

ILA LFMU Model Solutions

Fall 2022

1. Learning Objectives:

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

Learning Outcomes:

- (6a) The candidate will be able to describe, apply and evaluate considerations and matters related to:
- Insurance company mergers and acquisitions
 - Management of variable deferred annuities
 - Embedded Value determinations
 - VM-20 financial impacts
 - Rating agency considerations
 - Model Audit Rule and Sarbanes-Oxley Section 404 considerations
 - Source of Earnings analysis

Sources:

LFM-152-22 – Introduction to Source of Earnings Analysis

Commentary on Question:

This question tested the candidates' knowledge of Analysis in Change in Reserves and Source of Earnings Analysis.

Solution:

- (a) Construct an Analysis in Change in Reserves for the GAAP expectation and actual results.

Commentary on Question:

This was a challenging question for most candidates. Candidates did not need to provide formulas to receive full credit but providing correct formulas received partial credit if calculation results were incorrect. Common errors included: not multiplying by life count; using gross premium instead of net premium; incorrectly applying expected assumptions for actual reserves changes components such as expenses and interest; including actual death benefit paid instead of reserve released for death benefits; and omitting reserves released for surrenders. Candidates who constructed the complete and correct presentation for reserve roll-forward generally achieved more success.

1. Continued

On an expected basis, the Fackler recursive reserve formula is illustrated as follows, after applying the total life count:

$$l_x * [(V_t + NP - ME) * (1 + i^g) - (q_x^{(w)} * CSV) - (q_x^{(d)} * DB)] \\ = l_x * {}_1p_x * V_{t+1} = l_{x+1} * V_{t+1}$$

On an actual basis:

$$l_x * [(V_t + NP' - ME') * (1 + I') - (q_x^{(w)} * CSV + (q'_x{}^{(w)} - q_x^{(w)}) * V_{t+1}) \\ - (q_x^{(d)} * DB + (q'_x{}^{(d)} - q_x^{(d)}) * V_{t+1})] = l'_{x+1} * V_{t+1}$$

Translating these into an Analysis in Change in Reserves:

	Expected	Actual Results
Beginning of Period Reserves	$l_x * V_t$	$l_x * V_t$
Renewal Net Premium	$l_x * NP$	$l_x * NP'$
Reserves Released for Maintenance Expenses	$-l_x * ME$	$-l_x * ME'$
Tabular Interest Added to Reserves	$l_x * (V_t + NP - ME) * i^g$	$l_x * (V_t + NP' - ME') * I'$
Total Reserves Released for Death Benefits	$-l_x * (q_x^{(d)} * DB)$	$-l_x * (q_x^{(d)} * DB) \\ -l_x * (q'_x{}^{(d)} - q_x^{(d)}) * V_{t+1}$
Total Reserves Released for Surrenders	$-l_x * (q_x^{(w)} * CSV)$	$-l_x * (q_x^{(w)} * CSV) \\ -l_x * (q'_x{}^{(w)} - q_x^{(w)}) * V_{t+1}$
End of Period Reserves	= Sum of above components	= Sum of above components

Where $l_x = 5,000$, $V_t = 100$, $NP = NP' = 300$, $ME = 15$, $ME' = 8$, $i^g = 4\%$, $I' = 4.25\%$, $q_x^{(d)} = 0.002$, $q'_x{}^{(d)} = 0.003$, $DB = 100,000$, $q_x^{(w)} = 0.02$, $q'_x{}^{(w)} = 0.0$, $CSV = 0$

EOY number of policies is

$$l_{x+1} = l_x * {}_1p_x = l_x * (1 - {}_1q_x^{(w)} - {}_1q_x^{(d)}) = 5,000 * (1 - 0.02 - 0.002) = 4,890$$

Ending reserve per policy is

$$V_{t+1} = \frac{1,002,000}{4,890} = 204.91$$

1. Continued

	Expected	Actual Results
Beginning of Period Reserves	500,000	500,000
Renewal Net Premium	1,500,000	1,500,000
Reserves Released for Maintenance Expenses	(75,000)	(40,000)
Tabular Interest Added to Reserves	77,000	83,300
Total Reserves Released for Death Benefits	(1,000,000)	(1,001,025)
Total Reserves Released for Surrenders	-	20,491
End of Period Reserves	1,002,000	1,062,766
Change in Reserve	502,000	562,766

- (b) Explain how the Analysis in Change in Reserves from part (a) would change if the reserve was calculated using a present value of cash flows approach without margins, such as under ASU 2018-12.

Commentary on Question:

This part of the questions tested candidates' understanding of how margins impact the reserves and the Analysis in Change in Reserves. Candidates had to comment on the directional impact of margins to both Expected reserve base and deviation of Actual reserves to receive full credit.

The reserve is designed to release reserves for the expected rates of deaths and surrenders built into the reserves. Margin serves as the cushion to absorb the deviation of actual experience from the expected bases; if reserves were calculated without margin, then the amounts of expected reserve and reserve release on decrements would be smaller.

On an actual basis, more or less reserves are released to account for the differences between the expected and actual life count due to the higher than expected deaths and lower than expected surrenders; additional reserves equal to the difference between the number of contracts expected to decrement and those that actually decremented multiplied by the ending reserve factor becomes the reconciling item. If reserves were calculated without margin, then the reconciling item would increase in magnitude because the difference between anticipated decrement and actual decrement would be larger.

- (c) Construct a Source of Earnings analysis for the GAAP expectation and actual results.

1. Continued

Commentary on Question:

This part of the question tested candidates' understanding and key considerations of an SOE analysis, and how actual vs. expected changes affect various earnings components. Candidates were expected to construct a complete Source of Earnings analysis. Errors carried over from part (a) were not penalized. Several candidates failed to recognize that a reserve increase due to lower than the expected surrenders results in a negative impact to earnings. Candidates who constructed the complete and correct presentation for the SOE analysis generally achieved more success.

	GAAP	Actual	Actuals - GAAP
In Force Profit Margin			
Gross Premium - Renewal	1,625,000	1,625,000	-
GAAP Net Premium	(1,500,000)	(1,500,000)	-
Net Profit Margin	125,000	125,000	-

Experience - Investment Income			
Investment Income	77,000	83,300	6,300
GAAP Tabular Interest	(77,000)	(77,000)	-
Net Investment Income Margin	-	6,300	6,300

Experience - Mortality			
Actual Benefits	(1,000,000)	(1,500,000)	(500,000)
GAAP Reserve Released for Claims	1,000,000	1,001,025	1,025
Net Mortality Margin	-	(498,975)	(498,975)

Experience - Expenses			
Total Expense Charges	(75,000)	(40,000)	35,000
Release of Expense Reserves	75,000	75,000	-
Net Expense Margin	-	35,000	35,000

Experience - Surrender			
Actual Benefits	-	-	-
GAAP Reserve Released for Surrender	-	(20,491)	(20,491)
Net Surrender Margin	-	(20,491)	(20,491)

Total Gains / (Losses)	125,000	(353,166)	(478,166)
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1. Continued

- (d) Explain the main drivers of differences between the expected and actual results.

