Life Financial Management – U.S.

Exam ILALFMU

Date: Tuesday, May 9, 2023

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This examination has 10 questions numbered 1 through 10 with a total of 80 points.

   The points for each question are indicated at the beginning of the question.

2. While every attempt is made to avoid defective questions, sometimes they do occur. If you believe a question is defective, the supervisor or proctor cannot give you any guidance beyond the instructions provided in this document.

Written-Answer Instructions

1. Each question part or subpart should be answered either in the Word document or the Excel document as directed within each question. Graders will only look at work in the indicated file.

   a) In the Word document, answers should be entered in the box marked ANSWER within each question. The box will expand as lines of text are added. There is no need to use special characters or subscripts (though they may be used). For example, β_1 can be typed as beta_1, and x^2 can be typed as x^2.

   b) In the Excel document formulas should be entered. For example, X = component1 + component2. Performing calculations on scratch paper or with a calculator and then entering the answer in the cell will not earn full credit. Formatting of cells or rounding is not required for credit.

   c) Individual exams may provide additional directions that apply throughout the exam or to individual items.

2. The answer should be confined to the question as set.

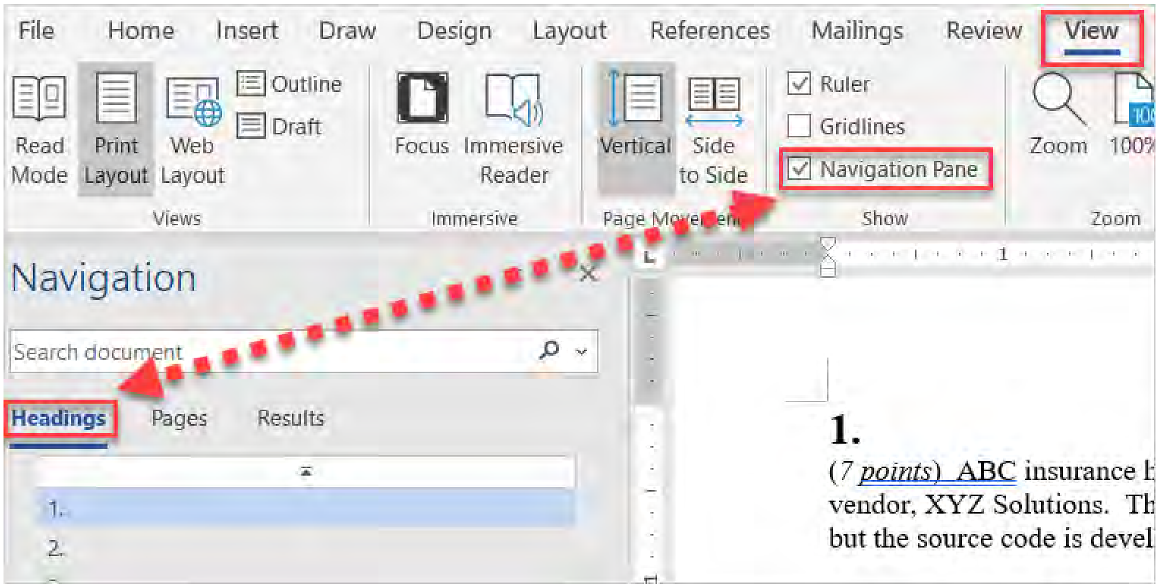
3. Prior to uploading your Word and Excel files, each file should be saved and renamed with your five-digit candidate number in the filename.

4. The Word and Excel documents that contain your answers must be uploaded before time expires.

Navigation Instructions

Open the Navigation Pane to jump to questions.

Press Ctrl+F, or click View > Navigation Pane:



1.

(*8 points*)

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

ANSWER:

(b) (*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:

1. Continued

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:

(c) (*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
(*6 points*)

(a) (*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) (*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 document.

(ii) Host value

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

Show all work.

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) (*2 points*) Calculate the deferrable acquisition expenses per individual policy.

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

3. **Continued**

(b) (*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 document.

(ii) Grouped Contract Approach

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

(c) (*2 points*) Recommend an approach for calculating the DAC asset. Justify your answer

ANSWER:

4.

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

(a) (*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:

4. **Continued**

(b) (*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 document.

(ii) Accumulated Other Comprehensive Income

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

Show all work.

5.

(*10 points*)

(a) (*5 points*) You are given the following for a fixed deferred annuity contract:

<table>
<tr><td>Issue date</td><td>6/30/2018</td></tr>
<tr><td>Valuation date</td><td>6/30/2020</td></tr>
<tr><td>Issue age</td><td>50</td></tr>
<tr><td>Gender</td><td>Male</td></tr>
<tr><td>Guaranteed interest credited rate</td><td>2.5%</td></tr>
<tr><td>Fund value on valuation date</td><td>115,000</td></tr>
<tr><td>Valuation interest rate for death benefits</td><td>5.0%</td></tr>
<tr><td>Valuation interest rate for withdrawal benefits</td><td>4.0%</td></tr>
<tr><td>Death benefit</td><td>Fund value (paid at end of contract year)</td></tr>
<tr><td>Valuation mortality</td><td>
<table>
<tr><th>Age</th><th>2012 IAM Male Age Nearest Birthday (1000qx)</th><th>Projection Scale G2 Male, Age Nearest Birthday</th></tr>
<tr><td>50</td><td>2.285</td><td>1.0%</td></tr>
<tr><td>51</td><td>2.557</td><td>1.1%</td></tr>
<tr><td>52</td><td>2.828</td><td>1.1%</td></tr>
<tr><td>53</td><td>3.088</td><td>1.2%</td></tr>
<tr><td>54</td><td>3.345</td><td>1.2%</td></tr>
<tr><td>55</td><td>3.616</td><td>1.3%</td></tr>
<tr><td>56</td><td>3.922</td><td>1.3%</td></tr>
<tr><td>57</td><td>4.272</td><td>1.4%</td></tr>
<tr><td>58</td><td>4.681</td><td>1.4%</td></tr>
<tr><td>59</td><td>5.146</td><td>1.5%</td></tr>
</table>
</td></tr>
<tr><td>Full surrender during the guarantee period is allowed, but incurs a surrender charge according to the following surrender charge schedule</td><td>
<table>
<tr><th>Year</th><th>Surrender Charge %</th></tr>
<tr><td>1</td><td>5%</td></tr>
<tr><td>2</td><td>4%</td></tr>
<tr><td>3</td><td>3%</td></tr>
<tr><td>4</td><td>2%</td></tr>
<tr><td>5</td><td>1%</td></tr>
<tr><td>6</td><td>0%</td></tr>
<tr><td>7</td><td>0%</td></tr>
</table>
</td></tr>
</table>

5. Continued

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 document.

(b) (*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.

(*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) (*1 point*) Calculate the Limited Fluctuation credibility factor Z. Show all work.

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

(b) (*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) (*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:

6. Continued

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.

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

(a) (*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:

7. Continued

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) (*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 document.

(c) (*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 document.

8.
(*6 points*)

(a) (*2 points*) You are given the following information about a recently sold UL policy:

- Face amount: 1,000,000 level death benefit
- Issue age: 45
- Policy guaranteed interest rate: 3%
- Applicable accumulation test minimum rate: 2%
- Policy expenses: 500 per year
- Premium load: 6% per year

You are also given the following calculations for the policy:

Interest rate	2%	3%	4%
PV Death Benefit	455,245	314,082	220,086
PV Expenses	4,568	4,381	4,206
$\ddot{a}_{45}$	27.10	22.78	19.45

(i) Calculate the Guideline Level Premium (GLP) for this policy.

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

(ii) Calculate the Guideline Single Premium (GSP) for this policy.

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

Show all work.

8. **Continued**

(b) (*3 points*) You are given the following information about a UL policy that uses the Guideline Premium test:

GLP	10,000
GSP	120,000
7-pay premium	28,000

Premiums paid	
Year 1	20,000
Year 2	30,000
Year 3	50,000
Year 4+	0

- Premiums are paid at the beginning of the year
- No surrender charges
- There have been no material changes since issue
- Account value at the end of year 3: 130,000

(i) Determine if the reserves for this policy qualify as life insurance reserves at the end of year 3.

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

(ii) At the end of year 3 the policyholder takes a 40,000 partial withdrawal. Calculate the taxable portion of the withdrawal, if any.

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

Show all work.

(c) (*1 point*) Describe a situation in which a premium payment could violate the Guideline Premium test but not disqualify the contract.

ANSWER:

9.

(*7 points*) WPC Insurance Company is a US company transitioning from US GAAP to IFRS17.

(a) (*4 Points*) Critique the following statements related to the transition to IFRS17:

A. *The purpose of any accounting model should be to communicate relevant financial and nonfinancial information to users of financial statements that allows such users to make decisions on that information.*

ANSWER:

B. *Regulators believe that the current system for U.S. insurance regulatory accounting has not performed, and wish to make substantial changes*

ANSWER:

C. *The NAIC will have the final say in how statutory reporting adopts changes in GAAP reporting*

ANSWER:

D. *The options being considered for how to align statutory with the GAAP/IFRS reporting changes include:*

- *Freezing SAP without any changes*
- *U.S. GAAP with statutory adjustments*
- *IFRS with statutory adjustments*
- *IFRS for public companies and IFRS/GAAP with statutory adjustments for non-public companies*
- *IFRS without adjustments*

ANSWER:

9. Continued

(b) (*3 points*) You are provided the following information for a sample block of term life insurance business that is issued on 12/31/2020. Assume:

- Premiums and commissions are paid at the beginning of the year
- Claims and expenses are paid at the end of the year
- Policy coverages terminate by the end of 2025 for this block

Total Net Amount at Risk	1,000,000
Nonforfeiture interest rate	3%
Adjustment for uncertainty	2% of the PV of claims

Year	2021	2022	2023	2024	2025
Premiums	5,750	5,750	5,750	5,750	5,750
Commissions	575	575	575	575	575
Claims	4,000	4,320	4,666	5,039	5,442
Expenses	115	115	115	115	115
Economic discount rate	5.0%	4.8%	4.5%	4.3%	4.1%
2001 CSO mortality	0.0050	0.0055	0.0061	0.0067	0.0073

Calculate the initial IFRS17 CSM assuming a transition date of 12/31/2020.

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

10.
(*6 points*)

(a) (*1 point*) Describe two methods of determining a discount rate when assessing a merger and acquisition transaction.

ANSWER:

(b) (*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****