ILA LFVU Model Solutions
Spring 2017

1.   **Learning Objectives:**
3.   The candidate will understand and apply emerging financial and valuation standards, principles and methodologies.

Learning Outcomes:
(3a)   Describe, evaluate and calculate the impact on reserves, income, capital, and processes of emerging developments in Statutory and U.S. GAAP reporting, International Financial Reporting Standards, and Solvency Modernization.

Sources:
IFRS 4 Phase II: Illustrative Example of Life Contract Without Participation Features, EY June 2015

LFV-132-14: Practical Guide to IFRS, PwC, exclude appendices 1, 2, and 4 (July 2013)

Analysis of Methods for Determining Margins for Uncertainty Under a Principle-Based Framework for Life Insurance and Annuity Products, Ch. 4

Investor Perspectives - Mind the Gap? December 2015

Commentary on Question:
This question tested the candidates' knowledge of international financial reporting standards.

Solution:
(a)   Management is concerned about potential financial statement volatility between the effective dates of IFRS 9 (effective January 1, 2018) and IFRS 4 (effective January 1, 2020 at the earliest). The IASB has developed proposals for dealing with this potential volatility.

   Recommend a course of action for each subsidiary based upon these proposals. Justify your response.

   Commentary on Question:
   This question tested candidates' knowledge of two approaches proposed by the IASB. To receive full credit, a candidate had to describe the two approaches and recommend a course of action. Most candidates did not understand that neither of the approaches can be applied to Subsidiary B (the bank).

1. **Continued**

Since Subsidiary B does not conduct any insurance activities, it has to apply IFRS 9, effective January 1, 2018.

Subsidiary L predominantly conducts insurance activities. It can therefore apply either the deferral approach or the overlay approach, proposed by the IASB to deal with potential volatility. The choice of approach is a matter of company preference.

Under the deferral approach, the entity would defer the implementation of IFRS 9 and continue to apply IAS 39. This approach also requires disclosure of information about the fair values of financial assets that would be required to be measured at fair value under IFRS 9.

Under the overlay approach, the entity would apply IFRS 9, and then for those assets backing insurance contracts that are now measured at fair value under IFRS 9, the entity would adjust the profit and loss statement to revert back to an IAS 39 effect. The amount of the adjustment would be recognized in other comprehensive income. The entity may make the adjustment in a single line or on a line-by-line basis.

(b) For Subsidiary L's variable annuity portfolio, a consultant suggests using the replicating portfolio technique to determine the fulfillment of cash flows under IFRS 4.

    (i)   Describe the replicating portfolio technique.

    (ii)   Assess the appropriateness of using the replicating portfolio technique for a variable annuity portfolio.

Commentary on Question:
This question tested candidates' knowledge of the replicating portfolio technique to determine the fulfillment of cash flows for a variable annuity portfolio under IFRS 4. A common error was to evaluate the technique as a hedging strategy rather than as an approach for determining the fulfillment of cash flows.

The replicating portfolio technique involves constructing a portfolio of assets whose cash flows exactly match the contractual cash flows of an insurance contract in amount, timing and uncertainty. The fair value of such portfolio can be used to measure the fulfilment cash flows of the insurance contract.

1. **Continued**

The replicating portfolio technique is not appropriate for a variable annuity portfolio, since it contains guarantees that make the cash flows difficult to match. These guarantees include guaranteed withdrawal and guaranteed accumulation benefits in variable deferred annuities, and guaranteed payment floors in variable immediate annuities.

(c)   Calculate the following:

   (i)   Best estimate liability at inception

   (ii)   Risk adjustment (or margin for uncertainties) at inception

   (iii)   Contractual service margin at inception

   (iv)   Insurance contract revenue for year 1

   (v)   Underwriting result for year 1

   Show all work.

   Commentary on Question:
   This question tested candidates' knowledge of the IFRS 4 building block measurement model for insurance contracts. Candidates generally did well on parts (i), (ii), (iii). Candidates generally did poorly on part (iv) and (v). Most candidates incorrectly calculated insurance contract revenue as premium less claims and underwriting result as actual claims less expected claims. In general, candidates failed to recognize that the income statement presentation under the building block approach is very different from the current income statement presentation.

   (i)   Best estimate liability (BEL) is defined as the present value of cash outflows minus the present value of cash inflows.
            PV of claims = 70 + 75 + 80 = 225 (since 0% discount rate).
            PV of premium = 100 + 100 + 100 = 300.
            BEL = PV of claims – PV of premium = -75.

