ILA LFMU Model Solutions
Spring 2021

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

Sources:
LFM-106-07 Insurance Industry Mergers and Acquisitions, Chapter 4 (Sections 4.1-4.6)

Commentary on Question:
This question tested the candidates' knowledge of actuarial appraisals.

Solution:
(a)   Describe one of the three basic techniques used by investment banks to value life insurance companies.

   Commentary on Question:
   Candidates received full credit for describing one of the methods below.

   Method 1: Comparable Company Analysis
   > apply relevant financial statistics of the selling company to the appropriate "multiples" of comparable public companies
   > comparable companies will ideally have regulatory/accounting/tax frameworks and business segments that are similar to the selling
      company
   > outcome is subjective since no two companies are identical

1. Continued

Method 2: Comparable Transaction Analysis

> apply relevant financial statistics of the selling company to the appropriate "multiples" of comparable insurance merger transactions

> comparable transactions should be relatively recent and will ideally involve companies whose size, regulatory/accounting/tax
   frameworks and business segments are similar to the selling company

> outcome is subjective since no two transactions are identical

Method 3: Discounted Cash Flows

> use the weighted average cost of capital to discount future after-tax cash flows

> cash flows for the foreseeable future (typically 5 years) are estimated by using the selling company's assumptions, subject to certain
   adjustments specified by the acquiring company

> Comparable Transaction Analysis is typically used to estimate cash flows beyond the foreseeable future

(b) Critique the following statements regarding actuarial appraisals:

A. *In essence, an actuarial appraisal is an analysis of cash flows, where the cash flow is based on GAAP earnings and changes in economic capital.*

B. *Assumptions should include a reasonable but not excessive provision for adverse deviation.*

C. *Mortality anti-selection is reflected to the extent that it is expected on lines of business with high lapse rates.*

D. *It is common to use a single yield curve which does not change over time, where the curve reflects actual market yields at the time the actuarial appraisal is performed. However, if these yields are abnormally low or high, they will typically be adjusted towards a long term expectation over time.*

E. *Effective tax rates on future business are often well below the tax rate applied to taxable income (currently 21% for U. S. companies) due to the DAC proxy tax and differences between GAAP and tax reserves.*

F. *If a fundamental change in business operations is expected after the transaction, operating expense assumptions are typically determined based on the "target unit expenses without an unallocated expense" approach.*

G. *Mortality improvement is not reflected on life insurance.*

1. Continued

Commentary on Question:
Candidates did well on this part of the question. Candidates needed to provide some explanation or rationale for their critique to receive full credit.

Candidates generally did not do well with statements E (tax rates) and F (expenses). Common errors include not correctly identifying that tax rates in Statement E vary due to differences between STAT (not GAAP) and Tax reserves; and discussing DAC, not DAC Tax.

A: partially true
> It is true that an actuarial appraisal is a cash flow analysis
> However, cash flow is based on statutory (not GAAP) earnings and changes in statutory (not economic) capital

B: false
> Assumptions should be best estimate; there is no PAD
> Risk should be reflected in the cash flow discount rate

C: true

D: partially true
> The first sentence is true
> The second sentence is false; while the yields may be adjusted towards a long term expectation, they typically are not, and sensitivity analysis is performed instead

E: false
> The effective tax rates are often well above, not well below, the tax rate applied to taxable income
> The reasons for the effective tax rates being higher are the DAC proxy tax and differences between statutory (not GAAP) and tax reserves

F: true

G: false
> Mortality improvement should be considered
> If the impact is material, a sensitivity test would typically be used to quantify the impact

1. Continued

(c) You are given the following information from Company B's actuarial appraisal:

	Year 1	Year 2	Year 3	Year 4	Year 5
After tax earnings (in-force and future business)	6	3	8	10	15
Required capital	15	20	22	25	33

Adjusted book value	40
Discount rate	10%
Before tax investment earnings rate on capital	5%
Tax rate	21%
Terminal valuations at end of Year 5	
Net present value of after tax earnings for Years 6 and later (in-force and future business)	155
Net present value of required capital charges for Years 6 and later	28

Calculate the actuarial appraisal value of Company B. Show all work.

Commentary on Question:
Candidates generally did well on this part of the question. Because there are several ways in which to calculate the appraisal value (e.g., using the NPV function within Excel or breaking down the calculations into more pieces), credit was given for a clear understanding of how to calculate the appraisal value. It should be noted that if a candidate missed part of a calculation but then carried that value through other formulas consistently and correctly, no credit was lost.

There were a few common errors. (1) The terminal valuations at end of year 5 (i.e., $155 of in-force/future business and $28 of required capital charges) were often discounted for 6 years, not 5, or they were not discounted at all. (2) The cost of capital rate (i.e., c) was not calculated correctly

Relevant Formulas
c = cost of capital rate = discount rate - after tax investment earnings rate on capital
ABV = adjusted book value = excess capital + required capital
VIB = value of inforce business = net present value of after tax earnings on inforce business
VFB = value of future business = net present value of after tax earnings on future business

1. **Continued**

CRC = cost of required capital = net present value of cost of required capital charges

AAV = actuarial appraisal value = ABV + VIB + VFB - CRC

Calculations
v = 1 / 1.10
c = 0.1 - [0.05 x (1 - 0.21)] = 0.0605
ABV = 40
VIB + VFB = (6 x v) + (3 x v^2) + (8 x v^3) + (10 x v^4) + (15 x v^5) + (155 x v^5) = 126.33
CRC = c x [(15 x v) + (20 x v^2) + (22 x v^3) + (25 x v^4) + (33 x v^5)] + [28 x v^5] = 22.48
AAV = 40 + 126.33 - 22.48 = 143.85

(d)   You are given:

- Company A and Company B use the same administration system.

- Company A has a larger distribution channel than Company B.

- Company A and Company B have a similar capital structure, but Company A has a lower CAPM beta.

(i)   Recommend three adjustments Company A should make to the actuarial appraisal developed by Company B.

(ii)   Describe the directional impact of each recommended adjustment on the actuarial appraisal value

Commentary on Question:
Candidates generally did well on this part of the question, recognizing that Company A could increase the overall actuarial appraisal value (AAV) due to economies of scale, higher projected future sales, and using Company A's lower discount rate. Some candidates misinterpreted the question and responded from the view of Company B. To receive full credit, candidates needed to provide recommendations for adjustments in part (i) not just provide comments on adjustments.

(i)
> Adjust the values of in-force and future business to recognize the anticipated synergies and economies of scale resulting from Company A having the same administration system

1. Continued

> Adjust future business values to recognize the anticipated additional sales resulting from Company A having a larger distribution channel

> Decrease the discount rate since Company A has a lower weighted average cost of capital

(ii)
> Administration system adjustment: increase actuarial appraisal value
> Distribution channel adjustment: increase actuarial appraisal value
> Discount rate adjustment: increase actuarial appraisal value

2. **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:
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

Commentary on Question:
This question tested the candidates' understanding of the Economic Capital Liability Runoff approach.

Solution:
(a)   A life insurance company is currently developing an Economic Capital model for its life in-force block, which includes UL, term and whole life products, using the Liability Runoff Approach. The intended applications of the model are for establishing the risk management and risk appetite.

Critique each of the following proposed approaches. Recommend improvements where applicable.

