

ILA LFMU Model Solutions

Fall 2020

1. Learning Objectives:

4. The candidate will understand the fundamental features of the U.S. and International regulatory framework.
5. The candidate will understand the fundamental purpose of capital, and its determination and stakeholders.

Learning Outcomes:

- (4a) The features of the U.S. regulatory regime and the forces which are shaping the evolution of the regime.
- (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:

Economic Capital for life Insurance Companies, SOA Research paper, Oct 2016 (exclude sections 5 and 7)

Economic Capital A Case Study to Analyze Longevity Risk, Silverman, JRM, 2010

LFM-148-20 The Theory of Risk Capital in Financial Firms

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

Commentary on Question:

This question tested the candidates' knowledge of economic capital and financial management.

Solution:

- (a) With regard to solvency regulation:
 - (i) List two reasons U.S. regulators would be interested in international regulatory developments.
 - (ii) Explain the shortcomings of the U.S. RBC factor-based approach compared to Solvency II's model-based approach.

1. Continued

Commentary on Question:

Candidates generally answered this part of the question well. Candidates who listed any two of the three items below in part (i) received full credit.

(i)

- U.S. regulators might be interested in international developments to identify potential improvements in U.S. regulation that they believe have merit.
- U.S. regulators may feel pressure to adopt certain methods to meet international standards or to prevent conflicts over "regulatory equivalency".
- U.S. regulators may wish to avoid federal intrusions into state regulation by adopting reforms that are reasonably consistent with international standards and address any perceived deficiencies in the current regulations.

(ii)

- The RBC approach is a one-size-fits-all approach, whereas a model-based approach can be tailored towards individual company characteristics.
- The RBC formula omits some risks, such as catastrophe and operational, that could be better quantified using a model.
- A model-based approach compels insurers to take a more forward-looking and comprehensive view of their risk and they can determine a regulatory capital amount that is more suited to their circumstances.
- The vast majority of U.S. insurance companies have regulatory capital significantly greater than the minimum amount that would require RBC action levels to be triggered; this calls into question how accurately the RBC formulas are actually measuring companies' financial risks.

- (b) Describe the advantages and disadvantages of LHR operating at an economic capital ratio of 150% compared to 400%.

Commentary on Question:

Candidates generally answered this part of the question well.

- 150% Pros: increases the return on capital by reducing the denominator.
- 150% Pros: Operating at this capital level ratio shows some level of capital efficiency if returns are commensurate
- 150% Cons: Mildly adverse performance may cause the insurer to breach the requirement over the next year and suffer the associated frictional costs and loss to franchise value
- 400% Pros: May increase the franchise value by attracting a greater amount of profitable business

1. Continued

- 400% Pros: Helps protect or enhance the interest of a number of stakeholders and to increase shareholder returns by avoiding costs of failure to meet the company's objectives
 - 400% Cons: Can be seen as having a cost to the business relating to tax, investment costs and potentially agency effects, thus reducing shareholder value
- (c) 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
 - (ii) Securitization of longevity risk through issuance of a 10-year longevity bond

Commentary on Question:

For part (i) credit was received for any evaluation on how mortality risks of a life vs. annuity block could be mismatched. Candidates generally did not do well on part (ii).

- (i) Life insurance issuance - mostly ineffective.
Diversification can provide some capital relief. But negatively correlated risks are rarely perfectly matched.
Overall changes in mortality may affect life blocks differently from annuity blocks.
- (ii) Securitization through longevity bonds - should be effective.
If the economic liability is below the attachment point, the insurer will not need to repay some of the principal. In fact, if the economic liability reaches the exhaustion point, the insurer would not need to repay any principal.
While such a bond is an out-of-the-money risk to the investor, it can immediately reduce an insurer's economic capital.
While not stated explicitly in the text, it is clear from the text example that the reduction in economic capital is a function of reduction of tail risks in longevity. Credit is given for coherent discussion of this concept.

1. Continued

(d) 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.*
- B. *The required risk capital of the combined X+Y+Z should be allocated across the business units.*
- C. *Having unallocated risk capital would indicate LHR is not covering all of its risks.*

Commentary on Question:

Candidates generally critiqued statements A and B well. For statement C, candidates generally neglected to discuss the extreme case of perfect correlation between business units.

- A. This is false; you must consider the correlation of risks amongst the units (the combination of units is 700, which is less than adding all 3 units, indicating there is some diversification benefit). A business that is unprofitable on a stand-alone basis may be profitable when there is other business with offsetting risks.

Calculating the marginal risk capital shows unit Z actually has the highest marginal capital. This indicates that eliminating unit Z would actually reduce required risk capital the most.

Unit	Marginal Risk Capital
X	180
Y	100
Z	240
Sum of Marginal Risk Capital	520

- B. This is false; the total amount of capital allocated should be 520, the sum of the marginal capital amounts. Allocating all of the risk capital is usually not feasible and it can distort the profitability of each unit.
- C. This is false; having unallocated capital indicates that the profitability of the business units is not perfectly correlated. Only in the extreme case of perfect correlation will all capital be allocated. Since not all of LHR's capital is allocated, this indicates a diversification benefit amongst the business units; this diversification actually makes the company less risky than if the units were perfectly correlated.

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
 - Special Purpose Vehicle

Sources:

LFM-147-20: A.M. Best's - Compendium of Publications

Commentary on Question:

This question tests the candidates' knowledge on how AM Best determines its capital adequacy ratio (BCAR) for a life insurance company, and how it can be used to evaluate alternative business decisions.

Solution:

- (a) AKL Life Insurance Company is a public company that was recently assigned a negative outlook by A.M. Best.
- (i) Describe the process followed by A.M. Best that results in the rating agency assigning a negative outlook to an insurance company.
- (ii) List three potential impacts of the negative outlook on AKL's day-to-day operations.