Commentary on Question:

Candidates generally performed well on this part of the question. Full credit was received for explaining the main drivers beyond just identifying them.

The largest variance came from mortality experience. Since the actual mortality rate is 50% higher than expected, there is not enough margin in the mortality assumed in the reserves to offset the adverse mortality experience, resulting in current period loss.

Lower than expected lapses also contributed to a loss due to lack of expected reserve release. These losses were partially offset by gains in expenses and investment income due to favorable experience.

2. Learning Objectives:

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

Learning Outcomes:

- (6a) The candidate will be able to describe, apply and evaluate considerations and matters related to:
- Insurance company mergers and acquisitions
 - Management of variable deferred annuities
 - Embedded Value determinations
 - VM-20 financial impacts
 - Rating agency considerations
 - Model Audit Rule and Sarbanes-Oxley Section 404 considerations
 - Source of Earnings analysis

Sources:

LFM-150-22: Captive Insurance Companies, NAIC, Feb 2021

Commentary on Question:

This question tested the candidates' knowledge of captive insurance companies.

Solution:

- (a) ABC Life is evaluating the use of an off-shore affiliate captive for reinsuring this portfolio.
- (i) Evaluate the advantages and disadvantages of this approach.
- (ii) Describe two potential captive structures.

Commentary on Question:

Most Candidates received partial credit for this part of the question. Full credit was not achieved in part (ii) for simply listing the structure. Credit was received for other possible structures (Group, Association, Industrial, Branch, Micro, Protected Cell, Risk Retention Group Captives) with appropriate descriptions.

- (i) Advantages: Captives can provide flexibility in managing risks and can be used to finance redundant XXX reserves. As well there may be some tax advantages
Disadvantages: Principle based reserves may reduce the need for these transactions – and they are facing increased regulatory scrutiny.
- (ii) Pure Captives – insures the risk of its parent company and affiliates.
Rental Captives – a captive insurer formed to enter into a contractual agreement with policyholders and that only insures those policyholders or associations

2. Continued

- (b) Explain each of the following regulations in relation to the use of captives or foreign affiliates by ABC's U.S. subsidiary:
- (i) Actuarial Guideline XLVIII (AG-48)
 - (ii) Principle Based Reserves (VM-20)

Commentary on Question:

Most candidates received partial credit on this part of the question.

- (i) AG-48 was instituted 1/1/2015 to standardize the financing reserving for XXX and AXXX reserves – there were significant amounts of these reserves, and many insurers were employing captives
 - (ii) PBR was intended to allow more company experience in reserving and to bring it into line with other reserving regimes.
 - it was also hoped that PBR would reduce the incentives for these transaction
- (c) Critique the use of captive insurance companies in the following circumstances:
- A. *A reinsurance company has acquired a block of term life insurance written in 2007. It has done this by accepting the business using 100% coinsurance.*
 - B. *A large life insurance company is writing its newest product of term life insurance.*
 - C. *A carrier has a large block of Universal Life (UL) policies that was written in 2016.*

Commentary on Question:

Candidates generally did not perform well on this part of the question.

Answering "Inappropriate" without justification did not receive full credit. Some candidates seemed to miss the significance of the dates.

- A. This block is subject to XXX reserving and using a captive might require Primary security assets
This arrangement may not be favorable to the company although AG-48 reserves might be preferable to XXX – there might be other arrangements.
- B. This is subject to PBR. As this is a large company, a small company PBR exemption is probably not available.
A captive is probably not needed for financing considerations as PBR was intended to reduce the need for these transactions

2. Continued

C. This business would be subject to AXXX reserving
Using a captive would require AG-48 primary securities.
This financing may or may not be favorable to the company although AG-48
reserves might be lower than AXXX but the company may not want to tie up
assets to provide primary security

3. Learning Objectives:

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

Learning Outcomes:

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

Sources:

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

LFM-143-20: Fundamentals of the Principle-Based Approach to Statutory Reserves for Life Insurance, Jul 2019

ASOP 52 - Principle-Based Reserves for Life Products under the NAIC Valuation Manual, Section 3

LFM-843-20: NAIC Life Insurance Illustrations Model Regulation

Commentary on Question:

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

Solution:

- (a) Compare the pre-PBR Standard Valuation Law to the Principles Based Reserve (PBR) for statutory reserves of life insurance policies with respect to the following:
 - (i) Valuation Methodology/Calculation
 - (ii) Assumptions

Commentary on Question:

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

3. Continued

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

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

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

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

Principles Based Reserves

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

- (b) Describe how each piece of the following information about XYZ Life should be used in setting assumptions under VM-20:
- XYZ has been selling 10-year Level Term and Whole Life insurance for 20 years.
 - Historically, sales have been limited to ages 18-50, but have been expanded to include ages 51-65 in the last 3 years.
 - XYZ expects increased deaths from COVID-19 for the next 3 years.
 - XYZ has implemented new underwriting guidelines that it expects to result in future mortality improvement.
 - XYZ does not have the capability to model mortality stochastically.

3. Continued

Commentary on Question:

A common issue on this part of the question was that candidates' description for one part were more appropriate for other parts. Partial credit was received where appropriate.

- (i) Policyholder behavior for the Level Term product should be taken into account where there is a dramatic increase in tail premiums.
- (ii) Exposure period should be at least 3 years, but not more than 10 years. Recommendation must take into consideration the 20 years of sales with only 3 years of experience for ages 51 to 65.
- (iii) If the actuary believes the mortality trends are expected to continue beyond the valuation date and would cause an increase to reserves, then the actuary should consider reflecting such trends in the assumptions for the cash flow projections.
- (iv) Future mortality improvement is only allowed to be reflected up until the valuation date.
- (v) Given the company's inability to model stochastically and since mortality is not required to be modelled stochastically, the company should set assumptions by developing prudent best estimates with additional appropriate margins.

Other answers that can be included above:

1. Create experience segments, where applicable.
2. Update experience study at least once every three years.
3. Credibility must be determined using the Limited Fluctuation Method or Buhlmann Empirical Bayesian Method.
4. There are prescribed margins for company experience and industry tables.
5. Company experience grades into industry rates depending on sufficient data period.

