

ILA LFBVU Model Solutions

Fall 2015

1. Learning Objectives:

1. The candidate will understand financial statements and reports of U.S. life insurance companies and be able to analyze the data in them.

Learning Outcomes:

- (1e) Describe, use and recommend methods for performing reviews of reserves.

Sources:

LFV-102-09: Actuarial Review of Reserves and Other Annual Statement Liabilities

Commentary on Question:

Commentary listed underneath question component.

Solution:

- (a) List six general principles to follow in performing a satisfactory audit of reserves.

Commentary on Question:

Many candidates answered this question with a detailed description of recalculating the reserve and the reasonableness of the numbers. Many also focused on the detail of sampling principles. Those who focused on the high level principles scored best (9 are stated in the solution below, though only 6 needed to be stated to receive full credit).

- Understand the purpose/objective of the person requesting the audit
- Plan the audit, scope and timing in advance
- When documenting the findings, provide a description of the review and give the customer the opportunity to provide feedback
- If the review is sufficiently large, have one actuary as point of reference to funnel all questions
- Ensure that all questions that come up during the audit are answered and resolved by the end of the audit
- When choosing samples for testing, pay attention to new plans or benefits and any changes to assumptions or systems
- Have all items or documents that the actuary is “checking to” on hand so that there is no “moving target”
- Leave no links untested
- Reference the prior review if the audit is periodic to serve as a guide and ensure corrective action taken on past errors

1. Continued

- (b) Evaluate the reasonableness of the reserves by analyzing the trend in the average tabular mortality rate. Justify your answer. Show all work.

Commentary on Question:

Most candidates understood the overall idea of what the question was asking. Some based their answers on the formula $(C-I)/(M+1/2 P)$ which was not the appropriate approach to the question. Many had minor errors in their answers but were able to derive the general direction of the numbers. Many did not subtract the reserve from the face amount when calculating the average amount at risk. Conclusions varied from very thorough to a simple summation. Many did not calculate the actual percentage of increase in mortality, but reasoned why the mortality rate might rise or not.

$$M(0) + P + I - C - VD - VT = M(1)$$

$$C = M(0) + P + I - (VD + VT) - M(1)$$

$$2012: C = 1,412 + 654 + 60 - 91 - 1,483 = 552$$

$$2013: C = 1,483 + 687 + 63 - 94 - 1,556 = 583$$

$$2014: C = 1,556 + 704 + 65 - 100 - 1,594 = 631$$

$$\text{ATMR} = \text{Average Tabular Mortality Rate} = C / \text{Average Amount at Risk} = C / \text{AAR}$$

$$\text{AAR} = \frac{1}{2} ((\text{Face amount at beginning of year} - \text{reserve at beginning of year}) + (\text{Face amount at the end of year} - \text{reserve at end of year}))$$

$$2012: \text{ATMR} = 552 / (((30,000 - 1,412) + (31,500 - 1,483)) / 2) = 0.018838$$

$$2013: \text{ATMR} = 583 / (((31,500 - 1,483) + (33,075 - 1,556)) / 2) = 0.018948$$

$$2014: \text{ATMR} = 631 / (((33,075 - 1,556) + (33,900 - 1,594)) / 2) = 0.019773$$

From 2012 to 2013, ATMR increased $.018948/.018838 - 1 = 0.6\%$

From 2013 to 2014, ATMR increased $.019773/.018948 - 1 = 4.4\%$

ATMR experiences a big jump in 2014, so there may be a problem with the reserves

- (c) Evaluate the reasonableness of the reserves using the roll forward approach. Justify your answer. Show all work.

1. Continued

Commentary on Question:

Candidates approached this question using a variety of approaches. Some did the calculations as shown in the solution below, but many were able to rationalize the change in reserve by looking at the average interest rate (4%) or by looking at the upper and lower bound of possible interest rates. Very few calculated the Average Credited Interest Rate correctly, possibly because the term was never defined or used in an example in the syllabus material. Most who knew to calculate an average did not subtract the credited interest amount from the denominator, but most were able to reason that the resulting number should be in the 3.5% – 4.5% range in order for reserves to be reasonable.

$$AV(0) + DNFEL + CI - COIC - EC - AVREL = AV(1)$$

$$CI = AV(1) - AV(0) - DNFEL + COIC + EC + AVREL$$

$$2012: CI = 174 - 75 - 125 + 10 + 1 + 19 = 4$$

$$2013: CI = 260 - 174 - 113 + 9 + 1 + 28 = 11$$

$$2014: CI = 328 - 260 - 101 + 8 + 1 + 36 = 12$$

$$ACIR = \text{Average Credited Interest Rate} = (2 \times CI) / (AV(0) + AV(1) - CI)$$

$$2012: ACIR = (2 \times 4) / (75 + 174 - 4) = 3.3\%$$

$$2013: ACIR = (2 \times 11) / (174 + 260 - 11) = 5.2\%$$

$$2014: ACIR = (2 \times 12) / (260 + 328 - 12) = 4.2\%$$

ACIR should be within 20 to 30 basis points of actual credited interest rates

ACIR for 2012 is just below the 3.5% minimum rate but within 20 to 30 basis points; change in reserve during 2012 may be ok, but further investigation would be prudent

Change in reserve during 2013 does not appear reasonable since ACIR is significantly more than 4.5%

Change in reserve during 2014 appears reasonable since ACIR falls within the 3.5% to 4.5% range

2. Learning Objectives:

1. The candidate will understand financial statements and reports of U.S. life insurance companies and be able to analyze the data in them.

Learning Outcomes:

- (1d) Explain the appropriate accounting treatments for items such as, but not limited to:
 - (i) Separate Accounts
 - (ii) Embedded options
 - (iii) Derivatives
 - (iv) Secondary guarantees

Sources:

US GAAP For Life Insurers, Herget et. al., 2nd Edition, Ch. 13(excl. 13.7)

Commentary on Question:

Commentary listed underneath question component.

Solution:

- (a) Calculate the total impact on LHW's GAAP financials for December month-end. Show all work.

Commentary on Question:

In general, candidates did well on this part. In order to receive full credit, the candidate had to identify which portion of the GAAP financials was impacted, if any, such as Other Comprehensive Income or GAAP earnings.

For Security ZZ, there would be an increase of 5 to Other Comprehensive Income (OCI).

For Security YY, there would be no impact to the income statement. This security is Held-to-Maturity, which is not carried at fair value; therefore a change in fair value has no impact.

For Security XX, there would be an increase of 20 to earnings.

For Security WW, there would be a decrease of 30 to earnings.

The overall impact to the income statement would be -10 on earnings (=20-30) and +5 on OCI.

- (b) For each security, state the additional information you would consider in order to determine its impairment status.