Commentary on Question:

For part (i), an outlook is issued in conjunction with a rating, and the process followed by AM Best is the same regardless of the ultimate assignment. To receive full credit, candidates needed to sufficiently describe the process from the collection of data all the way through to the dissemination of the rating/outlook.

For part (ii), candidates only needed to list three of the seven potential impacts listed below to receive full credit.

2. Continued

- (i) A rating analyst is assigned to facilitate and oversee the entire process.

The first step in the process would be data collection and interviews. The analyst would collect internal data from the insurance company, including financial statements, internal models and management reports. The analyst would then conduct interviews with company management to better understand the data and the company's risk position.

After several rounds of data collection and interviews, the analyst would perform financial analyses that measure the risks in the company, including equity risk, market risk, insurance risk and business risk. While performing these analyses, the analyst would also consider information from external sources, including the economic outlook of the market and industry.

Based on the results of the financial analyses, the analyst would recommend a rating/outlook to a rating committee, and the committee would rigorously review the recommendation and make a final decision. The analyst would then share the committee's decision with the company first. The company would then decide whether to appeal, accept or withdraw from the decision before any information is released to the public.

- (ii) Potential impacts of a negative rating are:

- Higher borrowing costs
- Increased regulatory pressure from governments
- Harder to raise capital
- Decreased sales or new business
- Increased lapses or lower persistency
- Negative pressure on stock price and concerns of shareholders
- Shareholders may seek higher returns given negative outlook

- (b) Calculate the BCAR for AKL. Show all work, including writing out relevant formulas used in any calculations.

Commentary on Question:

Generally, candidates calculated the BCAR correctly. Common errors included using one of the following formulas:

- $[(\text{Available Capital} - \text{Net Required Capital}) / \text{Net Required Capital}] \times 100$
- $[\text{Available Capital} / \text{Net Required Capital}] \times 100$

2. Continued

$$\begin{aligned}\text{Net Required Capital} &= [(15 + 15)^2 + (5 + 5)^2 + (5)^2]^{0.5} + 2 \\ &= 34.02\end{aligned}$$

$$\begin{aligned}\text{BCAR} &= [(\text{Available Capital} - \text{Net Required Capital}) / \text{Available Capital}] \times 100 \\ &= [(100 - 34.02) / 100] \times 100 \\ &= 65.98\end{aligned}$$

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

Commentary on Question:

The recommendation in part (ii) depends on recalculating the BCAR using the changes in Available Capital and Net Required Capital, and then comparing it to the base BCAR from part (b) above. The transaction that provides the largest BCAR will then be the recommended transaction. Generally, candidates who used the correct formula for BCAR made the correct recommendation. Candidates who used an incorrect formula received partial credit for calculating components correctly and demonstrating an understanding of the concepts.

For part (ii), candidates only needed to identify two of the four considerations listed below to receive full credit.

- (i):

$$\text{BCAR} = [(\text{Available Capital} - \text{Net Required Capital}) / \text{Available Capital}] \times 100$$

$$\begin{aligned}\text{BCAR Neither} &= \text{BCAR if neither transaction is done} \\ &= \text{current BCAR} \\ &= 65.98, \text{ from part(b)}\end{aligned}$$

2. Continued

$$\begin{aligned} \text{BCAR Buy} &= \text{BCAR if term block is purchased but annuity block is not sold} \\ &= [(98 - 35.02) / 98] \times 100 \\ &= 64.27 \end{aligned}$$

$$\begin{aligned} \text{BCAR Sell} &= \text{BCAR if annuity block is sold but term block is not purchased} \\ &= [(101 - 32.02) / 101] \times 100 \\ &= 68.30 \end{aligned}$$

$$\begin{aligned} \text{BCAR Both} &= \text{BCAR if term block is purchased and annuity block is sold} \\ &= [(99 - 33.02) / 99] \times 100 \\ &= 66.64 \end{aligned}$$

Based on BCAR score only, AKL should sell the annuity block since the sale would maximize the score

(ii):

- Impact on share price
- Impact on other key metrics such as RBC, profit
- AKL's operational capacities and competencies, expertise, admin systems
- AKL's vision and strategy

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

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.
- (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
 - Special Purpose Vehicle

Sources:

LFM-146-20: The Next Chapter - Creating an understanding of Special Purpose Vehicles

Impacts of AG 48, FR, 2015

LFM-822-16: Study Note on Actuarial Guidelines AG 38 & 48 (exclude pages 6 to 8)

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

Commentary on Question:

This question tested the candidates' knowledge of special purpose vehicles and reserve requirements.

3. Continued

Solution:

- (a) For a typical structure of a Special Purpose Vehicle (SPV) used to obtain financing:
- (i) Describe the entities involved.
 - (ii) Describe the interactions between them.

Commentary on Question:

Candidates who received full credit identified the four main entities and described the interactions between them, particularly with respect to the asset flows between the entities and noted the lower funding cost opportunities by moving certain assets to the SPV versus the corporation. Candidates generally did not describe the flow of assets between the entities or the lower funding cost opportunities.

The Main Corporation creates a SPV (its affiliate) in order to sell assets on its balance sheet to the SPV and obtaining financing through the SPV.

The SPV obtains funds to purchase the asset by way of debt financing from independent equity investors.

The SPV starts a circular transaction by transferring the money raised first to the main corporation and then to the investment bank. The assets flow in the opposite direction from the main corporation to the SPV and then to the investment bank and back to the main corporation, thus effectively cancelling each other out.

Since the SPV owns the assets, which then become the collateral for the securities issued, lenders evaluate the credit quality of the collateral and not the credit quality of the corporation. As a consequence, lower funding costs are possible. For example, a non-investment grade issuer might be able to obtain funding at investment-grade levels by isolating the assets in the SPV.