   (ii)   Risk adjustment (RA) under the cost of capital methodology is the present value of cost of capital (6%) applied to future required capital.
            RA = 6% * (320 + 280 + 220) = 49.2 (since 0% discount rate).

1. Continued

    (iii)   Contractual service margin (CSM) is the unearned profit at inception and is amortized over the coverage period.
BEL + RA + CSM = 0.
-75 + 49.2 + CSM = 0.
CSM = 25.8.

    (iv)   Insurance contract revenue is defined as the sum of release of CSM, release of RA related to past coverage, expected claims and expenses, and the part of the premium allocated to the recovery of acquisition costs.

Release of CSM for year 1 is the CSM amount amortized in year 1. Since CSM is amortized linearly over 3 years at 0% risk free rate, the amount amortized in year $1 = 25.8/3 = 8.6$.

Release of RA for year 1 is the release of cost of capital of year 1 required capital.
Release of RA for year $1 = 6\% \times 320 = 19.2$.
Alternatively, RA at end of year $1 = 6\% \times (280 + 220) = 30$.
Release of RA for year 1 = RA at inception – RA at end of year $1 = 49.2 – 30 = 19.2$.

Expected claims for year $1 = 70$.

Since expense = 0, expected expense and premium allocated to the recovery of acquisition cost = 0.

Insurance contract revenue for year 1 = 8.6 release in CSM + 19.2 release in RA + 70 expected claims = 97.8.

    (v)   Underwriting result = insurance contract revenue – actual claims incurred.
Underwriting result for year 1 = 97.8 – 80 = 17.8

2. **Learning Objectives:**
4. The candidate will understand basic financial management, capital management and value creation principles and methods in a life insurance company context.

Learning Outcomes:
(4a) Assess financial performance, including analyzing and interpreting the financial performance of a product line or company.

(4b) Apply methods and principles of embedded value.

Sources:
LFV-137-16: EVARAROC vs. MCEV Earnings – A Unification Approach, Kraus, 2011

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

Embedded Value: Practice and Theory, SOA, Actuarial Practice Forum, March 2009

Commentary on Question:
This question tested the candidates' knowledge insurance management valuation techniques. Most candidates demonstrated a level of comprehension. However, only a few candidates were able to apply their knowledge when confronted with specific contexts and details.

Solution:
(a) Compare and contrast the following measures used to determine the value of a block of life insurance:

- Embedded Value (EV);
- Market Consistent Embedded Value (MCEV); and
- Actuarial Appraisal Value (AAV)

Commentary on Question:
Candidates generally did well on this part of the question. Most candidates were able to elaborate on certain key differences, such as inclusion of new business, and discount rates. Many candidates failed to articulate similarities between the approaches clearly. Credit was awarded for recognizing the definitions for each measure. For each difference or similarity, it was critical for candidates to make comparisons, and not just state isolated facts

2. Continued

The three measures are defined as follows:
- EV = Value in Force + Free Surplus Required + Required Capital
- AAV = Value in Force + Free Surplus + Required Capital + Value of Future Business
- MCEV = PV of Future Profits – Frictional Costs of Required Capital – Costs of Residual Non Hedgeable Risks – Time Value of Options and Guarantees + Free Surplus + Required Capital

Several main similarities can be identified:
- Each of the measures broadly applies a discount cash flow, reflecting some form of cost of capital
- Each of the measures can be used consistently at a group level
- Each of the measures is ultimately intended for user purposes, and not strictly for regulatory requirements

Several main categories of differences are identified:

New Business
- EV and MCEV do not reflect the value of new business
- AAV does reflect new business

Discount Rate
- MCEV uses a risk free discount rate
- AAV and EV use risk adjusted discount rates
- AAV discount rates are typically higher
- MCEV uses an entire discount curve, rather than a single rate

Purpose
- EV is used for stock price evaluation, executive compensation, profit analysis by LOB, and capital allocation
- MCEV is used to analyze creation of value or change in MCEV over time, managerial performance, and consistent fair value analysis across companies by banks and financial institutions
- AAV is used to determine the acquisition value of a block of business

Capital
- EV is normally a regulatory capital or rating agency capital
- MCEV normally uses economic capital, Solvency II or other market based capital approach
- AAV normally uses regulatory or required capital

2. **Continued**

       Expenses
- EV and MCEV expense assumptions are company-specific
- AAV expenses reflect the prevailing market levels
- Synergies and economies of scale can be applied in AAV