A. *The liability runoff approach is being performed using a stochastic simulation with 3,000 real world economic scenarios. The scenarios being used were originally developed in the context of Variable Annuity Pricing.*

B. *The current valuation assumptions consist of best estimate assumptions plus margins for adverse deviations. Risk driver categories are aligned with these margins, covering a variety of economic and non-economic assumption sub-categories.*

C. *Current inforce data is used to generate projected liability cash flows. Lapse assumptions vary by scenario for UL products. Mortality and expense assumptions for all products and lapse assumptions for non-UL products are on a best estimate basis and do not vary by scenario, with the exception of expense inflation, which is scenario-dependent.*

2. Continued

    D. *Projected asset cash flows are generated for each scenario, such that the level of assets required at the beginning of a given scenario satisfies key obligations including paying policyholder cash flows, debt payments, and dividends.*

    E. *The required assets at the valuation date are ranked to form a distribution. The plan is to use a CTE99 metric applied to the distribution, based upon the segregated fund pricing methodology which uses CTE.*

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

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

Commentary on Question:
Candidates generally did not do well on this part of the question, especially with respect to statements A, B, and D. Some candidates critiqued the approach without providing justification or just rephrased the question by rearranging some words. To receive full credit, candidates had to provide valid reasons to support the critique.

Common errors include the following:
Statement A (Economic Scenarios) – Candidates suggested using more scenarios or not appropriate because it is developed in the context of Variable Annuity Pricing.

Statement B (Risk Driver) –The question stated the current valuation assumption includes a Margin for Adverse Deviation. The question did not state economic capital assumptions are padded. Candidates mis-interpreted the question and answered to use best estimate assumptions for economic capital. This was not the focus of the question.

Statement D (Asset cash flow) –Candidates failed to identify the assumptions or types of cash flow missing in the approach.

A Economic Scenario – It is good to use 3,000 scenarios as the paper suggests to use 1000 or more scenarios. The scenario distribution is a realistic assessment of the future risks and returns. Since the scenarios were originally developed for pricing, they represent a "best view" and are appropriate to use.

2. Continued

B Risk Driver – Company needs to select the risk drivers that represent the key risks. The process involves understanding of risk drivers and their relationship. It may be appropriate for practical reasons to use Valuation PfADs but they should be assessed whether it makes sense to look at things on a more aggregate or more granular level. Example, if mortality PfADs combine base or improvement, should the risk driver look at them separately?

C Liability Cash flow – If the company is writing significant new business, it is necessary to include new business in the projection. It is good that the approach vary lapse assumptions by scenario for key products. This will help to better understand the tail risk. However, the current approach did not quantify capital for mortality and expense risks. One approach is to develop stress test on these assumptions to determine the associated amount.
In addition, the liability cash flows should consider including realistic management actions.
Company can also develop a fully integrated stochastic model incorporating non-economic assumptions (example mortality, policyholder behavior) to better understand interaction between risks.

D Asset Cash flow – The cash flow should include investment returns earned on those assets (including investment strategy and re-investment considerations)

E CTE Metric – CTE is effective for capturing tail risks, especially if there are extreme edge case scenarios. The shortcoming of using CTE metric over VAR is that it is more difficult to communicate the results to senior management, and it may be more difficult to work with from a practical perspective.
Risk appetite statements and fundamental corporate philosophies should ultimately drive the decision of selecting a confidence level. It would be good to understand the chosen level of confidence relative to Valuation and Capital calculations.
CTE99 is likely too conservative as compared to Var99.5.

F Valuation of liabilities – The most important measure is the total assets required. This would be higher than the liabilities. Hence, the split of required assets between liabilities and economic capital is not important from this perspective.
Economic Capital = Total assets required – current value of liabilities (mean of the distribution or best estimate liabilities)

2. Continued

G Correlation matrix – Under the correlation matrix approach, standalone capital is calculated for individual risk factors and then aggregated by multiplying the capital results through a correlation matrix. The advantage of this approach is its ease of calculation. Another approach is to use scenario aggregation which involves the use of integrated scenarios containing multiple risk factors (example economic assumptions and lapse assumptions). This would implicitly account for correlation.

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

(i) Capital Adequacy

(ii) Performance Measurement

Commentary on Question:
Candidates generally did well on this part of the question.

(i) Capital adequacy is the core use of Economic Capital to provide a measure of capital that captures the risk of the insurer's own portfolio. Effective use of Economic Capital requires the Economic Capital to be integrated into the capital management process. Acceptance of the Economic Capital by regulators and rating agencies is necessary for achieving its business benefits.

(ii) In order to use Economic Capital to measure performance, it needs to be incorporated in some related measure of return. One approach involves using Economic Capital as a denominator to calculate the return on risk-adjusted capital (RORAC). An alternative approach involves the inclusion of Economic Capital as the measure of required capital within a value-based measure, such as embedded value (EV).

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

Sources:
Lombardi, Chapter 23 – PBR for Life Products (exclude 23.1)

Reporting and Disclosure Requirements Under VM-31 Reporting Requirements for Business Subject to PB, FR 2017

Commentary on Question:
This question tested the candidates' knowledge of principle-based reserves. Candidates generally did well on this question. For the Stochastic Exclusion Ratio Test, partial credit was received if margins were applied to assumptions to perform the test instead of using the best estimated assumption.

Solution:
(a)   You are given the following model output for a block of life insurance as of the valuation date:

Scenario	NPR	COI	Due & Deferred Premium Asset	PV With Margins				Reinsurance Reserve Credit (with Margins)	PV With No Margins				Reinsurance Reserve Credit (without Margins)
				Benefits	Premiums	Taxes	Expenses		Benefits	Premiums	Taxes	Expenses	
1	310	70	45	800	200	-57	150	480	760	202	-51	143	456
2	310	70	45	828	200	-59	151	497	787	202	-54	144	472
3	310	70	45	882	204	-63	151	529	838	206	-57	144	503
4	310	70	45	824	202	-59	152	494	782	204	-53	144	469
5	310	70	45	843	203	-60	153	506	801	205	-55	145	480
6	310	70	45	802	200	-57	152	481	762	202	-52	144	457
7	310	70	45	854	202	-61	150	513	812	204	-55	143	487
8	310	70	45	869	200	-63	151	521	825	202	-57	144	495
9	310	70	45	836	204	-59	152	502	794	206	-54	145	477
10	310	70	45	854	200	-61	151	512	811	202	-56	143	487
11	310	70	45	840	200	-60	152	504	798	202	-55	145	479
12	310	70	45	847	202	-61	152	508	804	204	-55	145	483
13	310	70	45	870	201	-63	151	522	826	203	-57	143	496
14	310	70	45	854	203	-61	152	512	811	205	-55	144	487
15	310	70	45	802	202	-57	153	481	761	204	-52	145	457
16	310	70	45	861	200	-62	152	517	818	202	-57	144	491
Baseline	310	70	45	836	204	-59	152	502	794	206	-54	145	477
Deterministic	310	70	45	847	202	-61	152	508	804	204	-55	145	483
CTE70				861	203	-62	152	517	818	205	-56	145	491
CTE90				873	204	-63	153	524	829	206	-57	145	498
CTE95				880	204	-63	153	528	836	206	-58	145	502

3. Continued

    (i)   Assess whether a Stochastic Reserve component is necessary for this block using the Stochastic Exclusion Ratio Test. Show all work.