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

Commentary on Question:

Candidates received full credit if 2 key benefits and 2 key risks were identified and explained. Candidates generally did well on this part of the question.

Benefits

1. Asset Ownership – An SPV allows the ownership of a single asset often by multiple parties and allows for ease of transfer between parties.
2. Minimal red tape – Depending on the choice of jurisdiction, it is relatively cheap and easy to set up an SPV. The process may take as little as 24 hours, often with no governmental authorization required.

3. Continued

3. Clarity of documentation – It is easy to limit certain activities or to prohibit unauthorized transactions within the SPV documentation.
4. Freedom of jurisdiction – The firm originating the SPV is free to incorporate the vehicle in the most attractive jurisdiction from a regulatory perspective whilst continuing to operate from outside this jurisdiction.
5. Tax benefits – There are definite tax benefits of SPVs where assets are exempt from certain direct taxes. For example, in the Cayman Islands, incorporated SPVs benefit from a complete tax holiday for the first 20 years.
6. Legal protection – By structuring the SPV appropriately, the sponsor may limit legal liability in the event that the underlying project fails.
7. Isolation of Financial Risk – By structuring the SPV as an ‘orphan company’, the SPV assets may not be consolidated with the firm’s on-balance sheet assets and are ‘bankruptcy remote’ in the event of bankruptcy or a default.
8. Meeting regulatory requirements – By transferring assets off-balance sheet to an SPV, banks are able to meet regulatory requirements by freeing up their balance sheets.

Risks

1. Lack of Transparency. The complexity of SPVs - often in the form of layers upon layers of securitized assets - can make it near impossible to monitor and track the level of risk involved and who it lies with.
2. Reputational Risk. The firm’s own perceived credit quality may be blemished by the underperformance or default of an affiliated or sponsored SPV. For this reason, it is not a credible risk that the firm will abandon the SPV in times of difficulty.
3. Signaling Effect. The poor performance of collateral in an SPV attracts a high degree of attention and assumptions are made that the quality of the firm’s own balance sheet can be judged on a similar basis.
4. Franchise risk. There is a risk that investors in an affiliated SPV are upset and this affects other relationships between the sponsor and these investors, for instance as holders of unsecured debt.
5. Liquidity and funding risk. The poor performance of an affiliated SPV may affect the firm’s access to the capital markets.; moral hazard
6. Equity Risk. The firm might hold a large equity tranche in a vehicle (e.g. an SIV). If the firm does not step in and support or save the vehicle from collapse in difficult situations, the resulting winddown of the SPV and sale of the assets at depressed valuations is likely to erode the firm’s equity in the SPV, to a greater extent than the firm stepping in and either affecting an orderly wind-down of the vehicle or bringing its assets back onto its balance sheet.
7. Mark-to-Market risk. The forced sale of assets from an affiliated SPV could depress the value of related assets that the firm holds on the balance sheet. The firm will want to prevent a large negative mark-to-market impact on its own balance sheet.

3. Continued

8. Regulation. The same regulatory standards do not apply to assets contained within an SPV as to the firm's assets on balance sheet. This is a reason that many firms opt for these vehicles in the first place. However, this lax regulation poses an indirect risk to the originating firm.

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

Commentary on Question:

This part of the question tested the candidates' understanding of the capital-intensive nature of term products due to regulation XXX. Full credit was received by connecting the product's profitability, current reserve requirements, and potential reserve relief through certain reinsurance arrangements.

Companies believe that XXX requires reserves that are redundant and can use captives that are reinsured through international reinsurers to reduce their reserve requirements.

- (d)
- (i) Describe XYZ's decision-making process of the determination of Actuarial Guideline 48's primary security requirement.
 - (ii) Calculate the Primary Security Requirement. Show all work, including writing out relevant formulas used in any calculations.

Commentary on Question:

Candidates who received full credit in part (i) recognized that the primary security requirement under AG48 is the actuarial method, which is VM-20 without modification (as stated in the information provided in the question). Candidates who received full credit in part (ii) identified which parts of VM-20 were applicable for this Term scenario (i.e., the stochastic exclusion test was available and was passed, therefore the stochastic reserve was not needed, but the deterministic reserve is required for Term). In general, candidates did well on this part of the question. Some candidates calculated the VM-20 reserve correctly but then defined the primary security requirement as the VM-20 reserve less CRVM. In this question, the primary security requirement is equal to VM-20 with no modifications as the actuarial method, so CRVM does not apply.

Because the Actuarial Method uses VM-20, this means that the Primary Security is equal to the VM-20 reserve with no modifications.

Because the company does not have a clearly defined hedging strategy, they may decide to take the stochastic exclusion test.

Because the company decided to take the stochastic exclusion test, they are not yet required to calculate a stochastic reserve.

3. Continued

Because they passed the Stochastic Exclusion Test, they are not yet required to calculate a stochastic reserve.

Because this is a Term product, the DR is required and the formula to use is:

$\text{NPR} + \text{Max} [0, \text{DR} - (\text{NPR} - \text{DDPA})]$

$100 + \text{Max}[0, 120 - (100 - 5)] = 125$

4. Learning Objectives:

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

Learning Outcomes:

- (2b) Describe, apply and evaluate the Principle-Based Reserves valuation methods and techniques for specific insurance products under U.S. Statutory rules.

Sources:

PBA Corner: Evolution of VM-20, Financial Reporter, June 2016

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

LFM-844-20 Life Principle-Based Reserves Under VM-20, AAA Practice Note (exclude questions which are not highlighted)

Commentary on Question:

This question tests the candidates' understanding of U.S. Statutory valuation principles and methods applicable to individual life insurance products, in particular VM-20.

