries:

Assets	**STAT**	**GAAP**
Bonds	112	117.60
Mortgage Loans	45	47.25
Stocks	30	30
Stocks in Subsidiary	10	10
Cash	15	15
Premiums Due	2	2
Separate Account	40	40

Liabilities	**STAT**	**GAAP**
Term Life Reserves	75	71.25
Income Annuity Reserves	120	114
Claims Payable	1	1
Policyholder Dividends Payable	4	2
Separate Account Liabilities	40	40
AVR	3	0
IMR	2	0

Other Information	**Values**
Life Insurance Face Amount In Force	900
Policy Count	3000
Annual Premiums	8
Subsidiary RBC Amount	2

Aggregate RBC Factors	**Factor**
C1 – Bonds	1%
C1 – Mortgages	1.50%
C1 – Stocks	30%
C1 – Cash	0%
C2 – Life Insurance	0.05%
C3 – Life Reserves	1.54%
C3 – Annuity Reserves	0.77%
C4 – Operational	3.08%
Tax Rate	21%

Authorized Control Level Risk-Based Capital Formula:

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

Determine whether your company has triggered any regulatory action level. Show all work.

The response for this part is to be provided in the Excel document.

~~(d)~~ **(NO LONGER RELEVANT)** ~~*(2 points)* Critique the following statements:~~

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

~~ANSWER:~~

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

~~ANSWER:~~

~~*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.*~~

~~ANSWER:~~

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

~~ANSWER:~~

8. 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

(*10 points*)

~~(a)~~ **(NO LONGER RELEVANT)** ~~(*4 points*) 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.*~~

~~ANSWER:~~

~~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.*~~

~~ANSWER:~~

~~C. *Premium payment pattern sensitivities are recommended under VM-31, but insurers can only change modelled premium payment patterns once every three years.*~~

~~ANSWER:~~

~~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.*~~

~~ANSWER:~~

(b) **(LO 1a)** (*3 points*) 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

ANSWER:

(ii) Indexed UL policies with no secondary guarantees and without a clearly defined hedging strategy that pass the stochastic exclusion test

ANSWER:

(iii) UL policies with lifetime secondary guarantees that do not pass the stochastic exclusion test

ANSWER:

(c) **(LO 1a)** (*3 points*) 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%

The response for this part is to be provided in the Excel document.

9. 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

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:

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

(*11 points*) You are given the following policies:

Policy A	20-year level premium term issued in 2015
Policy B	Whole life with increasing death benefit issued in 2015
Policy C	10-pay level death benefit whole life issued in 2015
Policy D	Level death benefit whole life issued in 2019
Policy E	20-year level premium term issued in 2020
Policy F	UL with secondary guarantee issued in 2020
Policy G	Level death benefit whole life issued in 2020
Policy H	Whole life with increasing death benefit issued in 2020

(a) **(NO LONGER RELEVANT)** (*2 points*) Assign each of the given 8 policies into the minimum number of groupings required under ASU 2018-12. Justify your answers.

ANSWER:

(b) **(LO 1a)** (*4 points*) You are given the following for policy C:

$1000\overline{A}_{x^1:\overline{1}\rceil} =$	1.21
$1000\overline{A}_{x} =$	353.57
$1000\overline{A}_{x+1} =$	365.14
$1000\overline{A}_{x+5} =$	412.33
$1000\overline{A}_{x+6} =$	424.62

$\ddot{a}_{x} =$	19.29
$\ddot{a}_{x:\overline{10}\rceil} =$	8.52
$\ddot{a}_{x:\overline{20}\rceil} =$	14.20
$\ddot{a}_{x+1:\overline{9}\rceil} =$	7.79
$\ddot{a}_{x+1:\overline{19}\rceil} =$	13.67
$\ddot{a}_{x+5:\overline{5}\rceil} =$	4.64
$\ddot{a}_{x+5:\overline{15}\rceil} =$	11.46
$\ddot{a}_{x+6:\overline{4}\rceil} =$	3.78
$\ddot{a}_{x+6:\overline{14}\rceil} =$	10.87

Assume Policy C was issued on July 1 with death benefit of 250,000, its level premiums are paid annually, and there is no premium deficiency.