3. Continued

- (c) Evaluate the following e-mail for compliance with the NAIC Life Insurance Illustration Model Regulation:

To: Illustration Actuary
From: Pricing Actuary
Subject: Illustration Sign-off for Upcoming Whole Life Product

My team has verified that for all illustrated points in time after the twentieth policy anniversary, the accumulated value of all policy cash flows equals or exceeds the policy cash surrender value (there are no other illustrated benefit amounts for this product). This is true under both experience assumptions and a modified persistency rate assumption. The modified persistency assumption uses experience persistency for the first 15 years and 100% persistency thereafter.

Below is a numeric summary of a sample illustration for a male, age 35, non-smoker.

Age	Policy Year	Cash Surrender Value
35	0	\$1,000
40	5	\$2,500
45	10	\$9,000
55	20	\$25,000
70	35	\$50,000

Commentary on Question:

Candidates generally did not perform well on this part of the question.

The team verifying that the accumulated value of all policy cash flows equals or exceeds the cash surrender value for all illustrated points in time after the fifteenth policy anniversary, not the twentieth policy anniversary, meets the self-support test.

The modified persistency assumption uses experience persistency for the first 5 years, not the first 15 years, and 100% persistency thereafter, meets the lapse-support test.

Policy years, as shown in the numeric summary of the sample illustration, are correctly assigned to the associated attained ages in the table.

3. Continued

It is necessary to clearly identify the illustrated scale from the guaranteed scale, with the guaranteed scale appearing first.

It is necessary for non-guaranteed elements in an illustrated scale to be reduced as follow:

- i. Dividends at 50% of the dividends contained in the illustrated scale used.
- ii. All non-guaranteed charges, including but not limited to, term insurance charges, , mortality, and expense charges, at rates that are the average of the guaranteed rates and the rates contained in the illustrated scale used.

The illustration shall be labelled with the date on which it was prepared.

Each page shall be numbered and must show the relationship to the total number of pages.

The assumed dates of payment receipt and benefit payout within a policy year shall be clearly identified.

If issue age is shown as a component of the tabular detail, then it should be equal to issue year plus the number of years that the policy is assumed to have been in force.

The assumed payment on which the illustrated benefits and values are based shall be identified as premium outlay or contract premium.

Any illustration of non-guaranteed elements shall be accompanied by an statement indicating that (a) the benefit and values are not guaranteed, (b) the assumptions are subject to change, (c) and the result may be less favorable.

A basic illustration shall include a brief description of the policy being illustrated with a statement that it is a life insurance policy.

A brief description of any policy feature, riders, or options, that are guaranteed or non-guaranteed, which are shown in the basic illustration along with the impact they may have on the benefits and values of the policy.

4. 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 and apply the requirements, calculations, and disclosures related to GAAP "Targeted Improvements".

Sources:

LFM-149-21: Insurance Contracts, PwC (Accounting Guide for Insurance Contracts), 2020, Sections 1.1 -1.3 (pp 1.2-1.9), 2.1-2.5 (pp 2.2-2.21) 3.1-3.9 (pp 3.2-3.48), 5.1-5.10 (pp 5.2-5.56), and Figures IG 2-1 (pp 2.4-2.6) & IG 2-2 (pp 2.15-2.18)

Commentary on Question:

This question tested the candidates' understanding of Market Risk Benefits and Embedded Derivatives under US GAAP Post LDTI. Candidates were expected to understand what characteristics define an MRB, whether common benefit features are considered to be MRB, and how to calculate the value of an MRB. Candidates had to understand the relationship between MRB, embedded derivatives, and the host contract.

Solution:

- (a) Assess whether the following benefit features meet the definition of Market Risk Benefits (MRB) under ASC 944 MRB Fair Value Guidance:
 - (i) Interest crediting rate on the account value based on performance of an equity index within an annuity
 - (ii) Guaranteed lifetime withdrawal benefit on a fixed-indexed annuity
 - (iii) Minimum guaranteed periodic payments on a variable immediate payout annuity, where payments will vary based on the investment performance of a related separate account fund
 - (iv) A secondary guarantee on a universal life contract, where the death benefit remains in force even if the account balance is insufficient to pay the cost of insurance assuming minimum funding requirements are met

Commentary on Question:

Candidates generally did well on this part of the question. Most candidates identified the correct conclusion and received at least partial credit. The more successful candidates were able to clearly show the reasons underlying their conclusions.

4. Continued

- (i) It depends on the termination provisions of the contract. If the equity index crediting earned to date is available upon surrender at any time, the equity index crediting is part of the account balance and is an embedded derivative. If the equity index crediting is only available after some specified period, or only upon death, it is an amount in addition to the account balance and may be an MRB.
 - (ii) Yes. These guarantee features are providing a potential benefit in addition to the account balance for difference between the guaranteed benefit and the account balance.
 - (iii) No. The MRB guidance applies to contracts with an account balance. A payout annuity has no account balance and there is only one benefit. Period certain guarantee is an embedded derivative.
 - (iv) No. The death benefit component of a life insurance product is excluded from the scope of the MRB guidance.
- (b) Critique the following statements regarding MRBs:
- A. *An MRB shall be measured at fair value. Total attributed fees used to calculate the fair value of the MRB can be negative. The unit of account for the attributed fee determination for an MRB can be calculated for a group of contracts with similar product types and issuance period.*
 - B. *An MRB can be evaluated using either a non-option or option-based valuation approach. If an option-based approach is adopted, the terms of the MRB can be adjusted to result in the MRB being equal to zero at inception.*
 - C. *If a contract contains multiple MRBs, those MRBs shall be bundled together as a single compound MRB in the fair value determination.*

Commentary on Question:

Most candidates were able to provide some valid criticism. The most common errors were not understanding that the unit of account for MRB is at a policy (seriatim) level and cannot be grouped for similar product types. Another common error was not recognizing that the attributed fees for MRB cannot be negative.

- A. It is true that MRB is measured at fair value. However, total attributed fees used to calculate the fair value of the market risk benefit shall not be negative or exceed total contract fees and assessments. Also, the unit of account for determining the attributed fee for an MRB is the individual policy (seriatim).

4. Continued

- B. It is true that MRB can be evaluated using non-option valuation approach or option based approach. However, if an option-based valuation approach is used, the terms of the market risk benefit shall not be adjusted to result in the market risk benefit being equal to zero at the inception of the contract.
- C. This statement is correct. The ASC specifically states that if a contract contains multiple market risk benefits, those market risk benefits shall be bundled together as a single compound market risk benefit.
- (c) Calculate the following under the non-option method:
- (i) Annual percentage of the account value that will be attributed to the host as fee revenue
- (ii) The value of the MRB at year 4

Show all work.

Commentary on Question:

Candidates generally performed well on this part of the question. Most candidates were able to correctly calculate the locked-in attributed fee at issue based on the combined GMDB and GMAB benefits and the MRB value. Candidates generally had challenges identifying the fee revenue rate attributed to the host.