Solution:

- (a)
 - (i) Describe two reasons why the credibility of a company's mortality experience is important under VM-20.
 - (ii) List the advantages and disadvantages of the Limited Fluctuation credibility method and the Bühlmann Empirical Bayesian credibility method.

Commentary on Question:

Candidates generally did well on this part of the question. For part (ii), some candidates only discussed one of the two methods.

(i)

Reason 1:

Credibility of experience mortality will determine the mortality margin
- Higher credibility will result in a lower margin

Reason 2:

Credibility of experience mortality will determine the schedule for grading into the industry table
- Higher credibility will result in grading starting at a later duration

4. Continued

(ii)

Limited Fluctuation

Advantages:

- only requires data from the company
- relatively easy to understand, implement and interpret

Disadvantages:

- does not specify procedures to estimate certain parameters (overcome in VM-20 by prescribed values)
- only considers the accuracy of the company's experience and does not consider any relationship to industry experience
- no quantities can be optimized in the calculation due to an a priori assumption that the data is normally distributed

Buhlmann Empirical Bayesian

Advantages:

- systematic approach with assumptions and optimizations defined, with no need to arbitrarily select parameters
- reflects the accuracy in both company and industry data through two variance calculations

Disadvantages:

- hard to interpret and explain
- requires the company to rely on statistical agents for industry data (overcome in VM-20 by a formulaic approximation)

(b) 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

- Identify the credibility method.
- Describe what is known about the estimate if there is full credibility.
- Explain whether or not the credibility factor would be appropriate under VM-20.

4. Continued

Commentary on Question:

Candidates were generally able to identify the credibility method. Some candidates had difficulty interpreting the formula.

(i)
Limited Fluctuation

(ii)
There is at least a 97.5 percent probability that the estimate is no more than 2.5 percent in error of the true value

(iii)
Yes, since VM-20 prescribes that there must be at least a 95 percent probability that the estimate is no more than 5 percent in error of the true value

- (c) 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.*
 - B. *A company may change credibility methods without obtaining permission from the commissioner.*
 - C. *If company experience is 100% credible, then no margin is required since there is no uncertainty.*
 - 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.*
 - 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.*
 - F. *When measuring credibility, it would be appropriate to combine simplified issue experience with fully underwritten experience.*

Commentary on Question:

Candidates generally did not do well on this part of the question. Full credit was only awarded to candidates who provided adequate rationale.

4. Continued

A.

The actuary should consider reflecting these trends if and only if they would produce a larger reserve.

B.

- If using 2015 VBT as the industry table, changing methods requires permission from the commissioner.

- If using 2008 VBT as the industry table, changing methods does not require permission from the commissioner.

C.

False. Even if company experience is fully credible, there is still uncertainty and margins would still be applied.

D.

This statement is true, except for the fact that VM-20 requires credibility to be measured by amount when using 2015 VBT as the industry table.

E.

False. The exposure period is limited to between 3 and 10 years.

F.

It would be appropriate to combine the blocks for purposes of measuring credibility if and only if the prudent estimate mortality assumption for each block was derived from combined experience.

- (d) 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.

4. Continued

Commentary on Question:

Candidates generally did well on this part of the question.

Step 1: calculate excess of DR over NPR at product group level

$$820 = 4100 - 3280$$

Step 2: divide Step 1 by NPR at product group level

$$0.25 = 820 / 3280$$

Step 3: multiply the policy's NPR by Step 2

$$61.25 = 245 \times 0.25$$

Step 4: calculate the policy's VM-20 reserve by adding Step 3 to the policy's NPR

$$306.25 = 61.25 + 245$$

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

Learning Outcomes:

- (1a) Describe, apply and evaluate the appropriate valuation methods and techniques and related accounting treatments for reserves and related items (e.g., DAC), and other assets and liabilities for specific insurance products under U.S. GAAP. Further, describe and recommend assumptions and margins appropriate to these GAAP reserves.
- (1b) Describe and apply the requirements, calculations, and disclosures related to GAAP "Targeted Improvements".
- (4c) The valuation methodology specified in IFRS 17.

Sources:

LFM-142-20: In Depth - Detailing the new accounting for long-duration contracts of insurers, PWC, Sep 2018

LFM-841-20: A Closer Look at How Insurers Will Have to Change their Accounting and Disclosures for Long-Duration Contracts

LO#4 LFM-141-18 IFRS 17 Insurance Contracts – IFRS Standards Effects Analysis, May 2017, IASB

Commentary on Question:

This question tested the candidates' knowledge of actuarial standards of practice under US GAAP and IFRS.

Solution:

- (a) 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

5. Continued

- (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.
- (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.

Commentary on Question:

This part of the question tested the candidates' understanding of U.S. GAAP valuation principles and methods applicable to individual life insurance and annuity products.

For part (i) either the retrospective or prospective approach was acceptable. The illustrated solution demonstrates the retrospective approach.

Candidates generally did well on part (i) and were able to clearly calculate the present value of benefits and present value of premiums. Some candidates struggled to accurately reflect the carryover amount in the calculation of the net premium ratio.

Candidates who used the prospective approach in part (i) generally struggled with part (ii).

Some candidates did not clearly specify if there was a remeasurement gain or a remeasurement loss.