(b)   Critique the following statements made by the CEO of ABC about valuing DEF's business:

    A. *The MCEV earnings for Fixed Deferred Annuities will look horrible, since a risk-free rate must be used for discounting and projecting investment income.*

    B. *Since our incentive compensation is based on operating MCEV earnings, we're taking a big gamble that interest rates will increase in the short term.*

    C. *MCEV doesn't do a great job incorporating cost of capital for the Term Insurance block.*

    D. *The AAV may overstate the value of the Variable Annuity block.*

Commentary on Question:
Candidates generally did not demonstrate the knowledge of MCEV required to critique statement A. Candidates generally critiqued the other statements well. Candidates received partial credit for identifying whether the statement was true or false. To receive full credit candidates were required explain why.

    A. This statement is false. Although the discount rate and projected investment income rate is at the risk free level (the reference rate) for VIF discounting purposes, the excess investment income (the spread) will be recognized in MCEV earnings when achieved (through the expected contribution of existing business line)

    B. This statement is false. Economic variance are included in Total MCEV earnings, but not Operating MCEV

    C. This statement is false. MCEV does include some form of cost of capital, through the cost of residual non-hedgeable risks, and the frictional costs of capital

    D. This statement is true. The AAV approach does not provide for an explicit approach to valuing options and guarantees, which are common and significant in VA blocks. Additionally, the fact that Value of New Business is included could inflate value since there are subjective assumptions required.

2. Continued

(c)   Calculate the Actuarial Appraisal Value on December 31, 2017. Show all work.

Commentary on Question:
Candidates generally struggled to capture all details of the calculation to receive full credit. Partial credit was awarded for addressing key concepts, such as the calculation of cost of capital, the discounting of several years of VNB, and the inclusion of Free Surplus and Required Capital

Main Formula for Valuation
AAV = NPV(Distributable Earnings) + Free Surplus = NPV(Profits on Business) – NPV(Required Capital x Cost of Capital) + NPV(Investment Income on Required Capital) + Initial Required Capital + Free Surplus

In Force Value Calculation
NPV(Profits on Business) – NPV(Cost of Capital x Required) + NPV(Inv Inc on Cap) + Initial Req Cap
= PV Prem + PV Inv Inc on Res – PV Ben – PVReqCap x CostofC + PV Inv Inc Cap + Initial Req Cap
=160 + 50 – 140 – 200 x 10% + 10 + 30 = 90

Value of One Year of New Business
Same formulas as for in-force, but for one hypothetical year of new business (excluding initial required capital since it is not in the entity)
20 + 10 – 15 – 40 x 10% + 4 + = 15

Discount of Three Years of New Business
VNB + VNB/(1 + Cost of Capital) + VNB/ (1 + Cost of Capital)^2
=15 + 15/1.1 + 15/1.1^2
=41

Final Sum of AAV Value
In Force Value + Value New Business + Free Surplus
=90 + 41 + 25
=156

3. **Learning Objectives:**

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

Learning Outcomes:

(2b) Evaluate, calculate, and interpret liabilities and DAC assets.

Sources:

US GAAP for Life Insurers, Herget et. Al., Ch. 7

Valuation of Life Insurance Liabilities, Lombardi, 4th Edition, Ch. 10

Commentary on Question:

This question tested the candidates' knowledge of basic statutory and GAAP principles.

Solution:

(a)

(i) Calculate the Deferred Acquisition Cost (DAC) at the end of the first policy year. Show your work.

(ii) Calculate the Unearned Revenue Liability (URL) at the end of the first policy year. Show your work.

Commentary on Question:

Candidates who did well were able to distinguish which elements belong in the account value calculation and which belong in the EGP calculation.

In this case, the only amount deducted from the account value is the front-end load; in particular, commissions and expenses are not deducted from the account value.

For the EGP calculation, the amounts to be deferred, both expenses and revenue, are ignored.

Alternative formulations are possible for both the DAC and the URL calculations, and are included in the solution.

It should be noted that the discount rate used is the credited rate.

3. **Continued**

For this SPDA, EGP contains investment spread, surrender charges and maintenance expenses.