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

(i)

Stochastic Exclusion Ratio (SER) Test is passed, if

$$(b - a) / c < 6\%$$

where,

    b = greatest adjusted deterministic reserve (DR) of SET scenarios = 273
    a = adjusted deterministic reserve (DR) for baseline scenario = 257
    c = PV benefits net of reinsurance = 318

Scenario	PV without margin				Adjusted DR = PV(Benefits) + PV(Expense) - PV(Premium) - PV(Reinsurance Credit) without margin
	Benefits	Premiums	Expenses	RI reserve credit	
1	760	202	143	456	245
2	787	202	144	472	256
3	838	206	144	503	273
4	782	204	144	469	253
5	801	205	145	480	261
6	762	202	144	457	247
7	812	204	143	487	264
8	825	202	144	495	271
9	794	206	145	477	257
10	811	202	143	487	266
11	798	202	145	479	261
12	804	204	145	483	262
13	826	203	143	496	271
14	811	205	144	487	264
15	761	204	145	457	245
16	818	202	144	491	270
Max					273
Baseline	794	206	145	477	257
Deterministic	804	204	145	483	262
CTE70	818	205	145	491	267
CTE90	829	206	145	498	271
CTE95	836	206	145	502	274

3. **Continued**

In this case, SER is
    (b – a) / c = 5.22% < 6%

Therefore, the Stochastic Exclusion test is passed, and Stochastic Reserves are not required.

(ii)

Minimum Reserves under PBR, if stochastic reserves are not required:
    NPR + Max(0, DR - (NPR - DDPA))

where
    NPR = 310
    DDPA = 45
    DR = PV(Benefits) + PV(Expense) - PV(Premium) - PV(Reinsurance Credit)
        [All with margins]
        = 847 + 152 - 202 – 508
        = 289

Therefore, Minimum Reserves = 310 + Max(0, 289 - (310 - 45)) = 334

COI floor of 70 is less than NPR.

(b)   Describe how VM-20 and VM-31 have impacted mortality assumption considerations and disclosures.

Under PBR, mortality is based on company experience.

In contrast, CRVM uses prescribed CSO Mortality Tables, which varies by issue year.

The company specific mortality experience could be reflected in the x-factors.

VM 31 requires the following considerations be disclosed:
        * Grading decisions from experience to industry tables
        * Details on Mortality Segmenting Decisions, with evidence that mortality is not lower
        * Justification of any adjustments to company experience
        * Details on Source of Data when company experience not used
        * Details on margins assumed for company mortality
        * Pre PBR Disclosure is not as extensive, although details are included in Exhibit 5

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:

(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 13: Investment Accounting (excluding 13.7 & 13.12)

Commentary on Question:

This question tested the candidates' knowledge of U.S. GAAP valuation principles and methods.

Solution:

(a)   Critique the following statements regarding the accounting for investments in debt securities, as defined by SFAS 115:

   A. *To avoid tainting the classification of other HTM securities, an HTM security should be reclassified before it is sold.*

   B. *Securities that are held to maturity (HTM securities) are carried at fair value.*

   C. *Securities that are held for trading purposes (Trading securities) are carried at amortized cost.*

   D. *Securities that are available for sale (AFS securities) are carried at amortized cost.*

   E. *Changes in the fair value of Trading securities are recognized in earnings.*

   F. *Changes in the fair value of AFS securities are recognized in other comprehensive income.*

   G. *If an HTM or AFS security is impaired, then the security must be written down.*

4. Continued

A. False; the reclassification and/or sale of an HTM security will taint the classification of other HTM securities
B. False; HTM securities are carried at amortized cost
C. False; Trading securities are carried at fair value
D. False; AFS securities are carried at fair value
E. True
F. True
G. False; the security is only written down if the impairment is other than temporary

(b) As of the date of purchase, you are given the following information about a collateralized mortgage obligation (CMO) accounted for under U.S. GAAP:

Principal Amount	500,000
Purchase Price	550,000
Stated Interest Rate	4%
Principal Pay Down Schedule	50,000 annually in years 5 to 14
Timing of principal and interest payments	End of year
Asset Classification	Held to maturity

(i) Calculate the expected amount of premium amortization in year 5. Show all work.

(ii) Assume:

- No principal payments occur in the first 3 years.
- A principal payment of 100,000 occurs in year 4.
- Future principal payments at the end of year 4 are forecasted to be 50,000 annually in years 5 to 12.

Calculate the true-up to interest income in year 4. Show all work.

4. **Continued**

Commentary on Question:
Candidates generally did not do well on this part of the question. For parts (i) and (ii), candidates generally did not calculate Interest Income correctly, using incorrect cash flows to calculate the Effective Yield Rate, or using Stated Interest Rate instead of Effective Yield Rate to calculate Interest Income. The model solution below uses the IRR function in Excel to solve for Effective Yield Rate. Full credit was also given to candidates using the goal seek function in Excel.

Candidates who did not have the correct formulas in part (i) were unable to do the correct calculations in part (ii). Partial credit was received if candidates provided the correct true-up formula and attempted the calculation using their formulas from (i). When calculating the true-up, many candidates failed to use cumulative Interest Income for years 1 to 4. Partial credit was received for only using year 4 Interest Income. Some candidates trued-up Amortization of Premium instead of Interest Income.

(i)
Relevant formulas:
o   Effective Yield Rate = Internal Rate of Return on the Investment, Principal Pay Downs and Interest Payments
o   Interest Payment(t) = Outstanding Principal at End of Year(t-1) x Stated Interest Rate
o   Interest Income(t) = Amortized Cost at End of Year(t-1) x Effective Yield Rate
o   Outstanding Principal at End of Year(t) = Investment(0) - (Sum of Principal Pay Downs for years 1 to t)
o   Amortized Cost at End of Year(t)
   ▪   For t = 0, Amortized Cost at End of Year(t) = Investment(t)
   ▪   For t > 0, Amortized Cost at End of Year(t) = Amortized Cost at End of Year(t-1) - Principal Pay Down(t) - Amortization of Premium(t)
o   Amortization of Premium(t) = Interest Payment(t) - Interest Income(t)

Calculations for all years are shown in the grid below. Effective Yield Rate is the internal rate of return on the cash flows in column (g) and equals 2.7753%. Amortization of Premium is shown in column (e), and the expected amount for year 5 is 5,284.

4. **Continued**

Year	Investment (a)	Principal Pay Down (b)	Interest Payment (c)	Interest Income (d)	Amortization of Premium (e)	Amortized Cost at End of Year (f)	Used to calculate effective yield rate (g)
0	550,000	-	-	-	-	550,000	-550,000
1	-	-	20,000	15,264	4,736	545,264	20,000
2	-	-	20,000	15,133	4,867	540,397	20,000
3	-	-	20,000	14,998	5,002	535,394	20,000
4	-	-	20,000	14,859	5,141	530,253	20,000
5	-	50,000	20,000	14,716	5,284	474,969	70,000
6	-	50,000	18,000	13,182	4,818	420,151	68,000
7	-	50,000	16,000	11,660	4,340	365,812	66,000
8	-	50,000	14,000	10,152	3,848	311,964	64,000
9	-	50,000	12,000	8,658	3,342	258,622	62,000
10	-	50,000	10,000	7,178	2,822	205,799	60,000
11	-	50,000	8,000	5,712	2,288	153,511	58,000
12	-	50,000	6,000	4,260	1,740	101,771	56,000
13	-	50,000	4,000	2,824	1,176	50,596	54,000
14	-	50,000	2,000	1,404	596	0	52,000

(ii)
Relevant formulas: same as (b)(i)

Revised calculations for all years are shown in the grid below. Effective Yield Rate is the internal rate of return on the cash flows in column (g) and equals 2.5213%.