Part (i):

Discount rate = $v = 1/1.03$

Present Value of Benefits (PVB) = $216v + 222v^2 + 227v^3 + 1106v^4 = 1,609$

Present Value of Gross Premium (PVP) = $360v + 342v^2 + 324v^3 + 1313v^4 = 2,135$

Net Premium Ratio (NPR) = $(\text{PVB} - \text{Carryover Reserve})/\text{PVP}$

5. Continued

$$\text{NPR} = (1609 - 150)/2135 = 68\%$$

$$\text{Reserve}(t) = \text{Reserve}(t-1) \times (1 + 3\%) + \text{Premium}(t) \times \text{NPR} - \text{Benefits}(t)$$

$$\text{Reserve}(1) = 150 \times (1.03) + 360 \times .68 - 216 = \mathbf{185}$$

Part (ii):

Calculate a modified reserve using the new NPR.

$$\text{Reserve}(t) = \text{Reserve}(t-1) \times (1 + 3\%) + \text{Premium}(t) \times \text{NPR} - \text{Benefits}(t)$$

$$\text{Modified Reserve}(1) = 150 \times (1.03) + 360 \times \mathbf{67\%} - 216 = 178$$

$$\text{Remeasurement Gain/Loss} = \text{Reserve}(1) - \text{Modified Reserve}(1)$$

$$\text{Remeasurement Gain/Loss} = 185 - 180 = \mathbf{5}$$

The improved NPR caused reserves to decrease, therefore this is a remeasurement **gain**.

- (b) 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.

Commentary on Question:

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

Candidates were generally able to reasonably describe at least two reasons the information is insufficient for IFRS calculations. It was challenging for candidates to identify four suitable reasons.

1. IFRS17 should be fully retrospective, this information only includes cash flows from the transition date, and not back to what might be the initial recognition date for IFRS17 purposes
2. IFRS17 discount rates need to reflect the characteristics of the insurance liability cash flows, so the PV for year 4+ would need to be recalculated with a different discount rate.
3. It is possible that this group of contracts could contain contracts that were onerous on inception. If that were the case, the cash flows would need to be calculated separately.
4. The information provided does not include an adjustment for risk.

5. Continued

(c) Critique the following statements:

- A. *A review of the current morbidity assumption is required, and a revised morbidity assumption should be used*
- B. *A review of the current expense assumption is required, and a revised expense assumption should be used*
- C. *The morbidity assumption should be reviewed quarterly instead of annually.*
- D. *Changes in morbidity assumptions and changes in discount rate are reported in the income statement in the same way.*
- E. *If the net premium ratio was over 100% prior to the assumption improvements, experience gains will not impact the income statement.*

Commentary on Question:

This question tested the candidates' understanding of the U.S. GAAP accounting guidance applicable to individual life insurance and annuity products.

Candidates generally struggled with Statement B.

Candidates generally had difficulty understanding how the 100% cap on NPR affects the remeasurement gain in Statement E.

- A. True - A review of the morbidity assumption is required. Best estimate assumptions should be used, so a revised assumption should be used.
- B. False – Expenses are the one assumption that is exempt from being required to be periodically reviewed and updated. If the company has made an entity-wide decision to lock in expense assumptions, a review of the assumption is not required, and an updated expense assumption is not required.
- C. False - The FASB's intent in specifying an annual review (with more frequent updating if evidence suggests the need) was to ease the administrative burden of having to perform frequent revisions. However, an entity is not prohibited from updating the net premium ratio cash flows more frequently.
- D. False – Changes to the interest rate will go through other comprehensive income. Changes to the morbidity assumption will affect net income directly.

5. Continued

- E. False - The Net Premium Ratio is capped at 100%. As the liability assumptions are updated, if conditions improve whereby the contracts are no longer expected to have net premiums in excess of gross premiums ($\text{NPR} < 100\%$), the improvement would be captured in the remeasurement process and reflected in earnings in the period of improvement.

6. 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:

- (2b) Describe, apply and evaluate the Principle-Based Reserves valuation methods and techniques for specific insurance products under U.S. Statutory rules.

Sources:

LFM-844-20: Life Principle-Based Reserves Under VM-20, AAA Practice Note (exclude questions which are not highlighted)

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 the candidates' knowledge of VM-20.

Solution:

- (a) 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*

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

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

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

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

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.

6. Continued

Commentary on Question:

Full credit was only awarded to candidates who provided adequate rationale.

- A. Group life insurance policies that include long-term care benefits are considered to be “combination” policies, and for these policies to be covered by VM-20, they must be filed as individual life insurance contracts.

Group and individual health insurance policies are not covered by VM-20, but rather they are covered by VM-25, VM-A and VM-C.

With respect to riders and supplemental benefits attached to individual life insurance policies:

- If the rider/benefit does not have a separate premium or charge, then it is combined with the base policy during valuation and is therefore covered by VM-20.
- If the rider/benefit has a separate premium or charge:
 - If the insurance company elects to combine it with the base policy during valuation, then it is covered by VM-20.
 - If the insurance company elects to value it on a standalone basis, then the nature of the rider/benefit will determine if it is covered by VM-20.

Waiver of premium claim reserves are not covered by VM-20, as indicated in Section II of the Valuation Manual.

- B. A company is not necessarily required to calculate all three components when determining the minimum reserve. The net premium reserve is always required to be calculated, but the company may elect to perform exclusion tests that, if passed, exempt some groups of policies from the deterministic reserve calculation and/or stochastic reserve calculation.
- C. Specified lapse rates, that vary by product type and number of guarantee years, are required to be used in the calculation.
- D. The mortality assumption can be unlocked in the future, but the NAIC has yet to provide details. The interest assumption, however, is locked in.
- E. The model projection period does not necessarily have to extend for the life of the business being valued. A shorter period is acceptable as long as either no material liabilities remain at the end of the period, or the actuary can demonstrate that a longer period will not result in a materially greater reserve.

6. Continued

F. If a company does not have credible or relevant mortality experience, then the actuary, as required by ASOP 52, should use professional judgment in advising the company on the adoption and modification of other sources of mortality experience data for the purpose of establishing the anticipated mortality assumption.

(b) 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.

Commentary on Question:

Candidates generally did well on this part of the question. Candidates who did not do well used the wrong interest rate or did not discount correctly.