- (i) MRB attributed fee is $30\% = 4,500/15000$.
Total annual fees are 1.50%
Annual percentage of the account value that will be attributed to the MRB is $0.45\% = 30\% * (1.50\%)$
Annual percentage of the account value that will be attributed as fee revenue to the host VA contract is $1.05\% = 1.50\% - 0.45\%$
- (ii) The MRB value is equal to the present value of the compounded (GMAB and GMDB) benefits at Year 4, 6,000
less
the attributed fee percentage (30%) times the PV of fees collected from the account at year 4 (10,000)
- MRB liability = $6,000 - 30\% * 10,000 = 3,000$

4. Continued

(d) You are given the following at issue:

- A contract holder deposits 50,000 in an index annuity with GMDB rider that provides the contract holder's death benefit be credited at 6% interest compounded annually.
- The fair value of benefit for the GMDB rider to be paid in excess of the account balance is 2,000.
- The fair value of the embedded derivative for index crediting is 8,000.

Describe the calculation needed for each of the following at a future valuation date under the option method:

- (i) MRB
- (ii) Embedded derivative
- (iii) Host

Commentary on Question:

Candidates generally had difficulty with this part of the question. Successful candidates were able to both clearly describe the revaluation using fair value accounting for the MRB and enhanced derivative, as well as the accretion of the initial host discount. Most candidates received partial credit for the components describe.

Model Solution:

- (i) The MRB would be revalued at fair value for each period. This can be seen as the amount which is defined as the current price to transfer the liability to a market participant in an orderly transaction.
- (ii) The Embedded derivative should also be revalued to fair value each period.
- (iii) The value at inception of the host needs to be calculated first. This is done by taking the account balance and subtracting the value of the MRB and Embedded derivative. In this case, the amount of the host discount is $10,000 = ([\text{MRB at inception}] 2,000 + [\text{Embedded derivative at inception}] 8,000)$, and the initial host is $40,000 = ([\text{the account balance at inception}] 50,000 - [\text{host discount}] 10,000)$.
When looking forward to future valuation dates, the host discount of 10,000 will be accreted through the interest credited expense until the discount reaches zero, and the host reaches 50,000.

5. 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 and apply the requirements, calculations, and disclosures related to GAAP "Targeted Improvements".

Sources:

LFM-841-20 A Closer Look at How Insurers Will Have to Change their Accounting and Disclosures for Long-Duration Contracts, E&Y, Nov 2018

Commentary on Question:

This question tested the candidates' knowledge of ASU 2018-12, also known as Long-Duration Targeted Improvements (LDTI).

Solution:

- (a) Critique the following statements with regard to ASU 2018-12:
 - A. *ASU 2018-12 updates the existing guidance to include a provision for adverse deviation for cash flow assumptions, which need to be reviewed on an annual basis.*
 - B. *Under ASU 2018-12, contracts are grouped in cohorts to measure the liability. These cohorts can include contracts from different issue years.*
 - C. *Terminal dividend liability is accrued at a constant rate based on the present value of the basis used for the amortization of DAC, which is a straight-line basis for individual contracts.*
 - D. *Market risk benefits are measured at fair value. The change in fair value is recognized in other comprehensive income (OCI).*

Commentary on Question:

Candidates generally did well on this part of the question. Candidates were expected to identify the validity of the statements or portions of statements and provide the rationale. Some candidates were unclear in statement D as to how to split change in fair value between OCI and net income. Another valid view is change in fair value is recognized in net income, except for the portion attributable to instrument-specific credit risk that is recognized in OCI.

5. Continued

- A. Cash flow assumptions
 - Reviewed at least annually
 - No provision for adverse deviation
 - B. Cohorts
 - Contracts can be grouped to measure the liability but cannot include contracts from different issue years
 - C. Terminal dividend liability
 - This statement is correct
 - D. Market Risk Benefits (MRB)
 - Measured at fair value
 - Change in fair value attributed to instrument-specific credit risk recognized in OCI; remainder of change recognized in net income
- (b) Company VLF currently sells fixed indexed annuities (FIA) with a GMWB, which is valued as an embedded derivative under FAS133. Under ASU 2018-12, VLF has concluded that FIA indexed credits and GMWBs are considered market risk benefits because they were previously valued as an embedded derivative, and because they have “other than nominal” capital market risk.
- (i) Critique VLF’s conclusion.
 - (ii) Describe “other than nominal” capital market risk that is relevant to VLF’s FIA product.

Commentary on Question:

Most candidates received partial credit for this part of the question. Part (ii) required an understanding of drivers of “other than nominal” capital market risk applied to the given situation, more comprehensive than reciting part of the flowchart and table included in the study note.

- (i)
 - Indexed credits/interest credits and GMWBs are embedded derivatives
 - Indexed credits/interest credits and GMWBs include capital market risk that is “other than nominal”
 - Indexed credits/interest credits remain an embedded derivative while GMWBs becomes a market risk benefit
 - GMWBs are market risk benefits due to transferring a shortfall/loss because when the FIA account value is depleted (reaches 0), insurer continues to pay appropriate GMWB amounts (a transfer from policyholder to insurer)

5. Continued

(ii)

- Capital market risks include equity, interest rate and foreign exchange risk
- Other-than-nominal exposure to capital market risk would exist if the net amount at risk (that is, the guaranteed benefit exceeds the account value, cash value or similar amount) varies by more than an insignificant amount in response to capital market volatility, and the exposure to market risk has more than a remote probability of occurring.
- Indexed credits/interest credits and GMWBs are subject to “other than nominal” exposure to capital market risk
- Indexed credits/interest credits are exposed to capital market volatility; if index increases, index credits occur and account value increases; if index decreases, no index credits and account value doesn’t change.
- GMWBs have exposure to capital market volatility because the benefit base is related in some way to account value, which moves according to indexed credits that are themselves subject to capital market volatility

(c) Describe the new disclosures with respect to ASU 2018-12 for the following:

- (i) liability for policyholder’s account balances and additional liability
- (ii) market risk benefits

Commentary on Question:

Candidates generally did not do well on this part of the question. Disclosures have only been seen in practice by actuaries working on LDTI implementation projects for 1/1/2023 or 1/1/2025 effective dates and will become more widely known as companies start using them in financial reporting.