Cumulative Interest Income for years 1-4 from Original schedule =
   15,246 + 15,133+ 14,998 + 14,859 = 60,253 (from (b)(i))

Cumulative Interest Income for years 1-4 from Revised schedule =
   13,867 + 13,713 + 13,554 + 13,392 = 54,526 (from grid below)

True-up to interest income in year 4 =
   Cumulative Interest Income for years 1-4 from Revised schedule -
   Cumulative Interest Income for years 1-4 from Original schedule =
   54,526 - 60,253 = -5,727

4. **Continued**

Year	Investment (a)	Principal Pay Down (b)	Interest Payment (c)	Interest Income (d)	Amortization of Premium (e)	Amortized Cost at End of Year (f)	Used to calculate effective yield rate (g)
0	550,000	-	-	-	-	550,000	-550,000
1	-	-	20,000	13,867	6,133	543,867	20,000
2	-	-	20,000	13,713	6,287	537,580	20,000
3	-	-	20,000	13,554	6,446	531,134	20,000
4	-	100,000	20,000	13,392	6,608	424,526	120,000
5	-	50,000	16,000	10,704	5,296	369,229	66,000
6	-	50,000	14,000	9,309	4,691	314,539	64,000
7	-	50,000	12,000	7,931	4,069	260,469	62,000
8	-	50,000	10,000	6,567	3,433	207,036	60,000
9	-	50,000	8,000	5,220	2,780	154,256	58,000
10	-	50,000	6,000	3,889	2,111	102,146	56,000
11	-	50,000	4,000	2,575	1,425	50,721	54,000
12	-	50,000	2,000	1,279	721	0	52,000
13	-	-	-	0	0	0	-
14	-	-	-	0	0	0	-

5.   **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.

(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: Chapter 18

LFM-842-20: NAIC Standard Non-forfeiture Law for Individual Deferred Annuities

Commentary on Question:

This question tested the candidates' knowledge of U.S. Statutory valuation principles and methods. The question was generally well done. Many candidates received at least partial credit for each part of the question and demonstrated a general knowledge of the concepts being tested. Common errors were not providing justification for a response and miscalculations.

Solution:

(a)   You are given:

- 5-year CMT rate is 2.00%
- No premium taxes
- The GLWB is elected in the first policy year

Calculate the NAIC nonforfeiture value for the first 5 years. Show all work.

Commentary on Question:

Candidates generally did well on this part of the question. Candidates were generally able to correctly identify and apply the formulas. The GLWB amount was often miscalculated and, in many cases, omitted altogether.

Standard Non Forfeiture Law (SNFL) $i = \text{MIN}(3\%, \text{MAX}(1\%, \text{5yr CMT} - 1.25\%))$, rounded to the nearest 1/20th of 1%

$\text{SNFL}_t = (\text{SNFL}_{t-1} + 87.5\% \text{ considerations} - \text{contract charge} - \text{premium tax}) * (1+i) - \text{policy loans and withdraws}$

5. **Continued**

SNFL i = MIN(3%, MAX(1%, 2% - 1.25%)) = 1.00%
GLWB payment = AV_0*GLWB % = 100,000*4% = 4,000

Year	Premium	Annual Contract Charge	GLWB Payment	SNFL
1	100,000	50	4,000	84,324.50
2		50	4,000	81,117.25
3		50	4,000	77,877.92
4		50	4,000	74,606.20
5		50	4,000	71,301.76

(b)   You have been asked to consider the implications of the Standard Nonforfeiture Law interest rate floor changing to 0.15%.

   (i)   Justify why this could be an appropriate measure for insurers.

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

Commentary on Question:
Generally, candidates could identify one reason/consequence for each of part (i) and part (ii) but very few candidates provided justification.

   (i)   A lower floor is appropriate for insurers as they may not be able to invest appropriately to back a 1% interest rate guarantee. Insurers may face solvency issues if they cannot afford a 1% guarantee.

   (ii)   The decrease in interest rate floor will negatively affect the policyholder by decreasing the guaranteed minimum nonforfeiture value. The SNFL is in place to protect policyholders who surrender their policies and maintain equity between those who surrender and those who remain. Lowering the interest rate floor could create an inequality between these groups.

(c)   Describe how the Commissioners Annuity Reserve Valuation Method (CARVM) would be performed on this type of GLWB policy.

Commentary on Question:
Generally, candidates defined CARVM as a worst-case scenario and received partial credit, although few candidates provided detail on how to perform the full process.

5.   Continued

Step 1: Project the fund value on a guaranteed basis and determine all future guaranteed benefits. Guaranteed benefits in this case include death benefits, annuitization benefits, GLWB payments and surrender benefits.
Step 2: Calculate the present value for each future guaranteed benefit stream using the prescribed valuation rates. Rates can vary by elective and non-elective benefits. Non-elective benefits for this policy are death benefits. Elective benefits include annuitization, GLWB payments and surrender benefits. The projected payment streams for each benefit will be integrated together. For elective benefits all possible incidence rates between 0%-100% must be considered. All future election points for annuitization must be tested to determine the greatest present value.
Step 3: The greatest present value of all integrated benefit streams will be used for the CARVM reserve.

(d)   Calculate the maximum present value of each of the following 4 CARVM benefit streams individually over the first 5 years of the policy assuming no mortality:

 (i) Surrender benefits assuming GLWB election in the first policy year

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

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

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

Commentary on Question:
This part of the question was generally done well. Common errors include miscalculating or forgetting the GLWB payment and missing the annual contract charge.

$i = 2.00\%$
AV End of Year (EOY) = (AV Beginning of Year + Premium) * (1+ i) – Annual Contract Charge – GLWB payment
CSV = AV EOY * (1 – Surrender Charge)
CARVM Discount rate = 3.00%, surrender and GLWB are elective

(i) GLWB payment = AV_0*GLWB % = 100,000*4% = 4,000

Year	Premium	Annual Contract Charge	GLWB Withdrawal	Guaranteed AV EOY	Surr Chg	CSV	Disc CSV
1	100,000	50	4,000	97,950.00	6%	92,073.00	89,391.26
2		50	4,000	95,859.00	4%	92,024.64	86,742.05
3		50	4,000	93,726.18	3%	90,914.39	83,199.55
4		50	4,000	91,550.70	2%	89,719.69	79,714.78
5		50	4,000	89,331.72	1%	88,438.40	76,287.74

5. Continued

Max(Disc CSV) = 89,391.26

(ii) GLWB payment = AV_4*GLWB % = 108,037.14*4% = 4,321.49

Year	Premium	Annual Contract Charge	GLWB Withdrawal	Guaranteed AV EOY	Surr Chg	CSV	Disc CSV
1	100,000	50		101,950.00	6%	95,833.00	93,041.75
2		50		103,939.00	4%	99,781.44	94,053.58
3		50		105,967.78	3%	102,788.75	94,066.26
4		50		108,037.14	2%	105,876.39	94,069.80
5		50	4,321.49	105,826.39	1%	104,768.13	90,373.91

Max(Disc CSV) = 94,069.80

(iii) GLWB payment = AV_0*GLWB % = 100,000*4% = 4,000

Year	Premium	Annual Contract Charge	GLWB Withdrawal	Disc GLWB	Sum Disc GLWB
1	100,000	50	4,000	3,883.50	3,883.50
2		50	4,000	3,770.38	7,653.88
3		50	4,000	3,660.57	11,314.45
4		50	4,000	3,553.95	14,868.39
5		50	4,000	3,450.44	18,318.83

Max(Sum Disc GLWB) = 18,318.83

(iii) GLWB payment = AV_4*GLWB % = 108,037.14*4% = 4,321.49

Year	Premium	Annual Contract Charge	GLWB Withdrawal	Disc GLWB	Sum Disc GLWB
1	100,000	50			
2		50			
3		50			
4		50			
5		50	4,321.49	3,727.75	3,727.75

Max(Sum Disc GLWB) = 3,727.75

(e) Combine the 4 individual benefit streams in part (d) into 2 appropriately integrated benefit streams.