Projection Year	0	1	2	3	4	5
Statement Value of Assets	10,000	5,000	1,000	-290	-300	250
One-Year Treasury Rate		5%	5%	5%	5%	5%
Negative of the Statement Value of Assets	-10,000	-5,000	-1,000	290	300	-250
Discount Rate		5.25%	5.25%	5.25%	5.25%	5.25%
Discount Factor	1.000	0.950	0.903	0.858	0.815	0.774
Discounted Negative Accumulated Deficiency	-10,000	-4,751	-903	249	244	-194

6. Continued

Discount Rate = 105% of One-Year Treasury Rate

Discount Factor = $(1 + \text{Discount Rate})^{-1 \times \text{Projection Year}}$

Discounted Negative Accumulated Deficiency =
(Negative of the Statement Value of Assets) x Discount Factor

Greatest Present Value of Accumulated Deficiency =

GPVAD =

MAX [Discounted Negative Accumulated Deficiency] = 249

Scenario Reserve = Starting Assets + GPVAD = 10,000 + 249 = 10,249

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.

Learning Outcomes:

- (1c) Describe, apply and evaluate the appropriate accounting treatments for derivatives and hedging arrangements.

Sources:

LFM-840-20: A Comprehensive Guide - Derivatives and Hedging, E&Y, 2019, (Sections 1.1-7, 3.1-3, 4.1-3, 9.1-5, Appendices A and C1.1-4)

Commentary on Question:

This question tested the candidates' knowledge of the appropriate accounting treatment for derivatives and hedging instruments.

Solution:

- (a) 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.
 - (ii) Explain if bifurcation is required.

Commentary on Question:

Candidates generally struggled to explain whether bifurcation is required and why.

A The host contract is the base variable annuity contract. The embedded derivative is the guaranteed minimum account value (similar to a put option). Bifurcation is required since the host and the embedded derivative do not share the same characteristics.

B The host contract is the annuity contract with the guaranteed interest rate. The embedded derivative is interest payments in excess of the guaranteed floor (similar to a call option on the equity index). Bifurcation is required since the host and the embedded derivative do not share the same characteristics.

7. Continued

C The host contract is the deferred annuity contract. The embedded derivative is the surrender provision for market value adjustment. The two share similar characteristics and cannot be bifurcated

(b) 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.

Commentary on Question:

Candidates generally did not do well on this part of the question, in particular the parts of the question where the hedge instrument was clearly not effectively aligned with the item being hedged.

- (i) No GAAP hedge accounting. A held to maturity assets is held at amortized cost so there's no need to hedge against a value which will fluctuate with the market.
- (ii) No GAAP hedge accounting. The hedged item cannot be revalued to an asset that will be remeasured with the changes in fair value reported currently in earnings

7. Continued

- (iii) No GAAP hedge accounting. No relation here between hedge and risk being hedged here.
 - (iv) It would qualify as a hedge if it meets effectiveness and documentation requirements.
 - (v) It would qualify as a hedge if it meets effectiveness and documentation requirements.
 - (vi) No GAAP hedge accounting. No relation here between hedge and risk being hedged here.
- (c) 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.

Commentary on Question:

Candidates generally did not do well on this part of the question. Candidates generally ignored the ineffective part of the hedge. A common error was discussing the impact of the hedge on earnings without considering the corresponding earnings impact of the item being hedged (missing out that they largely offset each other than on the ineffective portion).

7. Continued

For FV hedges provided the hedge qualifies as “highly effective”, any difference between the change in fair value of the derivative and the hedge item is forced through earnings.

FV1 net impact is +25 on earnings

FV2 net impact is -20 on earnings

FV3 net impact is -15 on earnings.

For CF hedges, the entire change in the fair value of the hedging instrument is reported as a component of AOCI and reclassified into earnings in the same period during which the hedged transaction affects earnings.

CF4 had \$10 impact on earnings, no impact on AOCI

CF5 had \$0 impact on earnings, \$10 impact on AOCI

For hedges of a net investment in a foreign operation, the entire change in the FV is reported in AOCI. The ineffective portion is recognized in earnings immediately.

FN6 has -\$10 impact on earnings, no impact on AOCI.

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

Learning Outcomes:

- (2c) Describe and evaluate the fundamental features and design of the U.S. Statutory regulatory system.
- (3a) Describe and apply the significant US tax regulations relating to the taxation of individual life and annuity insurance products.

Sources:

Statutory Valuation of Individual Life and Annuity Contracts Chapters 1, 4, 10 and 18

LFM-846-20: Company Taxation - Introductory Study Note

Commentary on Question:

This question tested the candidates' knowledge of U.S. Statutory and Tax regulation principles as applicable to life and annuity products.

Full credit was awarded to candidates who provided adequate rationale for their responses. Candidates generally did well on statement G. Candidates generally did not do well on statements B and H.

Solution:

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.*
- 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.*

8. Continued

- 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.*
- 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.*
- 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.*
- 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.*
- 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.*
- H. *Under TCJA, there have been no changes to tax reserves for annuity contracts not involving life contingencies.*
- A. *The SVL also applies to other types of contracts such as health and deposit-type contracts. While specific valuation requirements can vary from state to state, all states have adopted some form of the NAIC model SVL.*
- B. *The SVL requires an asset adequacy analysis of reserves for all products regardless of statutory reserves held. Companies are required to meet statutory minimum requirements in all situations. Deficiencies in individual components of the reserves may be offset by margins in other components, subject to specific state requirements.*
- C. *The SVL does not account for all product features. It provides broad guidance and is supplemented by Actuarial Guidelines to provide direction in situations where more specific guidance is required. In situations where the guidance is unclear, then the company should rely on the judgment of the appointed actuary, not management's judgment, since it is the appointed actuary's responsibility to opine on the appropriateness of the reserves.*

8. Continued

- D. For fixed deferred annuities, setting the statutory reserve equal to account value is not always appropriate, since CARVM requires that the reserve be set equal to the greatest present value of all possible future benefit streams.