2. Continued

Commentary on Question:

Many candidates struggled with this portion of the question compared to (a) and (c). To receive full credit, the candidate needed to identify if the security was impaired and why (i.e. if fair value < amortized cost). If the security was impaired, the candidate then needed to provide considerations for why the impairment would be classified as temporary or permanent. Partial credit was given if the candidate provided rationale to part of the question.

Security UU: The fair value is below the amortized cost, so the security is impaired. Since LHW sold similar securities at a loss recently, this indicates that the company probably does not have the intent to hold the security until it recovers; therefore the impairment is probably not temporary. Other factors to consider include how long UU has been impaired and whether the company has the intent or ability to hold UU through a reasonable recovery time (cash flow projections can be used to help determine this). You may also consider any changes in fair value since the balance sheet date. If the company deems this impairment "temporary", they should be prepared to defend that position with sufficient evidence.

Security TT: The fair value is above the amortized cost, so the security is not currently impaired. No further information should be necessary.

Security SS : The fair value is below the amortized cost, so the security is impaired. LHW's plan to hold the security for 10 years may or may not indicate the impairment is temporary. You should take into consideration what the maturity period of the security is, as well as whether LHW has the ability to hold the security to maturity. You should also collect information on whether LHW has ever sold a similar security at a loss. The duration of the impairment may also be considered, as well as any changes in fair value since the balance sheet date. LHW must provide evidence to support the argument that it is temporary. Evidence can include cash flows, credit ratings, economic forecasts, etc.

Security RR : The fair value is below the amortized cost, so the security is impaired. Even though LHW plans to hold the security, they recently sold a similar one at a loss. This could contradict their claim that they plan to hold the security to maturity. LHW should provide strong evidence that they have the intent and ability to hold this security or else it is not temporary. Additional information to consider could include the duration of the impairment, cash flow projections that demonstrate the ability to hold the security to maturity, economic forecasts, any changes in fair value since the balance sheet date, etc.

2. Continued

- (c) Determine the total impact on LHW's GAAP financials. Show your work.

Commentary on Question:

In general, candidates did well on this section. To receive full credit, the candidate needed to correctly identify (and quantify) which portion of the GAAP financials would be impacted by both the effective and ineffective portions of the gains/losses. Partial credit was given if the candidate answered the effective or ineffective portion correctly.

For the fair value hedge, gains and losses are recorded in earnings, whether they are effective or ineffective. So the impact is an increase of 30 to earnings.

For the cash flow hedge, the effective portion is accumulated in OCI until the hedged item impacts earnings. The ineffective portion is recorded in earnings. So, there should be an increase of 7 to OCI and a decrease of 12 in earnings.

For the foreign currency hedge on fair value, the accounting is the same as for a fair value hedge. So both pieces of the change would impact earnings. The result is an increase of 9 (=15-6) to earnings.

For the foreign currency hedge on net investment, the effective portion is recorded in OCI and the ineffective portion is recorded in earnings. So, the impact is an increase of 5 to OCI and a decrease of 5 to earnings.

The total impact on the financials is $30-12+9-5=22$ increase to earnings and $7+5=12$ increase to OCI.

3. Learning Objectives:

2. The candidate will be able to understand and apply valuation principles of individual life insurance and annuity products issue by U.S. life insurance companies.

Learning Outcomes:

- (2c) Calculate liabilities for life and annuity products and their associated riders under the following standards:
 - (i) U.S. Statutory
 - (ii) U.S. GAAP
 - (iii) U.S. Tax

Sources:

LFV-802-07: US Tax Reserves for Life Insurers: Ch2 Tax-Based Reserves and Ch 7 Section 807(c)

LFV-800-07: IASA, Chapter 8, page 1-15 and 32-33

Commentary on Question:

The candidates were asked to demonstrate knowledge in selected tax concepts, specifically: Taxable Gross Income, Tax Deductions, Dividend Received Deduction, Tax DAC concepts, Operations Loss Carryback and situations where an Operations Loss might be carried forward instead. Overall scores for part (b) were relatively better than for part (a) as the concepts were a little more straightforward.

Solution:

- (a) Calculate ABC's tentative Life Insurance Company Taxable Income (LICTI) for 2014 before small company deduction. Show all work.

Commentary on Question:

Some candidates correctly calculated the taxable gross income which has specific items that are different than a statutory gross income. Some candidates correctly calculated the tax deductions including the dividend received deduction. Some candidates incorrectly used the change in statutory reserve rather than the change in tax reserve in the taxable income calculation. A common problem overall was confusion related to separating balance sheet items from income statement items. This was most often seen in the Tax DAC calculation for 2014 where the capitalization amount was sometimes incorrectly charged entirely against the 2014 income without considering the amortization. A few candidates confused Tax DAC with GAAP DAC. Very few candidates correctly stated the final Tentative LICTI. Significant partial credit was available for the various individual formulas and pieces of part (a) answered correctly.

3. Continued

Tax Gross Income = Earned Premium from individual Life + Annuity considerations + Increase in premium paid in advance - Increase in deferred and uncollected premium + Net investment income

$$\text{Tax Gross Income} = 15 + 5 + 2 - 3 + 4 = 23.000$$

Tax Deductions = Maintenance expense + Commissions + Benefits Paid + Policyholder Dividend + Increase in Tax Reserves

$$\text{Tax Deductions} = 1.5 + 0.525 + 5 + 1.05 + (79-74) = 13.075$$

$$\text{2014 Taxable Income (before adjs)} = \text{Tax Gross Income} - \text{Tax Deductions} = 23.000 - 13.075 = 9.925$$

$$\text{Dividend Received Deduction (DRD)} = 0.70 * \text{Dividend} = 0.70 * 0.50 = 0.35$$

$$\text{Tentative 2014 LICTI (before Tax DAC)} = \text{2014 Taxable Income} - \text{DRD} = 9.925 - 0.35 = 9.575$$

2014 Tax DAC Capitalized = .0175 * Annuity Considerations + .0205 * Group Life Premium + 0.0770 * Other Premium

$$\text{2014 Tax DAC Capitalized} = .0175 * 5 + .0205 * 0 + .0770 * 15 = 1.243$$

Year	2014	2015	2016	2017	2018	2019
Capitalization	1.2430	----	----	----	----	----
Amort_Sched	0.1000	0.2000	0.2000	0.2000	0.2000	0.1000
Amortization	0.1243	0.2486	0.2486	0.2486	0.2486	0.1243

Notes: The amortization pattern was not explicitly specified on the syllabus so credit was given if the candidate amortized 1/5 of the 2014 capitalized balance. It is not necessary to show all years; all shown above for completeness. First amortization at half of normal is in same tax year as premium received. Schedule above is for a small life company, otherwise a 10-year schedule with a pattern: 0.05 in first year, 0.10 for the next 8 years, and 0.05 for year 10.

