Life Financial Management – U.S.

Exam ILALFMU

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This examination has 10 questions numbered 1 through 10 with a total of 100 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. The Word and Excel documents that contain your answers must be uploaded before time expires.

Canadian version of this exam is recognized by the Canadian Institute of Actuaries.

1. (*9 points*)

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

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

> ANSWER:

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

> ANSWER:

    (c)   (*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:

1. Continued

(d)   (*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:

2. (*9 points*)

    (a)   (*5 points*) AKL Life Insurance Company is a public company that was recently assigned a negative outlook by A.M. Best.

        (i)   (*3.5 points*) Describe the process followed by A.M. Best that results in the rating agency assigning a negative outlook to an insurance company.

> ANSWER:

        (ii)   (*1.5 points*) List three potential impacts of the negative outlook on AKL's day-to-day operations.

> ANSWER:

AKL has the following Best's Capital Adequacy Ratio (BCAR) components:

C1-Non Eq	15
C1-Eq	5
C2	5
C3-Int	15
C3-Mkt	5
C4	2
Available Capital	100

Net Required Capital =
$$\sqrt{\left(\text{C1-Non Eq}+\text{C3-Int}\right)^2 + \left(\text{C1-Eq}+\text{C3-Mkt}\right)^2 + \left(\text{C2}\right)^2} + \text{C4}$$

    (b)   (*1 point*) Calculate the BCAR for AKL. 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.*

2.   Continued

(c)   (*3 points*) AKL is considering buying a block of term life insurance business and selling a block of variable annuity (VA) business. Each transaction would impact capital as follows:

	Buy term	Sell VA	Both
Change in Net Required Capital	1	-2	-1
Change in Available Capital	-2	1	-1

(i)   Recommend whether AKL should buy the term life insurance block, sell the variable annuity block, do both or do neither based on the BCAR score only.

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

(ii)   Identify two considerations other than the BCAR score that should be taken into account when making the recommendation.

ANSWER:

3. (*9 points*)

    (a)   (*3 points*) For a typical structure of a Special Purpose Vehicle (SPV) used to obtain financing:

        (i)   Describe the entities involved.

> ANSWER:

        (ii)   Describe the interactions between them.

> ANSWER:

    (b)   (*2 points*) Describe two key benefits and two key risks to a company sponsoring an SPV.

> ANSWER:

XYZ Insurance Company is a U.S. company that established ABC Re Captive, an SPV to contain a block of their term life insurance business.

    (c)   (*1 point*) Explain a primary reason why XYZ would enter into this transaction based on the information provided.

> ANSWER:

3.   Continued

Assume that PBR has been implemented at the time of reporting and the Actuarial Method uses VM-20 without modifications. You are given:

Clearly Defined Hedging Strategy?	No
Perform Stochastic Exclusion Test?	Yes
Pass Stochastic Exclusion Test?	Yes
NPR using VM-20	100
NPR using existing CRVM	90
Deterministic Reserve	120
Stochastic Reserve	122
Due and Deferred Premium Asset	5

(d)   (*3 points*)

    (i)   Describe XYZ's decision-making process of the determination of Actuarial Guideline 48's primary security requirement.

> ANSWER:

    (ii)   Calculate the Primary Security Requirement. 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.*

4. (*12 points*)

    (a)   (*3 points*)

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

ANSWER:

        (ii)   List the advantages and disadvantages of the Limited Fluctuation credibility method and the Bühlmann Empirical Bayesian credibility method.

ANSWER:

    (b)   (*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:

4. **Continued**

    (c)   (*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:

4. Continued

(d) (*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.