For immediate annuities, there are also other mortality tables prescribed for contracts issued before 1985. The mortality table is chosen based on issue year only and does not take into account the length of the certain period. Mortality improvement is required and prescribed for 2012 IAM.

- E. Under TCJA, for life insurance and annuity contracts in force as of December 31, 2017, the amortization period for DAC tax amounts capitalized after 12/31/2017 was increased from 10 years to 15 years. For unamortized balances as of 12/31/2017, there were no changes to the amortization period. The DAC tax capitalization percentage applied to future net premiums was increased.
- F. Under TCJA, the tax reserve equals 92.81% of the statutory reserve calculated by the CRVM method and excludes any deficiency reserve, reserve attributable to deferred/uncollected premiums if the premiums are not included in taxable income and excess interest reserve. The reserve is also floored at the net surrender value.
- G. Under TCJA, the tax reserve for a variable annuity contract equals the greater of the net surrender value and the CARVM separate account reserve PLUS 92.81% of the excess of the CARVM reserve for the entire contract over the greater of the net surrender value and the CARVM separate account reserve.
- H. Under TCJA, the tax reserve is the greater of the contract's net surrender value or 100 percent of the discounted value of the obligations using the highest discount rate or rates permitted by the NAIC as of the date when the reserve is determined.

9. 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:

Lombardi, Chapter 14 – Universal Life (exclude 14.4.8, 14.4.9, 14.5.0, 14.6.2-6)
Impacts of AG 48, FR, 2015

Commentary on Question:

This question tested the candidates' knowledge of the valuation of universal life secondary guarantees.

Solution:

- (a) Compare and contrast these two ULSG designs: stipulated premium design and shadow account design.

Commentary on Question:

Candidates were generally able to identify one similarity (provide guarantee that the policy stays in force) and one difference (stipulated premium design requires to pay stipulated premium and shadow account design requires shadow account $AV > 0$). Some candidates mentioned the assumption for both designs were different from base and established at issue. Few candidates mentioned the design was provided for a definite time period or expiry date for partial withdrawal and loan.

Similarity:

- i. They both provide guarantees that the universal life policy will not terminate.
- ii. The input/assumption used for calculations for both of these designs (such as interest rate, charges) are established when the policy is issued.
- iii. It's common to see both designs providing coverage for a defined time period, i.e. first 20 policy years.

9. Continued

Differences:

- i. The benefit trigger/base are different--one is contingent on stipulated premium being paid periodically, and the other one is contingent on shadow account remain positive.
 - ii. The stipulated premium design expires when partial withdrawal or loans are taken, while the shadow account design does not.
 - iii. Benefit trigger/base used for stipulated premium design (premium paid) is also used for death benefit or CSV calculation. However, benefit trigger/base used for the shadow account design (shadow account value) is not used for death benefit or CSV calculation.
 - iv. A policy could have multiple shadow account coverages over different guaranteed periods. However, it is not common to have multiple stipulated premium coverages.
- (b) 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.

Commentary on Question:

Candidates generally did not do well on this part of the question. Common errors include:

- *Determining that moving to AG48 has impact on reserve credit.*
- *Not mentioning pre AG 48 and post AG 48 for part ii*
- *Only calculating Post AG 48 or Pre AG 48 redundant reserve for part (ii).*
- *Mixing up the formula between reserve credit and redundant reserve.*

9. Continued

i. Reserve credit = ceded reserve = AG 38 - UL CRVM

The calculation method is the same pre and post AG 48.

Therefore, moving to AG 48 has no impact on reserve credit calculation.

ii.

Pre AG 48

Redundant Reserve = AG 38 - UL CRVM - Economic Reserve

$$= 4500 - 2400 - 980$$

$$= 1120$$

Post AG 48

Redundant Reserve = AG 38 - UL CRVM - Actuarial Method Reserve

$$= 4500 - 2400 - 1350$$

$$= 750$$

The impact = $750 - 1120$

$$= -370$$

The impact is a reduction on redundant reserve of \$370.

(c) Critique the following statements related to ULSG:

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

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

(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.

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

Commentary on Question:

Full credit was awarded to candidates who provided adequate rationale for their responses.

For part (i) most candidates realized that AG 48 is not limited to carriers with captive structures

For part (iii) some candidates incorrectly explained the different types of security assets.

Candidates generally did well in parts (ii) and (iv).

9. Continued

- (i) AG 48 is not limited to carriers with captive structures.

Reinsurers does not meet the specified exemptions reinsures policies with Regulation XXX/AG 38 reserves will be subject to AG 48 as well.

- (ii) It is calculated as modified VM-20 reserve where when calculating the net premium reserve component, a factor is applied when calculating actuarial method reserve for AG 48 purpose. Modified VM-20 reserve = $\max(\text{NPR} \times \text{factor}, \text{Deterministic Reserve}, \text{Stochastic Reserve})$.

- (iii) The former is correct- other security cannot be used as primary security.

However, primary security can be used as other security, so the latter part is incorrect.

- (iv) Exclusions are also not permitted for Deterministic reserve.

Stochastic exclusion may be allowed for the current AG48.

10. 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-142-20: In Depth - Detailing the new accounting for long-duration contracts of insurers

Targeted Improvements Spreadsheet Model

Commentary on Question:

The question tested the candidates' knowledge of the full retrospective method and the DAC changes under LDTI.

Solution:

- (a) Describe the data requirements necessary for a company to implement a full retrospective transition to ASU 2018-12.