From table, for recent prior year Tax DAC the amortization schedule is 0.20. With 5m capitalized from prior years, 2014 amortization is 1m (= 5 * 0.20).

$$\text{Tax DAC Balance (2013)} = 5$$

$$\text{Tax DAC Balance (2014)} = \text{Tax DAC Balance (2013)} - \text{Amortization (2014 from 2012/2013)} + \text{Tax DAC Capitalized (2014)} - \text{Amortization (2014)}$$

$$\text{Tax DAC Balance (2014)} = 5 - 1 + 1.243 - 0.1243 = 5.1187$$

3. Continued

Increase in Tax DAC (2014) = $5.1187 - 5 = 0.1187$
 LICTI increases by 0.1187 due to increase in Tax DAC.

Tentative LICTI = Tentative LICTI (before Tax DAC) + Increase in Tax DAC =
 $9.5750 + 0.1187 = 9.6937$

- (b)
- (i) Recalculate LICTI after carryback for each prior year, assuming an operational loss of 15 million for 2019. Show all work.
 - (ii) Describe situations, in general, when a company would carry an operating loss deduction forward.

Commentary on Question:

Many candidates properly carried the operations loss back for three prior years while ignoring the fourth prior year. Some candidates applied some form of small company deduction, while fewer candidates reduced the small company deduction when earnings were greater than 3m where the small company deduction starts to phase out. Note it is easier to organize and show work in a table form especially for this kind of question. Most candidates expressed at least one of the two main situations where an operating loss might be carried forward with various levels of elaboration.

(i)

	1	2	3	4	5
Year	TLICTI (Given)	OLD Applied	(1) + (2)	Small Co. Deduction	(3) – (4) LICTI
2015	3	0	3	1.80	1.20
2016	3	-3	0	0.00	0.00
2017	15	-12	3	1.80	1.20
2018	4	0	4	1.65	2.35
2019	-15	----	----	----	----

2015 is not affected as is it more than 3 years prior to the operational loss in 2019.

Apply carryback to 2016 (-3), then 2017 (-12) adding up to the 15 available.

Small Co. Deduction = Earnings up to 3m * 0.60 – Max (0, Earnings – 3m) * 0.15

For 2015 = $3 * 0.60 = 1.80$ For 2016 = 0.00

For 2017 = $3 * 0.60 = 1.80$ For 2018 = $3 * 0.60 - (4 - 3) * 0.15 = 1.65$

3. Continued

LICTI is after OLD carryback and Small Co. Deduction:

For 2015 = $3.00 - 1.80 = 1.20$

For 2016 = 0.00

For 2017 = $3.00 - 1.80 = 1.20$

For 2018 = $4.00 - 1.65 = 2.35$

(ii)

- Company may not have enough tentative LICTI in the carryback period to absorb the operations loss, excess is carried forward
- Company may elect to waive the carryback of an operations loss and carry the loss forward.
 - Such an election may be beneficial when:
 - Tax benefits might otherwise expire unutilized.
 - Small Co. Deduction might be maximized.

4. Learning Objectives:

3. The candidate will be able to understand and analyze the implications of emerging financial and valuation standards.

Learning Outcomes:

- (3a) The candidate will be able to describe and assess the impact on reserves, capital, and/or income of emerging developments in U.S. GAAP Reporting.

Sources:

LFV-132-14 (Same as LFV-639-14) Practical Guide to IFRS, PwC, (July 2013)

Fair Value Accounting: Trouble-maker or Life-saver? Financial Reporter, April 2009

Commentary on Question:

Overall, the candidates did not do as well as expected on this question. Many candidates demonstrated only a superficial understanding of fair value accounting. The most common items that candidates lost points for were responses that did not address the topic asked about or responses that failed to elaborate on the reasons the answers were justified.

Solution:

- (a)
 - (i) Determine the discount rates that would be used to value liabilities using each of the two approaches. Show all work.
 - (ii) Describe the rationale for the inclusion of each component under each approach.

Commentary on Question:

Candidates did not do as well as expected. This was surprising given that the key details about the answer were provided in the question. The candidates were only required, in part (i) to identify those risk components associated with each discount rate methodology and perform the appropriate calculations. In part (ii), candidates often merely provided characteristics associated with each risk component and did not elaborate on their significance pertaining to the discount rate approach.

- (i) Under the Top-Down Approach, the Discount Rate = Expected Reference Portfolio Rate + Duration Mismatches – Market Risk Premium for Expected Credit Losses – Market Risk Premium for Unexpected Credit Losses = 6% + 0.5% - 1.5% - 1% = 4.0%.

Under the Bottom-Up Approach, the Discount Rate = Liquidity Premium + Risk-Free Rate = 1.25% + 2.50% = 3.75%

4. Continued

(ii) Rationale for Bottom-Up Approach

- Differences in liquidity characteristics arise when insurance liabilities do not have the same liquidity characteristics as assets that are traded in the financial markets.
- Insurance contract liabilities cannot generally be traded, and there may be no ability under the terms of the contract for cancellation before it matures.

Rationale for Top-Down Approach

- An entity can identify a discount rate on a replicating portfolio and deduct the elements not included in the liability, like credit risk.
- For debt instruments, the objective is to eliminate from the total bond yield the factors that are not relevant for the insurance contract, like the effect of credit losses and the market risk premium for credit.
- For equity investments, more significant adjustments are required to eliminate the factors that are not relevant to the insurance contract, which is due to the greater differences between the cash flow characteristics of equity investments and the cash flow characteristics of insurance contracts.
- The objective is to eliminate from the portfolio rate the part of the expected return for bearing investment risk, including market risk and any other variability in the amount and timing of the cash flows from the assets.
- May result in a discount rate closer to pricing due to inclusion of some components of the asset rate.

Theoretically, both approaches should lead to the same outcome, but this is unlikely in practice due to the existence of components in asset yields other than credit and illiquidity. .

(b) Critique each of the following statements about fair value accounting:

- A. Fair value accounting was the primary cause of the financial crisis of 2008.*
- B. Fair value accounting unfairly forces a company that is in financial turmoil to sell its assets at distressed prices that do not reflect anticipated cash flows.*
- C. Fair values for intricate financial derivatives (level 3) cannot be reliably produced even with complex computer models.*
- D. Fair value accounting increases volatility.*

4. Continued

- E. *Fair value accounting provides a true view of long-term value. Financial items valued under mark-to-market rules do not distort a company's balance sheet.*
- F. *Fair value accounting requires swift asset write-downs that help to re-establish stability after a financial crisis.*

Justify your response.

Commentary on Question:

Candidates were required to support or disagree with the various statements. Credit was given either way, provided that there were valid statements to support the arguments. In essence, the candidates were to explain how fair value accounting is useful or not useful to its users. Many candidates were able to explain what each statement meant, but few demonstrated a clear understanding of the underlying concepts in order to make a cohesive argument for or against each statement.

Argument for Statement A: Due to fair value accounting, a smaller decline in asset values triggered margin calls and other forced selling. This caused prices to fall even further which triggered more selling which brought on the crisis.