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

5. (*12 points*) Regarding the FASB's new guidance for long duration contracts
(ASU 2018-12):

(a) (*5 points*) You are given:

Projected Cash Flows

Projection Year	Year 1	Year 2	Year 3	PV Year 4 +
Gross Premiums	360	342	324	1313
Benefits & Claim Expenses	216	222	227	1106

Assume:

- Cash flows occur at the end of the year
- PV Year 4+ includes cash flows in year 4 and later, discounted to the end of year 4
- The carrying amount of the liability at the transition date is 150
- The carryover discount rate is equal to the upper-medium grade spot rate of 3% for all maturities
- Transition date occurs at the beginning of year 1

(i) (*3 points*) Calculate the liability for future policyholder benefits at the end of projection year 1 using the modified retrospective transition 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) (*2 points*) Calculate the remeasurement gain/(loss) for year 2 assuming:

- Better than expected results during projection year 2 produce a net premium ratio of 67%
- Actual results align with expected for year 1

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.*

5.   Continued

(b)   (*4 points*) You have been asked to determine whether the information for Gross
Premiums and Benefit & Claim Expenses provided in part (a) could also be used
in the calculation of a transition impact for IFRS 17.

Describe four reasons the information could be insufficient for the IFRS 17
impact calculation.

> ANSWER:

(c)   (*3 points*) You are reviewing a block of long term care business under the new
guidance. Experience over the past year has shown:

- Morbidity was 10% lower than the model's current assumption, with a
credible amount of data
- Expenses were 15% higher than the model's current assumptions,
which is expected to persist in the future

Critique the following statements:

A. *A review of the current morbidity assumption is required, and a
revised morbidity assumption should be used*

> ANSWER:

B.   *A review of the current expense assumption is required, and a revised
expense assumption should be used*

> *ANSWER:*

5. Continued

C. *The morbidity assumption should be reviewed quarterly instead of annually.*

> *ANSWER:*

D. *Changes in morbidity assumptions and changes in discount rate are reported in the income statement in the same way.*

> *ANSWER:*

E. *If the net premium ratio was over 100% prior to the assumption improvements, experience gains will not impact the income statement.*

> ANSWER:

6. (*9 points*)

    (a)   (*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:

6. Continued

      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)   (*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.*

7. (*10 points*)

    (a)   (*3 points*) For each of the insurance products below:

        A. Variable annuity with guaranteed minimum accumulation benefits (GMABs)

        B. Equity-indexed annuities

        C. Fixed deferred annuities with market value adjustments (MVAs)

    (i)   Identify the host contract and the embedded derivatives.

> ANSWER:

    (ii)   Explain if bifurcation is required.

> ANSWER:

7. Continued

(b)   (*3 points*) You are given the following:

	Hedged Item	Hedging Instrument(s)
(i)	Interest rate risk for a bond classified as held to maturity	Interest rate swap
(ii)	Interest rate risk for a bond classified as trading	Interest rate swap
(iii)	Exposure to equity markets	Treasury bond
(iv)	Future foreign currency transaction	Foreign exchange forward and a Treasury bond
(v)	Credit risk for a bond classified as held to maturity	Credit default swap on the issuer
(vi)	Inflation risk for a dividend from a US subsidiary	Inflation swap

Evaluate whether **each** derivative qualifies for GAAP hedge accounting under a new hedging program.

ANSWER:

7. Continued

(c) (*4 points*) Your company held the following derivatives on its balance sheet at 12/31/2020:

Identifier	2020 Gain/(Loss)	Portion Ineffective	Holding Classification	Other Classifications
FV1	100	25	Fair value hedge	
FV2	(100)	(20)	Fair value hedge	
FV3	(100)	(15)	Fair value hedge	
CF4	100	10	Cash flow hedge	Hedged item affects 2020 earnings
CF5	100	10	Cash flow hedge	Hedged item did not affect 2020 earnings
FN6	(100)	(10)	Hedge of net investments in foreign operations	

For 2020 these derivatives met all applicable criteria required for hedge accounting, including qualifying as highly effective.

Determine the net impact on GAAP financial reporting for the gain or loss for each derivative along with the underlying hedged item.

ANSWER:

8. (*10 points*) Critique the following statements regarding statutory and tax reserve valuations:

    A. *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. *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. *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. *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:

8. Continued

E. *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. *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. *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. *Under TCJA, there have been no changes to tax reserves for annuity contracts not involving life contingencies.*

ANSWER:

9. (*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) (*3 points*) Compare and contrast these two ULSG designs: stipulated premium design and shadow account design.

> ANSWER:

(b) (*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.*

9. Continued

(c)   (*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. (*10 points*)

(a) (*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) (*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.*

10. Continued

(c) (*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. |

END OF EXAMINATION