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

The response for this part is to be provided in the Excel document.

(c) **(LO 1a)** (*5 points*) You are given the following for the policies subject to PBR:

	Amounts in Millions				
Plan	Accumulation UL	UL w Lifetime Secondary Guarantee	Agency Term	Direct Response Term	Whole Life
Asset Segment Backing Liabilities	Segment # 1	Segment # 2	Segment # 1	Segment # 2	Segment # 1
PV Premium	15	19	44	26	44
PV Expenses	3	6	14	6	12
PV Benefits	6	16	49	14	35
PV Commissions	0	2	3	0	6
PV Federal Income Taxes	8	3	4	3	10
Stochastic Reserve - CTE 70	2	8	3	1	5
Stochastic Reserve - CTE 90	4	11	5	2	7
Net Premium Reserve	6	7	17	3	11

Assume the company passes the stochastic exclusion test for applicable plans except for UL with lifetime secondary guarantee.

(i) (*3 points*) Calculate the minimum PBR reserve permitted under the aggregation rules of VM-20.

The response for this part is to be provided in the Excel document.

(ii) (*2 points*) Calculate the amount of reserve savings realized via aggregation.

The response for this part is to be provided in the Excel document.

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

(*11 points*) With respect to VM-21 in the 2020 Valuation Manual:

(a) **(LO 1a)** (*6 points*) You are given:

Variable Annuity Balances as of the Valuation Date	
Estimated Stat Reserve	125,000
Separate Account Assets	99,330
General Account Assets	65,550

VM-21 model output: Scenario 1 of 1,000

	Projection of Accumulated Deficiencies			Projections of the Additional Invested Assets Portfolio		
Year	**Cash Surrender Value**	**Assets - Separate Account**	**Assets - General Account**	**Projection A**	**Projection B**	**Projection C**
0	141,900	99,330	25,670	38,400	39,150	40,350
1	147,650	105,080	22,739	39,641	40,391	41,591
2	140,151	98,106	24,444	40,711	41,461	42,661
3	137,774	96,442	25,827	41,749	42,499	43,699
4	139,388	98,056	29,194	42,771	43,521	44,721
5	113,125	79,187	25,229	43,785	44,535	45,735
6	83,094	58,166	29,161	44,794	45,544	46,744
7	78,224	54,757	25,806	45,801	46,551	47,751
8	54,345	38,041	16,078	46,806	47,556	48,756
9	46,256	32,379	9,847	47,811	48,561	49,761
10	39,162	27,413	4,463	48,815	49,565	50,765
11	35,676	24,973	945	49,821	50,571	51,771
12	29,339	20,537	(2,531)	50,827	51,577	52,777
13	23,229	16,260	(6,725)	51,834	52,584	53,784
14	18,323	12,826	(10,439)	52,842	53,592	54,792
15	14,030	9,821	(13,963)	53,852	54,602	55,802
16	10,924	7,647	(17,543)	54,863	55,613	56,813
17	7,918	5,543	(21,111)	55,876	56,626	57,826
18	7,221	5,055	(23,458)	56,890	57,640	58,840
19	5,762	4,033	(26,413)	57,906	58,656	59,856
20	4,390	3,073	(29,604)	58,923	59,673	60,873
21	3,307	2,315	(33,176)	59,943	60,693	61,893
22	2,563	1,794	(36,368)	60,963	61,713	62,913

23	2,217	1,552	(39,427)	61,986	62,736	63,936
24	1,862	1,303	(42,255)	63,010	63,760	64,960
25	-	-	(47,411)	64,036	64,786	65,986
26	-	-	(52,523)	65,063	65,813	67,013
27	-	-	(58,021)	66,093	66,843	68,043
28	-	-	(62,027)	67,124	67,874	69,074
29	-	-	(65,420)	68,156	68,906	70,106
30	-	-	(69,936)	69,190	69,940	71,140

(i) (*2 points*) Assess which of the additional invested asset projections is most appropriate to use in the net asset earned rate (NAER) method. Justify your response.