--OR--

Argument against Statement A: Simply telling the truth about the actual problems that were occurring cannot be the blame for causing the crisis. Furthermore, fair value accounting provided an early warning which ensured that the problems were brought to the forefront before the crisis got even bigger and make the situation worse.

Argument for Statement B: Temporary "fire-sale" prices often do not represent the true economic value of an asset as determined by the present value of a reasonable estimate of future cash flows. If companies can hold the assets beyond the period that their values are impaired, their true long-term values may prove to be true.

--OR--

Argument against Statement B: The transparency that comes from fair value accounting is a good thing. Good evidence of this was what happened to Japan during the 1990's which did not have the benefits of fair value accounting.

4. Continued

Argument for Statement C: Given that these financial derivatives are Level 3, which means they have significant unobservable inputs. Therefore, different individuals independently might come up with different values for those inputs. Combined with the complexity of the financial derivatives, the resulting independent valuations may be more significantly divergent. Thus, this and other sources of model risk mean that such input values may not be reliable.

--OR--

Argument against Statement C: There is no better alternative approach to deriving reliable values for financial derivatives due to their insufficient trading. Mark to a value that is known to be wrong, or mark-to-myth, would be unacceptable. At least, if performed with enough care to mitigate model risk, the fair value which can be derived would be more reliable than anything else that may be produced.

Argument for Statement D: Each little market movement can magnify the volatility. This comes about from forced selling at artificially low prices and companies representing their assets at temporarily-impaired values that are much lower than what they will ultimately be realized. As a result, their stock prices will be dragged down.

--OR--

Argument against Statement D: Due to the nature of financial markets, the volatility has always been there. The transparency from fair value accounting merely informs people what has always been the case.

Argument for Statement E: Some might want to believe that a drop in fair values may only be temporary and such values will rebound. But the possibility exists that such fair values may continue to fall further. Such fair values are a better measure of such uncertainty and are truly not a distortion.

--OR--

Argument against Statement E: If a company is planning to hold onto an asset whose value has temporarily declined, then the current fair value may not be a true long-term value.

Argument for Statement F: Because of the transparency of the fair value valuation process, as soon as it become apparent that there is a problem, then the company will be forced to take corrective action, like swiftly writing down assets, sooner rather than later before the problem becomes worse. Such actions will reestablish stability after a financial crisis.

--OR--

Argument against Statement F: Swift asset write-downs will actually decrease stability due to the fact that companies are forced to take corrective action sooner than they expected. As a result, this will worsen the financial crisis and allow the crisis to continue over a longer period of time.

5. Learning Objectives:

6. The candidate will be able to evaluate various forms of reinsurance, the financial impact of each form, and the circumstances that would make each type of reinsurance appropriate.

Learning Outcomes:

- (6b) Explain the consequences and evaluate the effect on both ceding and assuming companies with respect to:
- (i) Risk transfer
 - (ii) Cash flow
 - (iii) Financial statements
 - (iv) Reserve credit requirements

Sources:

Reinsurance: Chapter 4: Basic Methods of Reinsurance

Commentary on Question:

Commentary listed underneath question component.

Solution:

Construct the income statements and balance sheets for DEF Life and XYZ Re for this policy at the end of calendar year 2015. Show all work.

Commentary on Question:

There were a number of candidates who were able to use the correct method of calculation and distinguish themselves from the rest to obtain full credits on this question. The most common mistake made by candidates was the calculation of mod-co adjustment component.

Income Statement for DEF – Calendar Year 2015

Premiums

Gross = $(1,000,000 / 1,000) \times 8 = 1,000 \times 8 = 8,000$

Ceded = $8,000 \times 40\% = 3,200$

Net = Gross - Ceded = $8,000 - 3,200 = \mathbf{4,800}$

Investment Income

Reserves = $8,000 \times 0.05 = 400$

Surplus = $1,000 \times 0.05 = 50$

Total = $400 + 50 = \mathbf{450}$

Reinsurance Allowance = $3,200 \times 20\% = \mathbf{640}$

Mod-co Adjustment = $40\% \times (9,500 - 8,000 \times (1.05)) = 40\% \times (9,500 - 8,400) = \mathbf{440}$

Total Revenue = $4,800 + 450 + 640 + 440 = 6,330$

5. Continued

Claims = 0

Surrenders = 0

Reserve Increase = $9,500 - 8,000 = 1,500$

Commissions = $8,000 \times 10\% = 800$

Maintenance Expenses = 100

Total Benefits and Expenses = $0 + 0 + 1,500 + 800 + 100 = 2,400$

Gain from Operations = $6,330 - 2,400 = 3,930$

Balance Sheet for DEF – Calendar year 2015

Assets = Total Liabilities & Capital = 14,430

Reserves = 9,500

Surplus = $1,000 + 3,930 = 4,930$

Total Liabilities & Capital = 14,430

Income Statement for XYZ Re – Calendar Year 2015

Premiums

= DEF Ceded = **3,200**

Investment Income

Reserves = $0 \times 0.05 = 0$

Surplus = $2,000 \times 0.05 = 100$

Total = $0 + 100 = 100$

Total Revenue = $3,200 + 100 = 3,300$

Claims = 0

Surrenders = 0

Reserve Increase = 0

Commissions = 0

Maintenance Expenses = 50

Reinsurance Allowance = DEF Reinsurance Allowance = 640

Mod-co Adjustment = DEF Mod-co Adjustment = 440

Total Benefits & Expenses = $0 + 0 + 0 + 0 + 50 + 640 + 440 = 1,130$

Gain from Operations = $3,300 - 1,130 = 2,170$

Balance Sheet for XYZ Re – Calendar Year 2015

Assets = Total Liabilities & Capital = 4,170

Reserves = 0

Surplus = $2,000 + 2,170 = 4,170$

Total Liabilities & Capital = 4,170

6. Learning Objectives:

5. The candidate will understand the Risk Based Capital (RBC) regulatory framework and the principles underlying the determination of Regulatory RBC and Economic Capital.

Learning Outcomes:

- (5b) Describe the U.S. Risk Based Capital (RBC) regulatory framework and the principles underlying the determination of Regulatory RBC, and be able to compute RBC for a U.S. life insurance company including:
 - (i) Identification of significant risk components
 - (ii) Identification of specialized product RBC requirements
 - (iii) Interpreting results from a regulatory perspective
 - (iv) Implementation under U.S. principle-based approach
- (5c) Explain and describe the concept and roles of Economic Capital including:
 - (i) Identification of the significant risk components
 - (ii) Selecting calculation methods appropriate to stakeholder's perspectives
 - (iii) Describing how a company would implement an Economic Capital Program

Sources:

Valuation of Liabilities, Ch. 16 Risk-Based Capital (exclude section 16.6)

Economic Capital Overview; U.S. Insurance Regulation Solvency Framework and Current Topics

Commentary on Question:

*The first part of the question was aimed at testing the candidate's understanding of how to apply a stakeholder's perspective in selecting an appropriate calculation method. Thus for US statutory perspective, a projection of the balance sheet on a US stat basis was required. Each part of section (a) required an identification of methodology **and** a specification of the desired outcome to earn the available points. Most candidates left points on the proverbial table by doing one and not the other. A good many did not do either choosing instead to describe the strengths and weaknesses of each reporting basis. Candidates did not do well in part (a).*

Part (b) was well answered by a good proportion of the candidates. Several candidates prepared the calculations but did not state the consequences of the revised capital position thereby losing points.