Commentary on Question:

This part of the question tested the candidates' knowledge of the data needed for a full retrospective method calculation. Any four of the five points listed would have received full credit.

- Elect only when actual historical information for an issue year cohort is available for all periods back to inception for all applicable products entity wide. Cannot use estimates
 - Apply entity-wide for that issue year and all subsequent issue years
 - Need information on terminated policies
 - Need information on all periods back to contract inception
 - Need consistent historical information for both reserves and DAC
- (b) 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) 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.
 - (ii) Recommend either the full retrospective or modified retrospective approach for BLL. Justify your answer.

10. Continued

Commentary on Question:

Candidates generally were able to create the in-force schedule from the provided data. Some candidates applied a cumulative persistency amount against each year's in-force amount, which will greatly over-decrement the in-force.

Cumulative persistency amounts had to be multiplied against the original 5,000 amount. The table shows the method of applying each year's persistency against each in-force amount and 2023 is shown to indicate values go to zero. A few candidates didn't use the 2022 year even though the year starts with some in-force and ends at zero.

Candidates generally used the correct Deferred Acquisition Expenses to calculate amortization rates. A few candidates added the two years together or added the previous method DAC balances in with the Deferred Acquisition Expenses. Some candidates calculated the amortization factor as the first-year face amount over the PV face amount.

Candidates usually found a reasonable amortization amount using the sum of the in-force amounts as the basis for amortizing DAC. A few candidates took the concept of "straight-line amortization" too literally and amortized an equal amount each year. Some candidates amortized against the PV face amount, instead of the face amount at the corresponding period.

For part (ii), the highest available DAC balance of 344.82 was greater than the prior method of 300; thus, the full retrospective method is the recommendation since DAC is an asset for the companies and the data is fully available. Some candidates provided other recommendations which received credit based on the validity of the justification provided. For example, some candidates argued that companies should take modified retrospective due to fewer data needs, even though for this question all data was available.

(i)

	2017	2018	2019	2020	2021	2022	2023
Assumed Mortality Rate	10%	10%	10%	10%	10%	100%	---
Inforce Amount (BOY)	5000.00	4500.00	4050.00	3645.00	3280.50	2952.45	0.00
Amortization Rate	2.1342%	3.4908%	3.4908%	3.4908%	3.4908%	3.4908%	---
Deferred Acquisition Expenses	500	250	0	0	0	0	0
Amortization	-106.71	-157.09	-141.38	-127.24	-114.52	-103.07	0.00
DAC (BOY)	0	393.29	486.20	344.82	217.58	103.07	0.00

10. Continued

Amort Rate is only calculated when new Deferred Acquisition Expenses occur.

Amort Rate = (DAC + Deferred Acquisition Expenses) / Sum In-force

Amort Rate₂₀₁₇ = 2.1342% = (0 + 500) / (5000 + 4500 + 4050 + 3645 + 3280.50 + 2952.45)

Amort Rate₂₀₁₈ = 3.4908% = (393.29 + 250) / (4500 + 4050 + 3645 + 3280.5 + 2952.45)

Amortization_n = - In-force Amount_n * Amort Rate_n

DAC_n = DAC_{n-1} + Deferred Acquisition Expenses_{n-1} + Amortization_{n-1}

DAC (2020) = **344.82**

(ii)

Recommend using full retrospective method. At 1/1/2020 the existing DAC balance is 300 under the old method (as given), thus full retrospective will have a higher DAC balance which is favorable as DAC is an asset.

(c) 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) 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.

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

Commentary on Question:

Amortization is based on expected in-force amounts, and if in-force amounts change beyond the expected amount an experience adjustment is calculated as an additional reduction in the DAC balance. In this case, the amortization amounts by year change due to the different in-force amounts but not due to a change in amortization rate. The experience adjustment was the most challenging part. A few candidates re-calculated the amortization rates and DAC balance from the issue when the amortization rates and DAC in the past should not be changed.

For part (ii) the highest available DAC balance of 287.35 was less than the prior method of 300; thus, the modified retrospective method is the recommendation.

10. Continued

(i)

	2017	2018	2019	2020	2021	2022	2023
Assumed Mortality Rate	10%	10%	10%	10%	10%	100%	---
In-force Amount (BOY)	5000.00	4500.00	4050.00	3645.00	3280.50	2952.45	0.00
Additional Terminations	0%	15%	0%	0%	0%	0%	---
Updated In-force (BOY)	5000.00	4500.00	3375.00	3037.50	2733.75	2460.38	0.00
Amortization Rate	2.1342%	3.4908%	3.4908%	3.4908%	3.4908%	3.4908%	---
Deferred Acquisition Expenses	500	250	0	0	0	0	0
Amortization	-106.71	-157.09	-117.82	-106.03	-95.43	-85.89	0.00
Experience Adjustment	0	-81.03	0	0	0	0	0
DAC (BOY)	0	393.29	405.17	287.35	181.32	85.89	0.00

Amort Rate is only calculated when new Deferred Acquisition Expenses occur.

Amort Rate = (DAC + Deferred Acquisition Expenses) / Sum In-force

Amort Rate 2017 = 2.1342% (*no change*)

Amort Rate 2018 = 3.4908% (*no change*)

Amortization_n = - In-force Amount_n * Amort Rate_n

DAC_n = DAC_{n-1} + Deferred Acquisition Expenses_{n-1} + Amortization_{n-1}

Experience Adjustment = Amort Rate * (Sum PV In-force Difference 2019-2022)

Experience Adjustment = **-81.03** = 3.4908% * 2,321.32

DAC (2020) = **287.35**

(ii)

Recommend using modified retrospective method. At 1/1/2020 the existing DAC balance is 300 under the old method (as given), thus modified retrospective will have a higher DAC balance than the full retrospective method.