Identify the election timing option which should be used to set the CARVM reserve. Justify your answer.

5. Continued

Commentary on Question:
Few candidates recognized they were to fully integrate the benefit streams. Many candidates had an improper summation of CARVM results from part (d) which received partial credit. Credit was not lost for an error carried over from part (d).

Integrating (i) and (iii), election in year 1:

Disc CSV	Sum Disc GLWB	Integrated Stream
89,391.26	3,883.50	93,274.76
86,742.05	7,653.88	94,395.93
83,199.55	11,314.45	94,514.00
79,714.78	14,868.39	94,583.18
76,287.74	18,318.83	94,606.57

Max (Integrated Stream) = 94,606.57

Integrating (ii) and (iv), election in year 5:

Disc CSV	Sum Disc GLWB	Integrated Stream
93,041.75		93,041.75
94,053.58		94,053.58
94,066.26		94,066.26
94,069.80		94,069.80
90,373.91	3,727.75	94,101.66

Max (Integrated Stream) = 94,101.66

The CARVM reserve for this policy should be based on election in year 1 as this creates the greatest present value of the integrated benefit stream.

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.

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:

(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.

(3b) Describe, apply and evaluate the valuation methods and techniques for specific insurance products under U.S. taxation rules. Further, evaluate and calculate deferred tax items.

Sources:

Lombardi, Chapter 13 – Term Life Insurance

Lombardi, Chapter 11 – Valuation Methodologies (exclude 11.3.9 to 11.3.11)

LFM-846-20 Company Tax – Introductory Study Note

Commentary on Question:
This question tested candidates' knowledge of the valuation methods and techniques. Candidates generally did not do well on this question.

Solution:

(a) You are given the following information on a 5-year term policy that automatically expires after 5 years without a maturity benefit:

Issue date	1/1/2016
Face amount	100,000
Valuation interest rate	4.50%
EA under FPT for a 20-pay limited-payment life contract	50

6. **Continued**

	2016	2017	2018	2019	2020
Premium rate	0.011	0.011	0.011	0.011	0.011
Valuation mortality rate	0.009	0.0099	0.0109	0.012	0.0132

Calculate the statutory reserve for this policy at 12/31/2017 assuming that premiums are paid at the beginning of the year and death benefits are paid at the end of the year. Show all work.

Commentary on Question:
Candidates generally did not do well on this part of the question. Common errors included (1) not calculating the level premium and calculating the reserve using projected premiums instead; (2) incorrectly calculating the decrements, and not adjust the survivorship for the previous year's mortality; (3) calculating the reserve for the incorrect year; (4) calculating the reserve for each year but not identifying which calculation was the final answer; (5) not justifying only using one segment; and (6) not calculating a deficiency reserve.

First, we need to determine if more than one segment is needed. Since the premium is flat it will not increase by more than the mortality rate, so only one segment is required.

To begin the calculation, we need to calculate the PV of Future Benefits and a level annuity at time 0 to calculate the net level premium:

Time	Mortality	Survivorship	v	PV of Expected Benefit
0	0.00%	100%	1.00	-
1	0.90%	99.1%	0.96	861
2	0.99%	98.1%	0.92	898
3	1.09%	97.0%	0.88	937
4	1.20%	95.9%	0.84	977
5	1.32%	94.6%	0.80	1,016
Comment	Given	$=p_{x-1}*q_x$	$=1/(1+4.5\%)^t$	$=100{,}000*survivorship_{t-1}*Mortality*v_t$

Using the table above, AB = sum of PV of Expected Benefits
$$=861+898+937+977+1016$$
$$=\$4689$$

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6. Continued

$a = v_0*\text{Survivorship}_0 + v_1*\text{Survivorship}_1 + v_2*\text{Survivorship}_2 + v_3*\text{Survivorship}_3 + v_4*\text{Survivorship}_4$
$= 4.501$

To calculate the net level premium, we divide AB by a:
$PB = \$4689/4.501 = \$1041.71$

Since gross premiums (\$1100) are greater than net premiums (\$1041.71), no deficiency reserve is required.

Next we need to calculate the expense allowance under FPT for comparison to 50 provided to determine which is lower and should be used going forward. To do this we take:
$PB - v*q_x*\text{FaceAmount} = 180.47$

Since 50 is less than 180.47, the expense allowance we will be using is 50.

This needs to be amortized over 5 years, so the annual contribution will be:
$PE = 50/a = 50/4.501 = 11.11$
Now we need to calculate the reserve at the end of 2017. Using the same approach as above we generate the following table:

Time	Mortality	Survivorship	v	PV of Expected Benefit
0	0.00%	100%	1.00	-
1	1.09%	98.9%	0.96	1,043
2	1.20%	97.7%	0.92	1,087
3	1.32%	96.4%	0.88	1,130
Comment	Given	$=p_{x-1}*q_x$	$=1/(1+4.5\%)^t$	$=100,000*\text{survivorship}_{t-1}*\text{Mortality}*v_t$

$AB = \text{SumPVofExpectedBenefit} = 1043 + 1087 + 1130 = 3260.33$
$a = v_0*\text{Survivorship}_0 + v_1*\text{Survivorship}_1 + v_2*\text{Survivorship}_2 = 2.841$

$VB = AB - a*PB = 3260.33 - 2.841*1041.71 = 300.42$
$VE = a*PE = 11.11*2.841 = 31.56$

Combining the two, we have $V = VB - VE = 300.42 - 31.56 = 268.87$

The statutory reserve at December 31, 2017 is \$268.87.

6.   Continued

(b)   You are given the following balances (in millions) as of 12/31/2018 on GHI's entire block of term life policies:

Total Statutory Reserve	250
Statutory Basic Reserve	200
Statutory Deficiency Reserve	40
Asset Adequacy Reserve	10
Impact of Contract-Level Net Surrender Value Floor	5

Calculate the tax reserve. Show all work.

Commentary on Question:
Candidates were generally able to apply the correct factor to the reserve (92.81%), and most realized that the Deficiency Reserve should be deducted for calculating the tax reserve. Candidates generally did not demonstrate that there is a cap on the tax reserve equal to the statutory reserve, and that the Asset Adequacy Reserve should also be excluded from the calculation of the tax reserve.

Tax Reserve is floored at the Net Surrender Value and capped at the Total Statutory Reserve. So Tax Reserve is equal to:
Min[StatRes,Max{CSV,92.81%*(StatRes-DeficiencyRes-AssetAdeRes)}]

StatRes-DeficiencyRes-AssetAdeRes=200

92.81%*(StatRes-DeficiencyRes-AssetAdeRes)=185.62

Impact of CSV Floor is 5, so tax reserve = 185.62+5=190.65

This is less than the total statutory reserve, so the final tax reserve is 190.65.

(c)   With respect to GHI's term insurance products:

(i)   Describe the impact of the four major changes in the 2017 Tax Cuts and Jobs Act on profitability.