Part (c) was looking for an awareness of current thinking in the US regarding regulatory capital and moves towards the evolution of a common framework with the rest of the world. Candidates performed poorly in this section.

6. Continued

Solution:

- (a) Identify the approach in developing the economic capital model and the resulting outcome if EL's only concern is:
- (i) U.S. statutory reporting
 - (ii) Solvency II
 - (iii) Embedded value (EV)
- (i) Project the balance sheet on a US statutory basis with zero initial surplus
- Careful consideration should be given to the time horizon
 - The focus should be on a changes to the initial starting position
 - The outcome should be defined as maintaining a positive surplus position with any negative surplus indicating a need for capital
- (ii) Project the market value of surplus (MVA – MVL)
- The outcome is any adverse change in Market Value of Surplus
 - It is easy to obtain the MVA but MVL is difficult as liabilities are not traded openly
 - A discounting of cash flows with allowance for risk could be used
- (iii) Under each scenario the future distributable earnings should be discounted at the hurdle rate and the resulting EV should compared with the target EV
- The outcome is defined as maintaining the expected EV over the specified time frame.
 - Differences would be taken as required capital
- (b) Describe the U.S. regulatory consequences of:
- (i) YNK's current capital position.
 - (ii) YNK's resulting capital position if they sell the current bond portfolio for statement value and reinvest the proceeds in 100 issuers of Class 3 bonds.
- Show all work.
- (i) Ratio level mandates certain actions on part of authorities; the company must prepare and submit an RBC plan to the commissioner of the state of domicile.

6. Continued

- (ii) Ratio = 175% = Total Adjusted Capital/Risk Based Capital

Total Adjusted Capital will not change

Current Risk Based Capital = $((\text{asset risk-other} + \text{interest risk})^2 + \text{asset risk-stock}^2 + \text{insurance risk}^2)^{.5}$

$$= ((100+50)^2 + 100^2 + 20^2)^{.5} = 181.38$$

$$\text{New factor for 100 issuers} = (50 \times 2.5 + 50 \times 1.3) / 100 = 1.9$$

$$\text{New asset risk other amount} = 100 * (0.046 * 1.9) / (0.1 * 2.5) = 34.96$$

$$\text{New RBC amount} = ((34.96+50)^2 + 100^2 + 20^2)^{.5} = 132.73$$

$$\text{New Ratio} = 175\% \times 181.38 / 132.73 = 239\%$$

The Improvement in the RBC ratio gets YNK out of Company Action (or RBC plan range); however, the company must still perform trend tests.

- (c) Describe current solvency framework initiatives in the U.S. that would impact EL's decision.

"walls" and "windows" approach - for example, EL could not raid YNK's surplus to rectify other issues ("walls")

Emphasis is on U.S. cooperation with international regulators; U.S. regulators are working with International Association of Insurance Supervisors; Current focus is to understand international practices; they are hoping to create a common framework ("Comframe")

7. Learning Objectives:

6. The candidate will be able to evaluate various forms of reinsurance, the financial impact of each form, and the circumstances that would make each type of reinsurance appropriate.

Learning Outcomes:

- (6a) Describe the considerations and evaluate the appropriate form of reinsurance from the ceding and assuming company perspectives.
- (6b) Explain the consequences and evaluate the effect on both ceding and assuming companies with respect to:
- (i) Risk transfer
 - (ii) Cash flow
 - (iii) Financial statements
 - (iv) Reserve credit requirements

Sources:

Life, Health and Annuity Reinsurance, Tiller, 3rd Edition, Ch. 4-6

Commentary on Question:

The question tested the candidates understanding of the reinsurance and the concept of Letter of Credit.

Solution:

- (a) Calculate the net amount payable in the second policy year by Vega to Supra for this policy under these reinsurance agreements. Show all work.

Commentary on Question:

Most candidates made errors in their calculations and, thus, did not receive full credit for this part. Common mistakes made by candidates include:

- *Not calculating the premium tax impact.*
- *Not calculating a correct Cash Value of the ceded amount in year 2.*

Where candidates did well:

- *Calculating the YRT rate.*
- *Calculating the reinsurance premium on the WP rider, including the 10% allowance.*
- *Calculating the premiums for both the base plan and the WP rider.*

Note: for the premium tax reimbursement, it is acceptable to use the first year premium tax for the YRT portion. If so, the candidate would have to calculate first year premium for the YRT rates. The first year premium tax for the coinsurance is the same.

7. Continued

Steps of calculation:

Risk sharing = $(500,000 \text{ FA} - 100,000 \text{ retention}) * 50\% = 200,000$

Cash Value of the ceded amount in year 10 = $47 / 1000 * 200,000 = 9,400$

NAR year 2 = $\text{FA} - \text{Cash Value year 2} = 200,000 - 9,400/9 = 198,955.56$

YRT rates = $0.45 * 0.59 \text{ (IA 45 duration 2)} / 1000 = 0.2655 / 1000$

Reinsurance premium on the base plan = $198,955.56 * 0.2655 / 1000 = 52.82$

Premium tax = $5\% * 52.82 = 2.64$

Net payment is $52.82 - 2.64 = 50.18$

Reinsurance premium on the WP rider = $75\% * 50 * (1-10\% \text{ allowance in the second year}) = 33.75$

Premium tax = $5\% * 33.75 = 1.69$

Net payment = $33.75 - 1.69 = 32.06$

Total reinsurance premium in year 2 = $50.18 + 32.06 = 82.24$

- (b) Supra is not licensed in Vega's state of domicile. Recommend a solution that would allow Vega to claim a reserve credit on its statutory statement.

Commentary on Question:

Most candidates did not receive full credit for this part. Candidates received partial credit for demonstrating knowledge of the benefits of Letter of Credits.

Candidates could receive partial credit if recommendation is trust/escrow account and justification was provided.

Best option: Letter of Credit

YRT is not a significant source of reserve relief

The amount of reserve credit can be quite small in relation to the base product for whole life

Since YRT reserves are small, YRT is not a significant source of reserve relief to ceding company

Modco cannot be used since it is a YRT arrangement.