(i)

Liability for policyholder’s account balances - disaggregated roll forward of the insurance balance. Roll forward presented:

- Reconciliation of the disaggregated roll forwards to the aggregate ending carrying amount of the liability
- Tabular presentation of policyholder’s account balances by range of guaranteed minimum crediting rates, and the related range of the difference between rates being credited to policyholders and the respective guaranteed minimums
- Qualitative and quantitative information about adverse development that resulted in a charge to current-period benefit expense because of premium deficiency

5. Continued

(ii)

Market risk benefits - disaggregated roll forward of the liability balance. Roll forward presented:

- Components of the roll forward may include issuances, interest accrual, net assessments collected, benefit payments, derecognition (lapses), experience adjustments, changes in cash flow assumptions, changes in discount rate assumptions and change in the instrument-specific credit risk
- Guaranteed benefit amounts in excess of current account balances
- Reconciliation of the disaggregated roll forwards to the aggregate ending carrying amount of the liability, disaggregated between positions that are in an asset position and those that are in a liability position
- On an annual basis, qualitative and quantitative information about the significant inputs, judgements and assumptions used in measuring the liability, including how they changed and the effects of the changes on the measurement of the liability.

- (d) List the disaggregation principles that insurers will need to apply to the new required disclosure under ASU 2018-12.

Commentary on Question:

Candidates generally did not do well on this part of the question. Listing any four of the five disaggregation principles from the study note received full credit.

Disaggregation Principles:

- Disclose information in a manner that allows users to understand the amount, timing and uncertainty of future cash flows arising from the liabilities
- Do not obscure useful information by including a large amount of insignificant detail or aggregating items that have significantly different characteristics
- Consider how information has been presented for other purposes
- Do not aggregate amounts from different reportable segments
- Do not make disclosures for insignificant categories except in the reconciliation

6. Learning Objectives:

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

Learning Outcomes:

- (5a) The Candidate will be able to describe and evaluate the theory of capital (including economic capital), and evaluate its applicability for various purposes and its value to different stakeholders.

Sources:

Lombardi, Chapter 29 – Risk-Based Capital, Valuation of Insurance Liabilities, 5th Ed.

ASOP 55 – Capital Adequacy Assessment, Section 3 and Appendix 1

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

LFM-853-22 Group Capital Calculation: Pictorial, National Association of Insurance Commissioners, Dec 2020

Commentary on Question:

This question tested the candidates' understanding of capital at the entity and group level. Candidates generally received partial credit on each part. Few candidates received full credit.

Solution:

- (a) Critique the following statements in the context of RBC:
 - A. *AIF is not subject to the C-0 requirement if all its subsidiaries are non-insurance entities. If AIF has a life insurance subsidiary, then the C-0 factors of such subsidiary is equal to 30% to 100% of the book value of the subsidiary as reported in the statutory annual statement.*
 - B. *For MJE, the RBC interest rate risk factor for the SPDA reserve is determined under the medium category and is required to be increased by 50% due to an asset-liability mismatch. MJE can submit a qualified opinion based on a C-3 significance test to avoid the increase.*
 - 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.*
 - D. *The C-4 business risk capital for MJE will be 0 because AIF Life will allocate C-4 at Total Company level.*

6. Continued

- 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.*

Commentary on Question:

To receive full credit, candidates had to address the validity of each sentence. Some candidates did not. Most candidates received at least partial credit on each statement.

- A. The first sentence is false. AIF **is** subject to the C-0 requirement regardless of whether its subsidiary is a non-insurance entity. The second sentence is also false. If AIF has a life insurance subsidiary, then the C-0 factors of the subsidiary is the subsidiary's risk-based capital requirement.
- B. The first sentence is false. Because MJE's SPDA product does not have a surrender charge, the risk factor is determined under the high risk category and is required to be increased by 50% due to the asset-liability mismatch. The second sentence is also false. MJE can submit an **unqualified** asset adequacy opinion to avoid the increase.
- C. The first statement is true. $MJE's\ RBC\ ratio = 5.0/2.0 = 250\%$. The RBC trend test must be performed when the ratio is between 200-300%. So, MJE must perform the trend test. The second statement is false. Once MJE's RBC ratio falls below the Regulatory Action level, it must submit an RBC plan to its insurance commissioner. After examination or analysis, the commissioner will issue an order specifying corrective actions be taken.
- D. This is false. C-4 is intended to cover general business risks such as losses due to fraud and mismanagement. The C-4 factor is based on premium, annuity considerations, and separate account liabilities. For annuities, the RBC factor is 3.08% of annuity considerations, and will be allocated to **both** AIF and MJE.
- E. This statement is false. C-2 is a percentage of statutory reserves, not premium. Because statutory reserves are calculated past the first policy year, C-2 RBC will **not** only apply in the first year.

6. Continued

- (b) Calculate the Group Capital Ratio for AIF. Show all work.

Commentary on Question:

Most candidates demonstrated how to calculate a group capital ratio. However, few candidates calculated Minimum Regulatory Capital (MRC) correctly, including, but not limited to, the calculations on MRC for Company MJE and Company AIF. Partial credit was received if a group capital ratio formula is correct regardless of the underlying factors.

Available Regulatory Capital (ARC) = 20

Minimum Regulatory Capital (MRC for Company AIF) = $6 - (2 + 3) = 1$

MRC (for Company MJE) = $2 * 2 = 4$. Need to multiply Authorized Capital Level (ACL) by 2 to get Company Action Level (CAL) RBC.

MRC (for other subsidiaries) = 3.

MRC (total) = $1 + 4 + 3 = 8$

Group Capital Ratio = $ARC / MRC = 20 / 8 = 2.5$

- (c) Describe two considerations related to a capital adequacy assessment of an insurer that operates under more than one regulatory regime per *ASOP 55 – Capital Adequacy Assessment*.

Commentary on Question:

Few candidates referenced the applicable section of ASOP 55 correctly.

- a. different regulatory regimes that might apply to different parts of the insurer or different entities (including non-insurance entities) of the **group**, including:

1. cooperation and existence or non-existence of memorandums of understanding between regulators;
2. differing requirements for **capital**, scenario and stress tests, and financial reporting structures;
3. expected regulatory changes;
4. differing amounts of regulatory oversight;
5. impact of rules, restrictions, and time-lags on **capital** availability;
6. differing definitions of “insurance company” and “regulated entity”; and
7. differing **valuation bases**; and

- b. variations in taxation and approaches to litigation in various regulatory regimes.

7. 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.
4. The candidate will understand the fundamental features of the U.S. and International regulatory framework.

Learning Outcomes:

- (1b) Describe and apply the requirements, calculations, and disclosures related to GAAP "Targeted Improvements".
- (4c) The valuation methodology specified in IFRS 17.