The response for this part is to be provided in the Excel document.

(ii) (*3 points*) Calculate the scenario reserve using the NAER method

The response for this part is to be provided in the Excel document.

(iii) (*1 point*) Describe the changes to the projection that would result if the Direct Iteration method were used instead of the NAER method.

ANSWER:

(b) **(LO 1a)** (*5 points*) LZT Life has a large VA block with significant GMWB exposure and is in the process of formally documenting their hedging program as a Clearly Defined Hedging Strategy (CDHS).

You are given:

- LZT employs a dynamic delta, vega, and rho Greek matching strategy to hedge the fair value of their GMWB liability.
- LZT only hedges market risks and not decrement risks.
- LZT uses the CTE with Prescribed Assumptions (CTEPA) method to calculate the VM-21 additional standard projection amount, and their

hedging strategy meets the requirements of a CDHS. Assume the block of business is homogeneous.

- LZT is planning to document its CDHS for VM-21 using the same requirements as VM-20.
- LZT does not use the Alternative Methodology for any contracts.

		Best Efforts	Adjusted	Adjusted with Prescribed Assumptions
With Cash Surrender Value Floor	CTE65	1,700	1,760	1,840
	CTE70	1,710	1,770	1,860
Without Cash Surrender Value Floor	CTE65	1,660	1,740	1,840
	CTE70	1,680	1,770	1,860

E-Factor	30%
Pretax Interest Maintenance Reserve	100
Cash Surrender Value	1,675

(i) (*1 point*) List four additional items beyond those given that LZT must identify and document for their hedging strategy to meet the requirements of a CDHS.

ANSWER:

(ii) (*3 points*) Calculate the VM-21 reserve.

The response for this part is to be provided in the Excel document.

(iii) (*1 point*) 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.

ANSWER:

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

(*9 points*)

(a) **(LO 2c, 2d)** (*7 points*) 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. 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.

ANSWER:

B. *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.*

ANSWER:

C. *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.*

ANSWER:

D. *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.*

ANSWER:

E. *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.*

ANSWER:

F. *The economic capital is defined by applying the CTE99 metric to the total assets required and deducting the current statutory liabilities.*

ANSWER:

G. *It has been suggested that the development team use a correlation matrix approach to calculate the between-risk diversification benefits.*

ANSWER:

(b) (*2 points*) Describe ways that Economic Capital can be applied in the following areas:

(i) **(LO 2b, 2d)** Capital Adequacy

ANSWER:

(ii) **(LO 2b, 2d)** Performance Measurement

ANSWER:

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

With respect to Principle Based Reserve (PBR) calculations:

(a) **(LO 1a)** (*7 points*) You are given the following model output for a block of life insurance as of the valuation date:

				PV With Margins					PV With No Margins				
Scenario	NPR	COI	Due & Deferred Premium Asset	Benefits	Premiums	Taxes	Expenses	Reinsurance Reserve Credit (with Margins)	Benefits	Premiums	Taxes	Expenses	Reinsurance Reserve Credit (without Margins)
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) (*5 points*) Assess whether a Stochastic Reserve component is necessary for this block using the Stochastic Exclusion Ratio Test. Show all work.

The response for this part is to be provided in the Excel document.

(ii) (*2 points*) Calculate the minimum reserves required. Show all work.

The response for this part is to be provided in the Excel document.

(b) **(LO 1a)** (*2 points*) Describe how VM-20 and VM-31 have impacted mortality assumption considerations and disclosures.

ANSWER:

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)*

(*13 points*) You are given the following for a single premium fixed deferred annuity that has a guaranteed living withdrawal benefit (GLWB) rider:

- The death benefit is the current account value.
- No partial withdrawals are allowed outside of GLWB election.
- The GLWB amount is equal to the GLWB % times the account value at the beginning of the year of election.
- All GLWB payments are made at the end of the policy year.
- There are no policy fees for the rider.