Trust is an option but expensive for the limited reserve relief

Since the benefit is small, best to minimize the costs associated with the solution
Recommend using Letter of Credit:

- A letter of credit is obtained from a financial institution and provides that the ceding company may draw the funds on demand.
- Cost efficient (can be obtained for a nominal fee)
- Little administration needed

8. Learning Objectives:

2. The candidate will be able to understand and apply valuation principles of individual life insurance and annuity products issued by U.S. life insurance companies.

Learning Outcomes:

- (2c) Calculate liabilities for life and annuity products and their associated riders under the following standards:
 - (iv) U.S. Statutory
 - (v) U.S. GAAP
 - (vi) U.S. Tax

Sources:

US GAAP For Life Insurers, Second Edition, Ch. 6

Commentary on Question:

This question tested the candidate's knowledge of SFAS 97 concepts relating to the definition of a UL contract, the GAAP income statement presentation for UL contracts, the accrual of a bonus liability for UL contracts and the calculation of a SOP 03-1 reserve for UL contracts.

Solution:

- (a) Describe the features that determine whether a contract is a universal life contract according to SFAS 97.

UL contracts:

- Are long duration
- Have significant mortality risk
- Include one or more of the following features:
 - Premiums are flexible
 - Assessments against policyholders are not fixed and guaranteed
 - Amounts that accrue to the benefit of policyholders are not fixed and guaranteed

- (b) Create the 2014 GAAP income statement. Show all work.

Commentary on Question:

Most candidates had the right idea here and did not report premium as revenue. A fair number had items in the wrong places and reported surrender charges as a negative benefit or amortization of DAC as revenue (or other misclassifications such as having deferred expenses hit income). Most were awarded at least half of the available points for this part based on their knowledge of the four sources of earnings for a UL contract (mortality margin, interest margin, expense margin and surrender margin).

8. Continued

GAAP Income Statement

Revenue	
Expense charges	45
COI charges	100
Surrender charges = AV released due to surrenders – Surrender benefits	5
Net investment income	80
Total revenue	230
Benefits and other deductions	
Death benefits = Total death benefit claims – AV released due to death	40
Interest credited to policyholder account balances	75
Non-deferrable expenses	40
Deferred policy acquisition costs amortized	25
Total benefits and other deductions	180
Pre-tax earnings	50
Income taxes	15
After-tax earnings	35

- (c)
- (i) Calculate the persistency bonus liability at the end of year 2 using the straight line method. Show all work.
 - (ii) Calculate the excess death benefit liability at the end of year 2 in accordance with SOP 03-1. Show all work.

Commentary on Question:

A high percentage of candidates ignored the directive to use the straight line method in part (i). See the note below with regards to a defect in part (ii).

- (i) The account value at the end of year 5 reflects the persistency bonus. The account value before the bonus is $110,510,400 / 1.04 = 106,260,000$ and the bonus is therefore $110,510,400 - 106,260,000 = 4,250,400$. On a per policy basis, the bonus works out to $4,250,400 / 840 = 5,060$.

Accruing for the liability on a straight line basis gives a liability at the end of year 2 of $5,060 \times 2/5 \times 950 = 1,922,800$

8. Continued

- (ii) A defect in this part of the question led to the acceptance by the graders of a few possible answers. The defect has to do with the present value of excess death benefits at beginning of year 1. The present value given in the question is 838,000 but the real present value is approximately 1,534,000. If the excess benefit ratio is calculated using the 838,000 present value, then the answer will vary depending upon whether one uses a retrospective formula or a prospective formula to calculate the reserve.

This solution uses the 838,000 present value given in the question and shows the different answers obtained under the retrospective formula and the prospective formula (candidates were awarded credit for either formula and were not expected to recognize that the two formulas did not match). The few candidates who calculated and used the real present value received just as much credit as those who used 838,000.

$$\text{Excess benefit ratio} = 838,000 / 3,794,000 = 0.2209$$

Retrospective formula

CA = cumulative assessments as of the end of year 2

$$CA = 1,000,000 \times 1.05^{1.5} + 1,000,000 \times 1.05^{0.5} = 2,100,625$$

CEB = cumulative excess benefits as of the end of year 2

$$CEB = 10,000 \times 1.05^{1.5} + 500,000 \times 1.05^{0.5} = 523,107$$

$$\text{SOP 03-1 reserve} = \text{MAX} [0, CA \times 0.2209 - \text{CEB}] = \text{MAX} [0, -59,079] = 0$$

Alternative approach using prospective formula

PVA = present value of future assessments as of the end of year 2

$$PVA = 1,000,000 \times 1.05^{-0.5} + 1,000,000 \times 1.05^{-1.5} + 200,000 \times 1.05^{-2.5} = 2,082,363$$

PVEB = present value of future excess benefits as of the end of year 2

$$PVEB = 100,000 \times 1.05^{-0.5} + 200,000 \times 1.05^{-1.5} + 1,000,000 \times 1.05^{-2.5} = 1,168,646$$

SOP 03-1 reserve =

$$\text{MAX} [0, PVEB - 0.2209 \times PVA] = \text{MAX} [0, 708,652] = 708,652$$

9. Learning Objectives:

2. The candidate will be able to understand and apply valuation principles of individual life insurance and annuity products issued by U.S. life insurance companies.

Learning Outcomes:

- (2d) Calculate DAC assets for life and annuity products and their associated riders under the standard: U.S. GAAP.

Sources:

US GAAP For Life Insurers, Second Edition, Ch. 8

Commentary on Question:

Commentary listed underneath question component.

Solution:

- (a) Summarize the guidance as provided by SFAS 133 and the Derivatives Implementation Group when determining GAAP reserves for equity-indexed annuities.

Commentary on Question:

The majority of candidates recognized the need to value the host contract separately from the embedded derivative. Most mentioned Fair Value for the embedded derivative valuation, but fewer described how to value the host contract. Some confused SFAS 133 with Actuarial Guideline 35 (no points awarded for confusing GAAP with STAT). Few candidates provided specific guidance from the Derivatives Implementation Group in their response.

SFAS 133 requires separate valuation of host contract and the embedded derivative:

- Value embedded derivative similar to a derivative instrument
- Value host similar to an instrument without an embedded derivative

Derivatives Implementation Group

- Initial reserve = premium paid - initial value of embedded derivative
- Separate calculation of SFAS 97 account balance is no longer required
- Ignore any minimum liability that exceeds the sum of the values of embedded derivative and host
- Value of embedded derivative includes value of current year's option and all forward-starting options

- (b) Calculate the DAC asset at the end of policy year 1. Show all work.