Sources:

LFM-149-22: Insurance Contracts, PwC (Accounting Guide for Insurance Contracts), 2020, Sections 1.1 -1.3 (pp 1.2-1.9), 2.1-2.5 (pp 2.2-2.21) 3.1-3.9 (pp 3.2-3.48), 5.1-5.10 (pp 5.2-5.56), and Figures IG 2-1 (pp 2.4-2.6) & IG 2-2 (pp 2.15-2.18)

Chapter 3: US GAAP - Expenses and Capitalization (exclude 3.7.1, 3.7.3, 3.11.4.5, and 3.12)

LFM-141-18 IFRS 17 Insurance Contracts – IFRS Standards Effects Analysis, May 2017, IASB (sections 1, 2, 4 & 6.1-2 only)

Commentary on Question:

This question tested the candidates' understanding of the fundamental features of the U.S. and International regulatory framework.

Solution:

- (a) Critique each of the following approaches.
 - A. *For long-duration contracts, DAC is amortized on a straight-line basis over the expected term of the related contracts. DAC is not subject to impairment testing. However, the premium deficiency test for long duration insurance contracts will need to include the DAC balance.*
 - B. *The test for profits followed by losses may be performed on a grouped contract basis, at grouped contract inception, and is not revisited. When an additional liability is required, it is determined based on a benefit ratio that does not exceed 100%.*

7. Continued

- C. *Future cash flows used to estimate the liability for future policy benefits for limited-payment contracts must be discounted using an upper medium grade 10-year fixed-income instrument yield. The discount rate is required to be updated annually, with the effect of the discount rate changes on the liability recognized in accumulated other comprehensive income (AOCI).*
- D. *The ceding company may receive a ceding allowance from the reinsurer. The ceding allowance DAC offset must be limited to the amount that represents recovery of acquisition costs deferred by the ceding company. Any excess should be recognized in income at the time of the reinsurance transaction.*

Commentary on Question:

Most candidates did well critiquing statement A, but had difficulty recognizing issues in statement D.

- A. First two sentences are correct. DAC is amortized on a straight-line basis over the expected term of the related contracts and DAC is not subject to impairment testing. However, the last sentence is incorrect. The premium deficiency test for long duration insurance contracts will exclude the DAC balance.
- B. Both sentences are incorrect. The test for profits followed by losses is required to be performed on a contract-by-contract basis, at contract inception, and is not revisited. The benefit ratio determined in ASC 944-40-30-20 may exceed 100%, resulting in a liability that exceeds cumulative assessments.
- C. Both sentences are incorrect. The discount rate is required to be an upper-medium grade (low credit risk) fixed-income corporate instrument yield (“single A”) that reflects the duration characteristics of the liability. The discount rate is required to be updated at each reporting date, with the effect of the discount rate changes on the liability recognized in OCI.
- D. First two sentences are correct. In many reinsurance transactions, the ceding company will pay the reinsurer a reinsurance premium for reinsurance coverage, and receive a ceding commission from the reinsurer. The ceding allowance DAC offset is limited to the amount that represents recovery of acquisition costs deferred by the cedant. However, the last sentence is incorrect. Any remaining amount (i.e., the portion of ceding commission above the amount representing recovery of DAC) should be deferred and amortized rather than recognized in income immediately.

7. Continued

- (b) Calculate GAAP DAC capitalization at issue.

Commentary on Question:

Candidates generally did well calculating the DAC capitalization at issue.

Commission and policy underwriting expenses are deferrable. The first year and present values are equal. Therefore, the total amount is deferrable since there are no renewal commissions.

GAAP DAC capitalization at issue = Commission + Policy underwriting expenses
DAC = 28,000 + 8,000 = 36,000

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

Commentary on Question:

Candidates generally did well calculating the Contractual Service Margin. Partial credit was received if candidates missed one of the components in the risk-adjusted outflow calculation.

The contractual service margin (CSM) is the present value of risk-adjusted future cash inflows less the present value of risk-adjusted future cash outflows.

CSM = PV of Risk-adjusted Inflows – PV of Risk-adjusted Outflows
CSM = 249,000 – (28,000 + 4,980 + 8,000 + 18,550 + 187,000)
CSM = 249,000 – 246,530 = 2,470

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

Commentary on Question:

Most candidates received full credit for this part of the question.

A group of contracts becomes onerous if its estimated cash outflows exceed its estimated cash inflows, which implies a negative contractual service margin. This group of contracts is not onerous per IFRS 17 since the contractual service margin is positive.

- (e) Describe how reinsurance contracts held should be accounted under IFRS 17.

Commentary on Question:

Candidates generally struggled to identify the accounting for reinsurance contracts under IFRS 17.

7. Continued

IFRS 17 generally requires a company to account for reinsurance contracts held using an approach consistent with that for the underlying insurance contracts. Reinsurance contracts held are accounted for using the general accounting model modified for:

- (a) recognition date. A group of reinsurance contracts held is recognised from either the beginning of the coverage period of the group of reinsurance contracts or the initial recognition of the underlying insurance contracts, whichever is the later date, or from the beginning of the coverage period if the reinsurance coverage is not for the proportionate losses of a group of underlying insurance contracts.
- (b) estimation of the fulfilment cash flows. For reinsurance contracts held, the fulfilment cash flows reflect the risk of non-performance by the issuer of the reinsurance contract.
- (c) measurement of the contractual service margin at initial recognition. Any net gain or loss at initial recognition is recognised as a contractual service margin, unless the net cost of purchasing reinsurance relates to past events, in which case the company is required to recognise the net cost immediately in profit or loss.

8. Learning Objectives:

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

Learning Outcomes:

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

Sources:

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

- Chapter 19: Variable Deferred Annuities
- Chapter 23 – PBR for Life Products (exclude 23.1)
- Chapter 24 Addendum for Variable Annuity PBR Updates

LFM-143-20: Fundamentals of the Principle-Based Approach to Statutory Reserves for Life Insurance, Jul 2019

LFM-850-22: Changes to Section 7702 (IRC) and Nonforfeiture Interest Rates, Lewis & Ellis, Jan 2021

Commentary on Question:

The question tested the candidates' knowledge of VM-20, VM-21, and policyholder tax requirements of 7702. Candidates generally did well on this question.