(ii)   Propose a strategy that GHI could use to offset some of the tax burden from the 2017 Tax Cuts and Jobs Act. Justify your response.

Commentary on Question:
Candidates generally did well on part (i). Some candidates did not describe the capital implications, but generally described the other three impacts.

6. **Continued**

Candidates generally did not do well on part (ii). Many candidates provided additional commentary on the changes in the Act instead of providing strategies. The solution below contains three different possibilities; however, only one was required for full credit. Strategies not included below generally received credit if proper justification was provided.

(i)   The four main changes from the 2017 Tax Cuts and Job Act and their impact on profitability are:
   a. Decreased tax rate from 35% to 21%. This increases profitability since a lower tax rate results in a lower tax obligation.
   b. Tax reserve methodology has changed, with a major change being the tax reserve being set to 92.81% of the statutory reserve (subject to some constraints). Generally, this will result in a lower tax reserve which increases tax payable, decreasing profit.
   c. Tax DAC capitalization rates increased from 7.7 to 9.2 with amortization increased from 10 to 15 years. This will decrease profitability due to a higher capitalization and longer amortization period.
   d. Updated RBC factors due to the lower tax rate resulting in higher capital requirements due to a higher post-tax base. This will decrease profitability.
       c

(ii)   Possible strategies to offset some of the tax burden from the 2017 Tax Cuts and Job Acts include:
   a. Increase premiums in order to reduce the deficiency reserve so that the statutory reserve is closer to the tax reserve.
   b. Use reinsurance to reduce RBC requirements. A properly designed reinsurance treaty can reduce required capital, lowering the return required to meet the company's target ROE
   c. Redesign asset management strategy to reduce required capital on assets. Care would need to be taken to ensure that the new asset strategy maintains appropriate matching and that any reduction in yields doesn't hurt income more than the reduced capital benefits it.

7.   **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.

Sources:
Lombardi, Chapter 4 – Standard Valuation Law

Lombardi, Chapter 14 – Universal Life (exclude 14.4.8, 14.4.9, 14.5.0, 14.6.2-6)

LFM-844-20: Life Principle-Based Reserves Under VM-20, AAA Practice Note (required questions are listed on the first page of this study note)

Lombardi, Chapter 23 – PBR for Life Products (exclude 23.1)

Lombardi, Chapter 13 – Term Life Insurance

Lombardi, Chapter 12 – Whole Life

Lombardi, Chapter 10 – Valuation Assumptions (exclude 10.1.3, 10.3.8)

Lombardi, Chapter 11 – Valuation Methodologies (exclude 11.3.9 to 11.3.11)

Commentary on Question:
This question tested the candidates' knowledge of U.S. Statutory valuation principles and methods.

Solution:
(a)   List four responsibilities or requirements of the Appointed Actuary role.

-Appointed Actuary must meet the educational requirements and have at least 3 years of relevant experience
-must state in his opinion, whether the assets make sufficient provision for the obligations of the company
  -in this regard – must perform cash flow testing to ensure sufficiency of assets

7. Continued

(b) Describe the type of statutory reserve standards and components that may be applicable to the following cohorts of YUL's business:

   (i) Universal Life with Secondary Guarantee issued in 2015

   (ii) 10YR Level Term issued in 2018

   (iii) Whole Life issued in 2019

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

Commentary on Question
Candidates generally did well on this part of the question. Common errors include confusing statutory reserving with GAAP reserving and missing the optionality of the transition period.

   (i) Universal Life with Secondary Guarantee issued in 2015
   -prior to operative date of 1/1/2017 so SVL (CRVM) applies
    -using guaranteed maturity premium and guaranteed maturity fund
      Approach
   -note Actuarial Guidance 38 (AXXX)
   (ii) 10YR Level Term Issued in 2018
    -after operative date but still within 3-year transition period
     -can use PBR method or CRVM
      -PBR – need NPR and Deterministic Reserve (DR)
           -may test if Stochastic Reserve (SR) needed
      -if CRVM – need to follow XXX re deficiency reserves
   (iii) Whole Life Issued in 2019
    -similar to (ii) – still in transition period (PBR or CVRM)
    -PBR – calculate NPR (and DR and SR if tests failed
   (iv) Indexed UL with Clearly defined Hedging Strategy (CDHS) issued in 2020
    -no option – must use PBR
    -as CDHS present must calculate NPR, DR and SR – no exclusions
     permitted

(c) Critique the following statements:

   A. YUL's statutory reserves on business issued in 2015 continues to increase each year since the valuation interest rate is a function of the rolling average of corporate bond yields published by Moody's which has been decreasing each year.

7. Continued

    B. The main difference between a CRVM and NLP reserve for Whole Life under Standard Valuation Law (SVL) is the additional conservatism built into the CRVM method.

    C. The standard non-forfeiture calculation under SNFL uses the same mortality, interest, and expense allowance as SVL for policies issued before 1/1/2017.

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

Commentary on Question:
A common error with statement A is not dealing with clearly defined 2015 issues. A lack of a clear critique resulted in less than full credit.

A. Not accurate – 2015 valuation rates were locked in at issue so subsequent interest trends have no effect on the reserves

B. Inaccurate – CRVM includes an expense allowance (capped at that for a 20 pay policy) that reduces the NLP reserve

C. Not totally accurate – mortality stays consistent – but expense allowances are defined differently – and interest is 1.25 x the SVL rate

D. Not accurate – Mean reserves might be higher but are adjusted downwards by a Deferred Premium Asset
Goal is to be practical – not to add conservatism

8. **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:
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)

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

Commentary on Question:
The question was testing the candidates' understanding of NAIC required capital, including its shortcomings, strengths and use. Candidates generally performed well on this question.

Solution:
  (a)   Describe two reasons why the NAIC might be interested in international perspectives regarding insurance regulation.

  Commentary on Question:
  Full credit was received for describing two reasons. Below are a sample of acceptable reasons. Other appropriate reasons not listed received full credit.

  - To identify potential improvements in U.S. regulation that have inherent merit
  - Might feel pressure to adopt certain methods/practices to meet international standards or forestall conflicts over regulatory equivalency
  - To avoid further federal intrusions into state regulation by adopting reforms that are reasonably consistent with international standards and address perceived deficiencies in the current U.S. regulatory system

8. Continued

(b)   With respect to the NAIC's approach to determining RBC requirements as described in *The Modernization of Insurance Company Solvency Regulation in the US*:

      (i)   Describe two criticisms of the approach.

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

Commentary on Question:
Full credit was received for describing two criticisms and the NAIC's response to them. Generally, candidates performed better on part (i) than on part(ii). Shown below are a sample of criticisms that received full credit.

(i)
- Lack of Group level supervision; Walls and Windows approach not performing well for insurance companies
- Static formulas don't adequately measure some risks
- Mis-sizes risk at the company level because it is not geared to individual company characteristics
- Omits some risks that are quantifiable

(ii)
- Group level supervision: Walls and Windows approach proved to work as designed during the 2008 crisis
- Static formulas: will consider refinements to asset, investment and credit risk charges
- Mis-sizing: lower priority and generally opposed to any solution requiring dynamic modeling
- Omissions: will consider addition of an explicit risk charge for property-casualty catastrophe risk

(c)   Describe two positive outcomes and two negative outcomes that could potentially occur if the NAIC decided to increase RBC requirements.

Commentary on Question:
Full credit was received for describing two positive outcomes and two negative outcomes. Shown below are a sample of the outcomes that received full credit.