9. Continued

Commentary on Question:

Host Contract:

Most candidates recognized the need to calculate the annual guaranteed growth rate for the host contract, but many made one or more mistakes in their calculation. Common mistakes included the following:

- *Not incorporating the policy load correctly*
- *Calculating the rate over one year instead of two years*
- *Simply setting the rate equal to the 3% guaranteed interest rate*

EGP and DAC:

- *Most candidates made mistakes in their EGP calculations. Common mistakes included the following:*
 - *Disregarding interest credited on the host contract as an expense*
 - *Disregarding the change in value of the embedded derivative as an expense or, alternatively, recognizing it as an expense but not signing it properly (i.e., treating a reduction in value as an increase in expense rather than a reduction in expense)*
 - *Disregarding expense altogether and simply setting EGPs equal to the given income values*
- *Regardless of the mistakes in their EGP calculations, all candidates used correct formulas to calculate the k-factor and DAC, though not everyone recognized the need to cap the k-factor at 100%*

$$\text{Host Contract Guaranteed Annual Growth Rate} = \frac{(((1-.08) \times 200,000 \times (1.03^2)) / (200,000 - 24,474))^{(1/2)} - 1}{1} = 0.05457$$

$$\text{Initial Host Contract Value} = 200,000 - 24,474 = 175,526$$

$$\text{End of Year 1 Host Contract Value} = 175,526 \times (1.05457) = 185,104$$

$$\text{End of Year 2 Host Contract Value} = 185,104 \times (1.05457) = 195,205$$

Expense =

Interest Credited on Host Contract +
Increase in Fair Value of Embedded Derivative

$$\text{Year 1 Expense} = (175,526 \times 0.05457) + (14,960 - 24,474) = 64$$

$$\text{Year 2 Expense} = (185,104 \times 0.05457) + (12,264 - 14,960) = 7,405$$

EGP = Income - Expense

$$\text{Year 1 EGP} = 2,773 - 64 = 2,709$$

$$\text{Year 2 EGP} = 10,261 - 7,405 = 2,856$$

9. Continued

$$\text{PV Future EGP at issue} = (2,709 / 1.05) + (2,856 / (1.05^2)) = 5,170$$

$$\text{PV Future Def Exp at issue} = 200,000 \times 0.05 = 10,000$$

$$\text{k-factor} = \max [1, (10,000 / 5,170)] = 1$$

$$\text{PV Future EGP at End of Year 1} = 2,856 / 1.05 = 2,720$$

End of Year 1 DAC Asset =

$$\text{k-factor} \times \text{PV Future EGP at End of Year 1} = 1 \times 2,720 = 2,720$$

10. Learning Objectives:

4. The candidate will be able to explain and apply the methods, approaches and tools of financial management and value creation in a life insurance company context.

Learning Outcomes:

- (4d) Apply methods of valuation to business and asset acquisitions and sales. This includes explaining and applying the methods and principles of embedded value.

Sources:

LFV-106-07: Chapter 4 of Insurance Industry Mergers & Acquisitions (Sections 4.1-4.6)

Embedded Value: Practice and Theory

Commentary on Question:

Commentary listed underneath question component.

Solution:

- (a) Calculate the actuarial appraisal value at December 31, 2015 using Green's assumptions, ignoring all cashflows after 2017. Show all work.

Commentary on Question:

Most candidates were able to calculate the pre-tax statutory earnings and demonstrate their understanding of actuarial appraisal value. Few candidates were able to determine the income tax on pre-tax earnings. In particular, candidates did not include the change in tax reserves nor the change in DAC assets. Few candidates used the target capital ratio to determine the required capital for each year.

Actuarial Appraisal Value = Adjusted Book Value + NPV (Distributable Earnings), where:

NPV (Distributable Earnings) = NPV (Premium and Investment Income - Benefits - Expenses - Unallocated Expenses - Increase in Statutory Reserves - Taxes - Increase in Capital + Investment Income on Capital)

Required Capital (t)

= Minimum Required Capital (t-1) × Target Capital Ratio

- Year 2015 = $40 \times 300\% = 120$
- Year 2016 = $45 \times 300\% = 135$
- Year 2017 = $49 \times 300\% = 147$

Interest on Required Capital (t)

= Required Capital (t-1) × Interest on Capital

- Year 2016 = $120 \times 4\% = 4.8$
- Year 2017 = 5.4

10. Continued

Increase in Required Capital (t)

= Required Capital (t) - Required Capital (t-1)

- Year 2016 = 135-120 = 15
- Year 2017 = 147-135 = 12

Pre-Tax Statutory Earnings

= Premium and Investment Income – Benefits – Expenses – Unallocated Expense
- Change in Statutory Reserve + Interest on Required Capital

- Year 2016 = 210 - 17 - 10 - 7.2 - 50 + 4.8 = 130.6
- Year 2017 = 235 - 18 - 12 - 2.3 - 20 + 5.4 = 188.1

After-Tax Earnings = Pre-Tax Earnings - Income Tax

Income Tax = (Pre-Tax Statutory Earnings + Increase in Statutory Reserve -
Increase in Tax Reserve + Increase in Proxy DAC Tax Asset - Existing Proxy
DAC Tax Asset Runoff) × Tax rate

- Year 2016: Income Tax = (130.6 + 50 - 40 + 3 - 10) × 20% = 133.6 × 20% = 26.7;
After-Tax Earnings = 130.6 - 26.7 = 103.9
- Year 2017: Income Tax = (188.1 + 20 - 40 + 3 - 10) × 20% = 161.1 × 20%
= 37.6 ; After Tax Earnings = 188.1 - 37.6 = 155.9

Distributable Earnings

= After-Tax Earnings – Increase in Required Capital

- Year 2016 = 103.9 - 15 = 88.9
- Year 2017 = 155.9 - 12 = 143.9

Discount using CAPM:

$$r = r(f) + B \times [r(m) - r(f)] = 2\% + 1.25 \times (10\% - 2\%) = 12\%$$

Actuarial Appraisal Value

= Adjusted Book Value + NPV (Distributable Earnings)

$$= 65 + 88.9 \div 1.12 + 143.9 \div 1.12^2 = 259.06$$

Alternatively, “Cost of Capital” could be calculated using the following formula:

Cost of Capital (t) = Required Capital (t-1) × (RDR - i), where RDR = 12% and i = 4%

- (b) Describe the possible impact on the actuarial appraisal value based on each of Blue’s observations. Justify your answer.

10. Continued

Commentary on Question:

Most candidates were able to describe the possible impact on the actuarial appraisal value if Green is overly optimistic on the market return. For the second part, some candidates did not fully describe the impact of excessive capital on actuarial appraisal value.

Green is overly optimistic on the market return:

- Blue will lower the expected market rate of return, which reduces the discount rate
- The NPV of distributable earnings will then be higher, so the appraisal value would be higher

Green is holding excessive capital for this block:

- Blue will lower the capital target ratio and the required capital will be reduced
- The interest on required capital will be reduced, which lowers earnings
- The capital will be released earlier during the life time of the block and the increase in capital would be lower
- The distributable earning would be higher if after tax earnings are not reduced to offset the reduction in increased capital; or could be lower otherwise.