You are also given:

Premium	100,000
Interest Guarantee Period	5 years
Initial Interest Rate	2.00%
GLWB %	4%
Annual contract charge	50
Valuation Rate – Elective Benefits	3.00%
Valuation Rate – Non-Elective Benefits	3.50%

Surrender Charges (as a percent of account value)	First year: 6% Second year: 4% Third year: 3% Fourth year: 2% Fifth year: 1%

(a) **(LO 1a)** (*3 points*) 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.

The response for this part is to be provided in the Excel document.

(b) **(LO 1a)** (*2 points*) 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.

ANSWER:

(ii) Evaluate the change in the interest rate floor from the policyholder perspective.

ANSWER:

(c) **(LO 1a)** (*2 points*) Describe how the Commissioners Annuity Reserve Valuation Method (CARVM) would be performed on this type of GLWB policy.

ANSWER:

(d) **(LO 1a)** (*4 points*) 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

The response for this part is to be provided in the Excel document.

(ii) Surrender benefits assuming GLWB election in the fifth policy year

The response for this part is to be provided in the Excel document.

(iii) GLWB payment stream assuming election in the first policy year

The response for this part is to be provided in the Excel document.

(iv) GLWB payment stream assuming election in the fifth policy year

The response for this part is to be provided in the Excel document.

(e) **(LO 1a)** (*2 points*) 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.

The response for this part is to be provided in the Excel document.

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, and 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

- *Chapter 11: Valuation Methodologies (excluding 11.3.9-11.3.11)*
- *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*

(*10 points*) GHI Company is analyzing the impacts of the 2017 Tax Cuts and Jobs Act on their block of term life insurance business.

(a) **(LO 1a)** (*4 points*) 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.

The response for this part is to be provided in the Excel document.

(b) **(LO 1a)** (*2 points*) 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.

The response for this part is to be provided in the Excel document.

(c) **(LO 4e partially)** (*4 points*) 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.

ANSWER:

(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.

ANSWER:

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)

(*9 points*) YUL Life, a US life insurance company, has existing in-force and actively writes new business in the market.

(a) **(LO 1a)** (*1 point*) List four responsibilities or requirements of the Appointed Actuary role.

ANSWER:

(b) **(LO 1a)** (*4 points*) 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

ANSWER:

(ii) 10YR Level Term issued in 2018

ANSWER:

(iii) Whole Life issued in 2019

ANSWER:

(iv) Indexed UL with Clearly Defined Hedging Strategy (CDHS) issued in 2020

ANSWER:

(c) **(LO 1a)** (*4 points*) 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.

ANSWER:

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.

ANSWER:

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.

ANSWER:

D. YUL uses mean reserves because they are higher and thus a more conservative basis for setting up a liability.

ANSWER:

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

- *Chapter 3: NAIC Annual Statement*
- *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

- *Ch. 29: Risk-Based Capital*

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

(*11 points*)

(a) **(LOs 2a, 2b)** (*1 point*) Describe two reasons why the NAIC might be interested in international perspectives regarding insurance regulation.

ANSWER:

(b) **(LO 2a, 2b)** (*2 points*) 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) (*1 point*) Describe two criticisms of the approach.

ANSWER:

(ii) (*1 point*) Describe the NAIC's response to each criticism above.

ANSWER:

(c) **(LOs 2a, 2b)** (*2 points*) Describe two positive outcomes and two negative outcomes that could potentially occur if the NAIC decided to increase RBC requirements.

ANSWER:

(d) **(LOs 1a, 2a)** (*6 points*) MSP Life is a U.S. life insurance company. MSP's inforce block consists of ordinary whole life insurance and individual fixed deferred annuities. Some of the annuities allow the contract holder to withdraw funds at book value with no surrender charge, whereas the rest of the annuities apply a market value adjustment to withdrawals.