Potential positive outcomes:
- Fewer insolvencies
- Increased consumer confidence in the insurance industry
- Increased investor confidence in the insurance industry

8. Continued

Potential negative outcomes:
- Higher costs or reduced benefits for consumers
- Inefficient use of capital
- Unwarranted company and regulatory actions

(d)

    (i)   Calculate the ACL RBC for MSP. Show all work.

    (ii)   Describe the regulatory action triggered by MSP's RBC ratio. Show all work.

Commentary on Question:
On part (i), candidates generally struggled with determining the correct NAR for the C2 calculation and the correct reserve risk classifications (low/medium/high) for the C3a calculation. On part (ii), partial credit was received if the candidate made errors in part (i) but determined the RBC ratio and corresponding regulatory action using the correct formula and the calculated ACL RBC from part (i).

(i)
C0 = Asset Risk Affiliated = 2 million

C1CS = Asset Risk Unaffiliated = 10 million

C1o = Asset Risk Other = 5 million

NAR = Net Amount at Risk =
    Amount of insurance in force for ordinary life - Reserves for ordinary life =
    7,500 million - 500 million = 7,000 million

C2 = Insurance Risk =
    MIN [500 million, NAR] x 0.0023 +
    MAX [0, MIN (4,500 million, NAR - 500 million)] x 0.0015 +
    MAX [0, MIN (20,000 million, NAR - 5,000 million)] x 0.0012 +
    MAX [0, NAR - 25,000 million] x 0.0009 =
    (500 x 0.0023) +
    (4,500 x 0.0015) +
    (2,000 x 0.0012) +
    (0 x 0.0009) =
    10.3 million

8. Continued

Low Risk Reserves =
  Reserves for ordinary life +
  Reserves for annuity contracts with a market value adjustment =
  500 million + 200 million = 700 million

Medium Risk Reserves = 0

High Risk Reserves =
  Reserves for annuity contracts with a book value withdrawal
  and no surrender charge = 100 million

C3a = Interest Rate Risk =
  (Low Risk Reserves x 0.0077) +
  (Medium Risk Reserves x 0.0154) +
  (High Risk Reserves x 0.0308) =
  (700 x 0.0077) +
  (0 x 0.0154) +
  (100 x 0.0308) =
  8.47 million

C3b = Health Credit Risk = 0 (MSP has no health products)

C3c = Market Risk = 0 (MSP has no variable products)

C4a = Business Risk = 10 million

C4b = Health Administrative Expense Risk = 0 (MSP has no health products)

ACL RBC =
  0.5 x {2 million + 10 million +
        [(5 million + 8.47 million)^2 + (10 million + 0)^2 +
        (10.3 million)^2 + 0^2 + 0^2]^0.5} =
  15.84 million

(ii)
RBC ratio = TAC / ACL RBC = 40 million / 15.84 million = 2.52

A common alternative formula not discussed in the source material uses Company Action Level (CAL) RBC in the denominator instead of ACL RBC. Credit was awarded for either definition. Under the alternative definition:

8. **Continued**

RBC Ratio = TAC / CAL RBC =
TAC / (2 x ACL RBC) = 40 million / 31.69 = 1.26

A trend test is triggered when TAC is at least 200% but less than 300% of ACL RBC (or, alternatively, at least 100% but less than 150% of CAL RBC)

MSP must perform a trend test

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.

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

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".

(1d)   Describe, apply and evaluate the appropriate valuation methods and techniques and related accounting treatments for Investments held by insurance companies.

(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

Sources:

Chapter 15:   US GAAP - Accounting for Business Combinations (exclude 15.7.3 to 15.7.8, and 15.10.5 to 15.15)

LFM-106-07 Insurance Industry Mergers and Acquisitions, Chapter 4 (Sections 4.1-4.6)

Commentary on Question:

This question tested the candidates' understanding of acquisition accounting with respect to existing in force business prior to the acquisition and business issued after the acquisition. Specific topics covered included the DAC (Deferred Acquisition Cost) asset, VOBA (Value of Business Acquired), identifiable intangible assets, and the deferred tax liability.

Several statements on this exam question referenced SFAS 60. Due to recent developments with the implementation of ASU 2018-12, candidates received full credit referencing either ASU 2018-12 or SFAS 60. Both sets of answers will be provided in this model solution, where appropriate.

9. Continued

Solution:

(a) Critique the following statements regarding how EWR should account for the acquired business under U.S. GAAP:

> *A. EWR should establish a DAC asset based on SFAS 60 deferability criteria.*
>
> *B. EWR should amortize the DAC asset as a level percentage of premium using assumptions consistent with benefit reserves.*
>
> *C. With respect to acquired identifiable intangible assets, EWR should initially record each asset at estimated fair value and then amortize it over the lesser of the asset's useful life and 30 years.*
>
> *D. EWR should establish a deferred tax liability based on temporary timing differences between acquisition basis accounting and tax basis accounting.*

Commentary on Question:

Many candidates provided incomplete answers to the statements given in this part of the question. The scenario described at the beginning of the question was with regard to the acquisition of one insurance company by another insurance company. This transaction involves activities that impact the accounting by the acquiring company for business issued prior to and after the acquisition of the acquired company. Most candidates described the resulting accounting transaction from the perspective of either company prior to the acquisition or after the acquisition, but not both. Both sides of the transaction needed to be considered to receive full credit.

Statement A: It is true that EWR should establish a DAC asset for business issued by LGA after the acquisition date based on SFAS 60 deferability criteria. However, for business issued by LGA prior to the acquisition, any existing DAC asset would be eliminated by EWR. Alternatively, for candidates who responded with regard to ASU 2018-12, the deferability criteria as defined by ASU 2018-12 would be applied to business issued by LGA after the acquisition date. The DAC asset for LGA's business issued prior to the acquisition would still be eliminated.

Statement B: It is true that EWR should amortize the DAC asset for post-acquisition business issued by LGA as a level percentage of premium using assumptions consistent with benefit reserves. Alternatively, with regard to ASU 2018-12, EWR should, instead, amortize the DAC asset for post-acquisition business issued by LGA as a level percentage of in force.

9. Continued

Statement C: It is true that EWR should initially record each acquired identifiable intangible asset at estimated fair value, but EWR must then amortize such assets over their useful life (not the lesser of their useful life and 30 years), if such useful life can be determined. If such useful life cannot be determined, then the identifiable intangible assets are treated like goodwill and not amortized.

Statement D: It is true that EWR should establish a deferred tax liability based on temporary timing differences between acquisition basis accounting and tax basis accounting.

(b) You are given the following information for the acquired business at the time of acquisition:

	(in millions)
Actuarial appraisal	
Adjusted book value (ABV)	400
Value of Future Business Capacity (VFBC)	100
Total Actuarial Appraisal Value (TAAV)	990
GAAP benefit reserve based on best estimate assumptions at issue plus PAD (GBRI)	4,800
GAAP benefit reserve based on best estimate assumptions at acquisition plus PAD (GBRA)	4,700
Statutory reserve (SR)	5,000
GAAP deferred tax liability excluding the impact of income tax on the VOBA asset (DTLX)	5

Tax rate (TR) is 21%

(i) Calculate the initial VOBA asset. Show all work.

(ii) Calculate the initial GAAP deferred tax liability. Show all work.

(iii) Describe the procedure for amortizing the VOBA asset.