Alternatively, candidates can provide justifications using cost of capital:

- Blue will lower the capital target ratio, reducing the required capital
- The cost of capital will then be reduced, leading to higher appraisal value

- (c) Identify differences between actuarial appraisal value and embedded value calculations. No calculations are required.

Commentary on Question:

Candidates did relatively well on this part. Most candidates were able to identify the differences between actuarial appraisal value and embedded value calculations.

- Actuarial Appraisal Value typically assign a value to the contribution of future new business whereas Embedded Value does not
- Actuarial Appraisal Value is typically calculated using higher discount rates than Embedded Value
- Expense assumptions used in calculating Embedded Value are typically more company specific than those used in Actuarial Appraisal Value which tend to be more reflective of the prevailing market sentiment

11. Learning Objectives:

3. The candidate will be able to understand and analyze the implications of emerging financial and valuation standards.
6. The candidate will be able to evaluate various forms of reinsurance, the financial impact of each form, and the circumstances that would make each type of reinsurance appropriate.

Learning Outcomes:

- (3c) The candidate will be able to describe and assess the impact on reserves, capital, and/or income of emerging developments in U.S. principle-based reserve regulation.
- (6b) Explain the consequences and evaluate the effect on both ceding and assuming companies with respect to:
 - (i) Risk transfer
 - (ii) Cash flow
 - (iii) Financial statements
 - (iv) Reserve credit requirements

Sources:

LFV-808-15: Fundamentals of the Principle-Based Approach to Statutory Reserves and Risk Based Capital for Life Insurance and Annuities

Life, Health and Annuity Reinsurance, Tiller, 3rd Edition Ch 10

Commentary on Question:

This question tested a candidate's knowledge of principles-based reserves under VM-20. Candidates were also asked to compare and contrast several aspects of the current regulatory environment for calculating U.S reserves with the regulatory regime under VM-20.

Solution:

- (a) Your first task is to determine what model will be used for calculating reserves according to VM-20.
 - (i) A colleague has stated that under VM-20, the net premium reserve (NPR) serves as the reserve floor and therefore LPN only needs to calculate this reserve.

Assess the appropriateness of this approach.
 - (ii) Explain the similarities and differences between the current CRVM approach and the VM-20 net premium approach.

11. Continued

- (iii) You currently have a cash flow model that is used to project business for 10 years. The model contains liabilities for all universal life, term, and whole life business, and one set of assets that are used to support all three lines of business.

Propose ways in which this model can be modified to calculate PBR.

Commentary on Question:

For part (i) most candidates correctly stated that the colleague's approach was inappropriate and mentioned that the deterministic and stochastic reserves also need to be calculated. To receive full marks candidates also needed to mention that if LPN satisfied the exclusion tests then calculating only the NPR was acceptable. Candidates who did not explicitly disagree with the colleague's statement received partial marks if it was clear that they understood that other reserves needed to be calculated.

Candidates did reasonably well on part (ii). There were some candidates answered with far too simple comparisons such as "Both CRVM reserves and the NPR are conservative" or "Both use a net level premium approach" and received little to no credit.

For part (iii) many candidates suggested that the model should be enhanced to be able to run many stochastic scenarios or to allow multiple sets of assumptions. These responses earned no credit.

- (i) The colleague's approach is inappropriate. The minimum reserve under VM-20 is defined as the maximum of the NPR, the stochastic reserve, and the deterministic reserve. Unless LPN satisfies the exclusion tests, all three reserves need to be calculated.
- (ii) Similarities:
- Both use the same prescribed mortality
 - Both use the same prescribed interest rates
 - For both methods the gross premiums are the guaranteed premiums stated in the contract

Differences:

- The expense allowance definition between the two is different.
- Term policies without nonforfeiture values are allowed to use lapse rates under VM-20
- Certain UL policies with nonforfeiture values are allowed to use lapse rates under VM-20

11. Continued

- (iii) A ten-year projection period is insufficient. The model's projection period should be extended such that no materially higher reserve would result from extending the projection period further. Each product line should be modeled separately and the assets supporting each model segment's liabilities should be modeled separately.
- b) Your next task is to set assumptions to be used in principle-based reserving.
 - (i) List four assumptions that are prescribed within VM-20.
 - (ii) LPN began selling universal life with secondary guarantees (ULSG) one year ago. A colleague has said that since PBR should be based on a company's own experience, this ULSG block should use assumptions based on its past year of experience with no added margins.

Assess the appropriateness of this approach.

Commentary on Question:

Most candidates did well on part (i). In their responses to part (ii) candidates should describe what LPN should do, not what they could do. Many candidates incorrectly stated that LPN should not add margins to their assumptions if they use industry experience.

- (i) Interest rate movements for the deterministic reserve
Equity performance for the deterministic reserve
Spreads over treasuries on reinvestment assets
Definition of the industry mortality table and the method to grade into this table
- (ii) The colleague's approach is inappropriate. Under VM-20 a company should only use its own experience if it is relevant and credible. After one year it is unlikely that LPN has credible experience. Therefore, LPN should blend its experience with industry experience.

Risk margins should be added to any assumptions that are not stochastically modeled. The margins should increase the reserve and the more uncertainty, the higher the margin. Since LPN has very limited experience it should use large margins.
- (c) With the adoption of a principle-based approach to reserves, companies will be required to submit experience data to a statistical agent. Explain why this data collection will be valuable.

11. Continued

Commentary on Question:

Most candidates did well on this section.

- Companies with little or no experience can use this industry data to develop their assumptions.
 - The data can be used to update standard valuation tables.
 - Regulators and auditors can use the data to assess the reasonableness of a company's reserves.
- (d) LPN reinsures a portion of its life business. You are asked to research how PBR will impact reinsurance.
- (i) Explain why LPN and its reinsurer may currently have mirror image statutory reserves.
 - (ii) Explain why LPN and its reinsurer may currently have different statutory reserves for the same policies.
 - (iii) Explain why mirror image reserves are not required under principle-based reserving according to VM-20.

Commentary on Question:

Candidates did not do as well on parts (i) and (ii) as they did on (iii). Almost all candidates correctly explained part (iii).

For part (i) most candidates stated that under current reserving requirements the assumptions are prescribed so two companies should arrive at the same result. This answer received some credit. However, to receive full credit a candidate needed further detail such as explaining the concept of a "vanishing" reserve.

- (i) The ceding company cannot take a reserve credit that is more than the reserve that the reinsurer is holding. Holding a mirror image reserve ensures that no liabilities have "vanished".
- (ii) A lag in reporting may mean that the reinsurer does not have complete data by the time it has to close its books.
Reinsurers may group policies from different policy forms that are similar but not identical.
If the ceding company is ceding a product like variable annuities with guarantees, the reinsurance could be on mortality only but the ceding company has to consider the entire contract.

11. Continued

- (iii) Under VM-20 companies should use assumptions and margins appropriate to their company. It is unlikely that two companies will have the same assumptions and so they will calculate different reserves for the same policies.