You are given the following RBC information for MSP (in millions):

Asset Risk Affiliated	2
Asset Risk Unaffiliated	10
Asset Risk Other	5
Amount of insurance inforce for ordinary life	7,500
Reserves for ordinary life	500
Reserves for annuity contracts with a market value adjustment	200

Reserves for annuity contracts with a book value withdrawal and no surrender charge	100
Business Risk	10
Total Adjusted Capital (TAC)	40
Policy loans	0

Authorized Control Level (ACL) RBC formula:

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

Insurance Risk	
Net Amount at Risk	**RBC Factor**
First 500 million	0.0023
Next 4,500 million	0.0015
Next 20,000 million	0.0012
Over 25,000 million	0.0009

Interest Rate Risk	
Risk Category	**RBC Factor**
Low	0.0077
Medium	0.0154
High	0.0308

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

(*9 points*) XYZ Insurance Group is a US-based corporation that sells Variable Deferred Annuity policies with GMDB, GMAB, and GMWB riders. XYZ is now preparing for implementation of Long Duration Targeted Improvements in FASB's ASU 2018-12 (LDTI).

(a) **(LO 1b)** (*5 points*) 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

ANSWER:

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.

ANSWER:

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.*

ANSWER:

D. *Assumptions for mortality and lapses will no longer be needed for DAC calculations since it will be based on a straight-line basis.*

ANSWER:

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.*

ANSWER:

F. *All changes in fair value related to market risk benefits shall be recognized in net income.*

ANSWER:

(b) **(LO 1b)** (*4 points*) 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.

The response for this part is to be provided in the Excel document.

(ii) Calculate the amount recognized in Other Comprehensive Income (OCI) in the first year of the policy. Show all work.

1. Fall 2020 ILA LFMU Exam (LOs 2a 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)

(*9 points*)

(a) (*2 points*) With regard to solvency regulation:

(i) **(LO 3b)** List two reasons U.S. regulators would be interested in international regulatory developments.

ANSWER:

~~(ii)~~ **(NO LONGER RELEVANT)** ~~Explain the shortcomings of the U.S. RBC factor-based approach compared to Solvency II's model-based approach.~~

~~ANSWER:~~

LHR Life is reviewing its economic capital.

(b) **(LOs 2b, 2d)** (*1 point*) Describe the advantages and disadvantages of LHR operating at an economic capital ratio of 150% compared to 400%.

ANSWER:

(c) **(LOs 2b, 2d)** (*2 points*) 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

ANSWER:

(ii) Securitization of longevity risk through issuance of a 10-year longevity bond

ANSWER:

(d) **(LOs 2b, 2d)** (*4 points*) LHR has three major business units, denoted X, Y, and Z. You are given the following information on the capital allocation to each unit:

Business unit	**Stand-alone risk capital**
X	390
Y	200
Z	325

Combination of business units	Required risk capital
X+Y	460
Y+Z	520
X+Z	600
X+Y+Z	700

The response for this part is to be provided in either the ANSWER box below or in the Excel document.

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.*

ANSWER:

B. *The required risk capital of the combined X+Y+Z should be allocated across the business units.*

ANSWER:

C. *Having unallocated risk capital would indicate LHR is not covering all of its risks.*

ANSWER:

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

(*12 points*)

(a) (*3 points*)

(i) **(LO 1a)** Describe two reasons why the credibility of a company's mortality experience is important under VM-20.

ANSWER:

~~(ii)~~ **(NO LONGER RELEVANT)** ~~List the advantages and disadvantages of the Limited Fluctuation credibility method and the Bühlmann Empirical Bayesian credibility method.~~

~~ANSWER:~~

~~(b)~~ **(NO LONGER RELEVANT)** ~~(*2 points*) 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.~~

~~ANSWER:~~

~~(ii) Describe what is known about the estimate if there is full credibility.~~

~~ANSWER:~~

~~(iii) Explain whether or not the credibility factor would be appropriate under VM-20.~~

~~ANSWER:~~

(c) **(LO 1a, partially)** (*4 points*) 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.