Solution:

- (a) Critique the following statements:
 - A. *A block of business containing universal life with secondary guarantee policies, which were issued in 2020 and 2021, is subject to VM-20.*
 - B. *If a group of term life contracts passes the deterministic exclusion test for VM-20, the minimum reserve is the aggregate net premium reserve.*
 - C. *To qualify as a clearly defined hedging strategy, the strategy must specify the risks being hedged and instruments used for hedging.*
 - D. *If a group of universal life with secondary guarantee policies has a clearly defined hedging strategy, it is subject to the stochastic exclusion test for VM-20.*

8. Continued

- E. Disintermediation risk, annuitization risk, and reinsurer default risk should be reflected in the VM-21 reserve calculation.*
 - F. If the VM-21 total reserve equals the standard scenario amount, there is no need to allocate the results to the contract level.*
- A. Partly true. The policies were issued in 2020 and 2021 after the 1/1/2017 operative date of VM-20 and after the three year optional transition period. So unless the company can pass the company wide exclusion test the block would be subject to VM-20.
- B. False. Neither term life nor secondary guarantee UL are permitted to use the deterministic exclusion test (DET) to avoid computing deterministic reserves. Only “other life” is eligible to take the DET. If the term policies fail the stochastic exclusion test, the minimum reserve will also need to include the excess of the stochastic reserve over the deterministic reserve.
- C. Partly True. These are only two out of over a dozen requirements that are needed to qualify as a CDHS.
- D. False. Policies with a CDHS cannot avoid stochastic reserves via the stochastic exclusion test. Such policies must go through a stochastic reserve calculation.
- E. Partly True. Disintermediation risk and annuitization risk should be reflected. Reinsurer default risk should not be reflected in the VM-21 reserve calculation unless it has actually happened prior to the valuation date.
- F. This statement is correct as the contract level results do not need to be allocated since the standard scenario amount is used and is computed at the contract level.
- (b) Identify whether each of the following would increase or decrease due to a change of the 7702 insurance interest rate from 2.0% to 3.0% for a Universal Life contract in a future year:
- (i) Seven-pay Premium
 - (ii) Guideline Level Premium
 - (iii) Guideline Single Premium

8. Continued

- (iv) CVAT Corridor Factor

Justify your response.

Commentary on Question:

Candidates generally identified the interest rate increase from 2% to 3% as leading to a decrease in the 7702 premiums. Some candidates did not adequately explain how the guaranteed interest rate came into play.

- (i) Interest rate used for PV calculation in = Max (contract guarantee rate and 7702 int rate).

If the 7702 insurance interest rate increases from 2% to 3% and the guaranteed crediting rate is less than 3%, then the 7-pay premium interest rate increases to 3% and the 7-pay premium decreases.

If the guaranteed credited interest rate is equal to greater than or equal to 3%, then the 7-pay premium interest rate is equal to the guaranteed credited interest rate and the 7-pay premium is unchanged.

- (ii) Interest rate used for PV calculation in = Max (contract guarantee rate and 7702 int rate).

If the 7702 insurance interest rate increases from 2% to 3% and the guaranteed crediting rate is less than 3%, then the GLP interest rate increases to 3% and the GLP decreases.

If the guaranteed credited interest rate is equal to greater than or equal to 3%, then the GLP interest rate is equal to the guaranteed credited interest rate and the GLP is unchanged.

- (iii) Interest rate used for PV calculation in = Max (contract guarantee rate and 7702 int rate + 2%) = Max(contract guarantee rate and 5%)

If the 7702 insurance interest rate increases from 2% to 3% and the guaranteed crediting rate is less than 5%, then the GSP interest rate increases to 5% and the GSP decreases.

If the guaranteed credited interest rate is equal to greater than or equal to 5%, then the GSP interest rate is equal to the guaranteed credited interest rate and the GSP is unchanged.

8. Continued

- (iv) If the 7702 insurance interest rate increases from 2% to 3%, and the guaranteed crediting rate is less than 3%, then the interest rate for the NSP's used in the CVAT corridor calculation would increase to 3%. This means the NSP's would decrease and the CVAT corridor factor would increase since the cash value would fund a greater death benefit. (The CVAT corridor factor is the reciprocal of the NSP).

If the guaranteed crediting rate is greater than or equal to 3%, then the guaranteed crediting rate would continue to be used for the calculation of the CVAT corridor factor and would not change.

- (c) Whole life policies were issued at the guaranteed interest rate of 5% in 2021.

Explain how the changes of the minimum interest rates for CVAT will impact the cash value.

In 2021, the CVAT minimum interest rate was reduced from 4% to 2%.

This means cash values on the policy must be less than the NSP calculated using 2%. Previously they had to be less than the NSP calculated using 4%.

The whole life policies were issued with a guaranteed interest rate of 5%. Since whole life cash values are calculated prospectively, the 5% whole life cash values are lower than the NSP's in either case. Cash values would not change.

9. Learning Objectives:

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

Learning Outcomes:

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

Sources:

US GAAP for Life Insurers, Herget et al., 2nd Edition, 2006, Chapter 9

Commentary on Question:

This question tested the candidates' understanding of US GAAP accounting for limited-payment annuity contracts with significant and insignificant mortality risk. Candidates were to determine GAAP reserves and profits based on the Constant Yield to Maturity Method for limited-payment annuity contracts with insignificant mortality risk classified as investment contracts.

Solution:

- (a) Critique each of the following statements with respect to annuities in payment status:
 - A. *A contract whose life contingent payments is 20% of the present value of all payments anticipated under the contract is not considered to have a nominal mortality risk and thus, can be valued as an investment contract.*
 - B. *Some companies can group contracts with similar characteristics together when classifying policies for accounting purposes and can change such classification when circumstances change during the contract's lifetime.*
 - C. *The concept of loss recognition applies to investment contracts under SFAS97.*
 - D. *Once the DAC asset for an investment contract has been written off, the deferral of future losses can be avoided by increasing the benefit reserve.*
 - E. *The concept of locked-in assumptions is applicable to investment contracts.*
 - F. *Margins for adverse deviations should be included in setting assumptions for investment contracts.*

9. Continued

Commentary on Question:

To receive full credit candidates had to clearly state if the statement was correct or not in addition to the rationale. For several statements, candidates needed to consider both 'nominal' and 'other than nominal' mortality risk to receive full credit. Credit was not received if the candidate simply restated the statement.

(A) False. It is generally accepted that a contract whose life contingent payments exceed 5 to 10% of the present value of all payments anticipated under the contract contains more than a "nominal mortality risk" and therefore should be accounted for as a limited payment insurance contract.

(B) False. Companies can group contracts with similar characteristics together when classifying policies for accounting purposes and such classification must remain in effect for the contract's lifetime.

(C) False. The concept of loss recognition does not apply when accounting for investment contracts under SFAS91 or SFAS97 but if the contract is under SFAS97 limited pay, loss recognition applies.

(D) False. Once the DAC asset for an investment contract is written off, the deferral of a future loss cannot be avoided by increasing the benefit reserve because loss recognition is not a concept recognized in the accounting for investment contracts as it is for insurance contracts.

(E) False. The concept of locked-in assumptions is not applicable to investment contracts.

(F) False. Margins for adverse deviations are applicable to annuities in payment status with more than an insignificant amount of mortality risk. There are no margins for adverse deviations applicable to annuities in payment status with insignificant amount of mortality risk.