Commentary on Question:
Candidates who struggled on part (i) and part (ii) did not know the proper formulas or left out some pertinent information in their calculations. With regard to the procedure for amortizing the VOBA asset, many candidates understood the connection to the DAC asset but did not describe the process adequately. Simply saying that "VOBA is amortized the same way as DAC" was not sufficient for full credit. Further details about the VOBA amortization process were necessary for full credit.

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9. Continued

(i)   Initial VOBA Asset =
(TAAV – VFBC – ABV – SR + GBRA + DTLX) / (1 – TR) =
(1,000,000) x (990 – 100 – 400 – 5,000 + 4,700 + 5) / (1 – 0.21) =
246,835,443

(ii)   Initial GAAP Deferred Tax Liability =
(TR x Initial VOBA Asset) + DTLX =
(0.21 x 246,835,443) + 5,000,000 = 56,835,443

(iii)   With respect to SFAS 60, the VOBA asset must be amortized over its estimated useful lifetime in proportion to premium revenue. The amortization interest rate must be the same interest rate that is used to amortize the DAC asset. The VOBA asset is subject to both recoverability and loss recognition testing.

Alternatively, if ASU 2018-12 applies, then the VOBA asset must be amortized over its estimated useful lifetime in proportion to in force. Amortization is done without interest (i.e. the amortization interest rate is 0%), and the VOBA asset is not subject to either recoverability or loss recognition testing.

(c)   As part of the acquisition, EWR obtained the following items from LGA:

(i)   A significant term life reinsurance contract with rates higher than current market rates

(ii)   A captive agency sales force that has expressed enthusiasm over the acquisition

(iii)   An independent agency sales force that has expressed reservations over the acquisition

(iv)   A home office building, including land and office supplies

(v)   All employees (1,000 in total) working at the home office

(vi)   A lease agreement for home office computer equipment at rates lower than current market rates

(vii)   Negative goodwill

(viii)   Licenses to operate in all 50 states

9. Continued

Explain whether each of the above items should be recognized on EWR's balance sheet as an identifiable intangible asset (IIA).

Commentary on Question:
Candidates generally had difficulty explaining why each of the items would be or not be recognized on EWR's balance sheet as an identifiable intangible asset (IIA).

(i)   A significant term life reinsurance contract with rates higher than current market rates would not be an IIA because the contract does not have value due to its above market rates.

(ii)   A captive agency sales force that has expressed enthusiasm over the acquisition would be an IIA because the sales force has value since it is highly likely to generate new and renewal business under existing agency contracts due to its captive nature and its enthusiasm over the acquisition.

(iii)   An independent agency sales force that has expressed reservations over the acquisition may or may not be an IIA. Since the sales force is not enthusiastic over the acquisition and, due to its independent nature, has the ability to easily place business with other carriers, careful consideration should be given when assessing the potential of the sales force to generate new and renewal business under existing agency contracts.

(iv)   A home office building, including land and office supplies, would not be an IIA because these assets are tangible (have physical substance).

(v)   The employees working at the home office would not be an IIA because they are free to change employers at will.

(vi)   A lease agreement for home office computer equipment at rates lower than current market rates would be an IIA because the lease agreement has value due to its below market rates.

(vii)   Negative goodwill would not be an IIA because negative goodwill is recognized immediately as an extraordinary gain in the period of the acquisition.

(viii) Licenses to operate in all 50 states would probably be an IIA. While it might not be EWR's intent to ever sell these licenses, the possibility of such a sale would appear to indicate that they have value.

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:
(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".

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

Sources:
LFM-XXX-21: LFMU GAAP Materials Flowchart

LFM-XXX-21: Insurance Contracts, PwC (Accounting Guide for Insurance Contracts), 2019, (Sections 1.1, 3.5, 5.1-5.10; Figures IG 2-1, IG 2-2)

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

Implementation Considerations For VA Market Risk Benefits, Financial Reporter, Sep 2019

Targeted Improvements Interactive Model

Commentary on Question:
This question tested the candidates' understanding of U.S. GAAP valuation principles and methods.

Solution:
(a)   Critique the following statements regarding LDTI:

   A. *Because XYZ's GMDB protects the value of a death benefit, it will not be considered a Market Risk Benefit*

   B. *The requirement to adjust DAC for unrealized gains and losses on available for sale assets (shadow DAC adjustment) is eliminated. Therefore, changes in asset values will only affect the DAC balance when gains or losses are realized.*

10. Continued

    C. If the calculated market risk benefit amount is negative, it needs to be floored at zero to avoid being reported shown in an asset position.

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

    E. An own credit adjustment is used to account for when a company cannot fulfill its obligations, which will increase the fair value liability due to this non-performance risk.

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

Commentary on Question:
Most candidates knew the basics of the new DAC amortization method under LDTI and were able to least obtain partial credit based on that knowledge.

A – statement is false. The exemption from MRB for protecting a death benefit only applies to insurance contracts and not annuities

B – While the first sentence is true the conclusion is false. DAC amortization is based on the expected life of a group of contracts or straight line on an individual contract. But changes in asset values don't affect amortization.

C – statement is false. An asset position is allowed when PV attributed fees > PV expected benefits

D – statement is false. These assumptions are needed to project inforce to determine DAC amortization pattern.

E – statement is false. The own credit adjustment increases the discount rate which will decrease the fair value liability

F – statement is false. All the changes in fair value related to market risk benefits shall be recognized in net income, with the exception of fair value changes attributable to a change in the instrument-specific credit risk of market risk benefits in a liability position, which should be recognized in the OCI

(b)   For a single premium variable deferred annuity with a Guaranteed Minimum Withdrawal Benefit (GMWB), the only fees charged are the M&E fees. XYZ decided to use the non-option method to value the Market Risk Benefit (MRB) for the GMWB.

10. Continued

You are given the following risk-neutral scenario projections for a single policy:

Projection date: At-issue			Projection date: 1 year after issue,			Projection date: 1 year after issue,		
Discount rates: risk-neutral interest rates plus the instrument specific credit risk			Discount rates: updated risk-neutral interest rates plus the at-issue instrument specific credit risk			Discount rates: updated risk-neutral interest rates plus updated instrument specific credit risk		
Scenario	PV of M&E Fees	PV Of GMWB Excess Benefits	Scenario	PV of M&E Fees	PV Of GMWB Excess Benefits	Scenario	PV of M&E Fees	PV Of GMWB Excess Benefits
1	100	20	1	94	17	1	93	16
2	93	26	2	87	25	2	86	25
3	95	29	3	91	30	3	90	29
4	107	10	4	102	11	4	101	10
5	102	15	5	98	15	5	97	15
6	97	30	6	91	29	6	90	29
7	92	40	7	87	41	7	86	41
8	108	20	8	104	21	8	103	21
9	106	18	9	102	16	9	101	16
10	100	22	10	94	25	10	93	24

(i)   Calculate the MRB fair value 1 year after issue. Show all work.

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

Commentary on Question:
Candidates generally did not do well on this part of the question. Candidates who demonstrated understanding of the MRB calculations performed well on this part of the question.

The Attributable Fee % = Min(100%,Avg PV of Excess Bens / Avg PV of Fees)
AF% = 23 / 100 = 23%

MRB_1=(Avg PV of excess benefits) – AF% X Avg PV of Fees
(calculated using right most columns)
=22.6 – 23% X 94 = 0.98.

10. Continued

Amount recognized in OCI = change in MRB due to change in instrument specific credit risk

So now calculate MRB at end of year 1 with original credit risk
MRB = 23.0 – 23% X 95=1.15

So the reduction in the MRB from 1.15 to 0.98 = 0.17 is recognized in OCI.