ANSWER:

B. *A company may change credibility methods without obtaining permission from the commissioner.*

ANSWER:

C. *If company experience is 100% credible, then no margin is required since there is no uncertainty.*

ANSWER:

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.*

ANSWER:

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.*

ANSWER:

F. *When measuring credibility, it would be appropriate to combine simplified issue experience with fully underwritten experience.*

ANSWER:

(d) **(LO 1a)** (*3 points*) 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.

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

(*9 points*)

(a) **(NO LONGER RELEVANT)** ~~(*7 points*) 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*~~

~~ANSWER:~~

~~*B. A company is required to calculate all three components (net premium reserve, deterministic reserve and stochastic reserve) when determining the minimum reserve.*~~

~~ANSWER:~~

~~*C. Lapse rates are not to be used in the net premium reserve calculation.*~~

~~ANSWER:~~

~~*D. The mortality and interest assumptions used in the net premium reserve calculation are locked in at issue.*~~

~~ANSWER:~~

~~*E. When calculating the deterministic and stochastic reserves, the model projection period must extend for the life of the business being valued.*~~

~~ANSWER:~~

~~*F. When establishing the anticipated mortality experience assumption for the deterministic and stochastic reserves, if a company does not have credible or relevant experience, then the company must use industry experience with no modifications.*~~

~~ANSWER:~~

(b) **(LO 1a)** (*2 points*) 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.

The response for this part is to be provided in the Excel document.

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

(*10 points*) 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.*

ANSWER:

(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.*

ANSWER:

(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.

ANSWER:

(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.*

ANSWER:

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.*

ANSWER:

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.*

ANSWER:

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.*

ANSWER:

H. **(LO 1b, 4e)** *Under TCJA, there have been no changes to tax reserves for annuity contracts not involving life contingencies.*

ANSWER:

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

(*10 points*) ABC is a life insurance company specializing in Universal Life products with Secondary Guarantees (ULSG). Similar to many of its peers, company ABC cedes its ULSG business to a captive reinsurer to lessen reserve strains.

(a) **(LO 1a)** (*3 points*) Compare and contrast these two ULSG designs: stipulated premium design and shadow account design.

ANSWER:

(b) **(LO 1a)** (*4 points*) 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.

The response for this part is to be provided in the Excel document.

(c) **(LO 1a)** (*3 points*) Critique the following statements related to ULSG:

(i) AG 48 only applies to ULSG carriers utilizing captive reinsurance.

ANSWER:

(ii) Actuarial Method Reserve is calculated as VM-20 Reserve.

ANSWER:

(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.

ANSWER:

(iv) For AG48, no exclusions are permitted from the Stochastic Reserve only.

ANSWER:

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

(*10 points*)

(a) **(LO 1b)** (*2 points*) Describe the data requirements necessary for a company to implement a full retrospective transition to ASU 2018-12.

ANSWER:

For a block of UL policies issued by BLL Life on 1/1/2017, you are given:

- Initial face amount is 5,000

- Insurance inforce is used as the basis for DAC amortization under ASU 2018-12
- Mortality is the only decrement and occurs at the end of the year

Assumption/Policy Information	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Deferred Acquisition Expenses	500	250	0	0	0	0
Assumed Mortality Rate	10%	10%	10%	10%	10%	100%
FAS 97 DAC Balance – End of Year	700	500	300	n/a	n/a	n/a

(b) **(LO 1b)** (*4 points*) 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) (*3 points*) 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.

The response for this part is to be provided in the Excel document.

(ii) (*1 point*) Recommend either the full retrospective or modified retrospective approach for BLL. Justify your answer.

The response for this part is to be provided in the Excel document.

(c) **(LO 1b)** (*4 points*) 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) (*3 points*) 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.

The response for this part is to be provided in the Excel document.

(ii) (*1 point*) Describe if the change in mortality experience alters the recommendation in part (b)(ii).

The response for this part is to be provided in the Excel document.