(b) You are given the following data for a 5-Year certain annuity contract:

- Premium paid at beginning of policy year 1: 1,400
- Acquisition expenses incurred at beginning of policy year 1: 75
- Policy benefits paid at the end of each policy year 1 to 5: 300
- Maintenance expenses incurred at the end of each policy year 1 to 5: 15
- Investment rate of return in all policy years: 6.50%

9. Continued

With respect to the Constant Yield Method:

- (i) Calculate the discounted interest rate needed to determine the net policy reserves. (Hint: Use IRR function in Excel to determine this interest rate.)
- (ii) Calculate the GAAP net policy reserves for the end of each policy year 1 through 5.
- (iii) Determine the GAAP profit for each policy year 1 through 5, assuming actual realized experience match the assumed assumptions.

Show all work.

Commentary on Question:

Candidates generally did well on this part of the questions. To receive full credit on the discount rate calculation candidates had to use the IRR function in Excel as stated in the question.

See Excel version (ILA LFMU Solutions Fall 2022 Question 9) for part b

10. Learning Objectives:

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

Learning Outcomes:

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

Sources:

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)

ASOP 52 - Principle-Based Reserves for Life Products under the NAIC Valuation Manual on PBR for Life Products, Section 3

Commentary on Question:

This question tested candidates' understanding of U.S. Statutory valuation principles and methods.

Part (b) of the question tests candidates' understanding of the model validation techniques from ASOP 52. Full credits are given only when the model technique is described instead of just listed. Candidates who gave generalized validation techniques outside of the reading did not receive full credits as the question specifies the source reading.

Solution:

- (a) 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.

10. Continued

With respect to the calculations provided in the spreadsheet:

- (i) Revise the calculations, where necessary, to assure the accurate calculation of pre-PBR CRVM and deficiency reserves.
- (ii) Assume the above policies are issued on January 1, 2022. Calculate the Deterministic Reserve as of December 31, 2022 using the Prospective Method.

Commentary on Question:

Candidates generally did poorly on part (i). This part of the question tested candidates' understanding of calculations for CRVM Reserves, Deficiency Reserves, Adjusted Basic Reserves and Basic Reserves.

Candidates generally identified that the interest rate and mortality rate were incorrect; while many candidates identified an incorrect expense allowance, few candidates properly corrected the formula. Few candidates identified that the CRVM Valuation Net Premium needed to be revised. Most candidates did poorly identifying the Basic Reserve Per Unit Inforce, Adjusted Basic Reserve Per Unit Inforce, and Deficiency Reserve Per Unit Inforce needed modifications. Candidates received credit by identifying whether a column within the calculation is incorrect and making appropriate revisions; and identifying columns that were correct and leaving them as such.

Part (ii) of the question tested candidates' understanding of Deterministic Reserve using Prospective Method. Candidates received full credit by listing out the formula, performing the calculations and obtaining the correct answer.

Candidates generally understood the formula to calculate the Deterministic Reserve using the Prospective Method. Most candidates received partial credit for attempting to calculate the reserve. Common mistakes included: Using the valuation interest rate instead of the net asset earned rate; incorrectly calculating the liability cashflows before FIT; and not calculating the reserve as of the date asked for in the question (December 31, 2022).

For Part (a)(i), the columns below require modifications:

- Premiums Per Unit of 1 for all years in Column C should be replaced with the actual gross premium per unit of 5.20. However, any value can be placed in this column since the calculation of CRVM reserves are not impacted by premiums as long they are level. But, they do impact the calculation of deficiency reserves.

10. Continued

- The net asset rates shown in the Interest Rate column in Column D should be replaced with valuation interest rates allowed by the valuation law.
- The mortality rates shown in the Per \$1000 Mortality Rate column in Column E are experience mortality rates and should be replaced with the applicable valuation mortality rates. Statutory valuation reserves are required to use mortality rates from permitted valuation mortality tables.
- The formula for the Expense Allowance in Column R and in the first year for CRVM Valuation Net Premium in Column U includes a full-year interest discount for the tabular cost, which is inconsistent with the assumption for the payment of death benefits that is assume to occur at the beginning of the year. The full-year interest discount should be removed from the formula.
- Typically, curtate CRVM reserves are 0 in the first two policy years. Removal of the full-year interest discount for the tabular cost of insurance in Columns R and U will correct this problem and the CRVM reserves for the first two years will become 0. This is consistent with the beginning of year death benefit payment assumption.
- The formula in Column U for calculating the CRVM Valuation Net Premium is incorrect. The CRVM Valuation Net Premium should equal the Statutory Net Level Premium + annual amount to amortize the expense allowance over the ten-year life of the plan (or Expense Allowance / a-double-dot(55,10)).
- The formula presented in the Column AA for Deficiency Reserve Per Unit Inforce was the formula applicable to the calculation of deficiency reserves prior to the implementation of Triple X, where deficiency reserves were equal to the Present Value of the excess of future Statutory Valuation Net Premiums over Gross Premiums, if any. Current calculation of deficiency reserves requires the calculation of Adjusted Basic Reserves as defined above, which are to be reduced by Basic Reserves, also defined above, to determine deficiency reserves. Since the same valuation assumptions are used to calculate both approaches for the deficiency reserves calculations, the resulting deficiency reserves will be the same.
- Deficiency Reserves = Adjusted Basic Reserves - Basic Reserves, where Adjusted Basic Reserves are equal to Basic Reserves replacing the valuation net premium with the gross premium when it is less than the valuation net premium and Basic Reserves are equal to the minimum reserves falling within the scope of the Valuation of Life Insurance Policies Model Regulation.

For Part (a)(ii), Deterministic Reserve = $-1 \times \text{PV Liability Cash Flows before FIT}$.

See Excel spreadsheet for calculation details.

10. Continued

- (b) Describe 3 model validation techniques as outlined by *ASOP 52 - Principle-Based Reserves for Life Products under the NAIC Valuation Manual on PBR for Life Products*.

Commentary on Question:

There are four model validation techniques listed in the source material. Candidates only need to provide three out of the four techniques to receive full credit. Candidates generally described two of the techniques (static validation and dynamic validation).

Full credit was given when the model technique is described and not just listed. Candidates who described generalized validation techniques outside of the reading did not receive credit as the question specifies the source reading.

- (i) Static validation that confirms that initial values (for example, net premium reserves, face amount, policy count, premium in force, account values, net amount at risk, and other measures of inforce exposure to risk) materially balance to the insurer's records as of the valuation date used to calculate the stochastic reserves and deterministic reserves.
- (ii) Dynamic validation: compare the cash flows produced by the model to the actual historical data to verify, where appropriate, that the model produces results reasonably like those experienced.
- (iii) Consistency of the model results: compare the results of any other existing internal systems that have similar calculations, such as economic capital analysis and cash flow testing analysis.
- (iv) Review model changes: perform an analysis that critically compares the results stemming from the changes made to the prior validated model.