After policy load, BOY AV (AV at time 0) = premium x (1 - load%)
    = 100,000 x (1 - 2%) = 98,000
Investment spread = earned interest on AV - credited interest on AV
    = earned rate x BOY AV - credited rate x BOY AV
    = 6% x 98,000 - 3% x 98,000 = 2,940

Surrender charge = EOY AV x surrender rate x surrender charge rate
    = BOY AV x (1 + credited rate) x surrender rate x surrender charge rate
    = 98,000 x (1 + 3%) x 6% x 5% = 303

Maintenance expense = annual expense = 50

EGP for year 1 = investment spread + surrender charges - maintenance expenses
    = 2,940 + 303 - 50 = 3,193

PV of EGP will be used as the basis for calculating amortization factors for both DAC and URL. It is calculated using discount rate set equal to the credited rate:

PV EGP = $(1+3\%)^{-1}$ x 3,193 + $(1+3\%)^{-2}$ x 3,000 + $(1+3\%)^{-3}$ x 2,800
    = 8,490

i) DAC amortization factor, k_d = PV Deferrals / PV EGP
    = (commission + initial expense) / PV EGP
    = (100,000 x 4% + 250) / 8,490 = 50.1%

DAC @ end of first year = (Beginning balance + Year 1 Deferrals)*(1+i)
    - k_d * EGP_1
    Beginning balance = 0, Year 1 Deferrals = (100,000 x 4% + 250) = 4,250

DAC @ end of first year = (0 + 4,250)* (1.03) – 50.1% * 3,193
    = 2,778

Alternative formula:
DAC @ end of first year = k_d * PV(future EGPs at duration 1)
    - PV(future expense deferrals)
    = 50.1% * (3,000/1.03 + 2,800/(1.03^2)) - 0 = 2,778

ii) URL amortization factor, k_u = PV Front End Load / PV EGP
    = (100,000 x 2%) / 8,490 = 23.6%

3. **Continued**

URL @ end of first year = (Beginning balance + Year 1 Deferrals) * (1+i)
$$- k_u * EGP_1$$
Beginning balance = 0, Deferrals = (100,000 x 2%) = 2,000

URL @ end of first year = (0 + 2,000) * 1.03 – 23.6% * 3,193
$$= 1,306$$

Alternative formula:
URL @ end of first year = k_u * PV(future EGPs at duration 1)
$$- PV(future\ revenue\ deferrals)$$
$$= 23.6\% * (3,000/1.03 + 2,800/(1.03^2)) - 0$$
$$= 1,306. \qquad .$$

(b) Explain the differences between loss recognition testing and recoverability analysis for SPDAs.

Commentary on Question:
This part of the question tested the candidates' knowledge of GAAP recoverability and loss recognition. Both deal with the question of whether there are sufficient EGPs to amortize, or "pay off", the deferred expenses.

It should be noted that neither recoverability nor loss recognition is concerned with the deferral of revenue.
Recoverability analysis is only performed on the policies issued in a given year, to determine whether the present value of EGPs is at least equal to the present value of all future deferrable expenses. It is permissible to combine products within a product line, but not across issue years.

In contrast, loss recognition testing is performed occasionally throughout the life of a block of business. Its purpose is similar: to determine whether future EGPs are sufficient to amortize the existing DAC and expenses to be deferred in the future. In this case, a block must consist of a single line of business, but may contain multiple issue years.

(c)

(i) Calculate the reserve at issue using the Commissioner's Annuity Reserve Valuation Method (CARVM). Assume full surrenders are the only benefit stream.

(ii) Explain how the calculation would be different if there were other benefit streams.

3. Continued

Commentary on Question:
This part of the question tested the candidates' knowledge of CARVM for SPDAs. Candidates were generally able to apply the concepts well.

Since the policy matures at the end of year 3, credit was also given if candidates assumed the year 3 CSV may be calculated without deducting the surrender charge.

In part (ii), many candidates did not consider the combination of different benefit streams, referred to as "integrated benefit streams".

(i)
Step 1: Calculate the assumed surrender value (CSV) at each period end.

CSV @ end of year 1 = initial premium x (1-load) x (1 + credited rate) x (1 - year 1 surrender charge)
$$= 100,000 \text{ x } (1-2\%) \text{ x } (1+3\%) \text{ x } (1-5\%) = 95,893$$
CSV @ end of year 2 = initial premium x (1-load) x (1 + credited rate)^2 x (1 - year 2 surrender charge)
$$= 100,000 \text{ x } (1-2\%) \text{ x } (1+3\%)^2 \text{ x } (1-2\%) = 101,889$$
CSV at end of year 3 = initial premium x (1-load) x (1 + credited rate)^3 x (1 - year 3 surrender charge)
$$= 100,000 \text{ x } (1-2\%) \text{ x } (1+3\%)^3 \text{ x } (1-1\%) = 106,016$$

(Note: Since the policy ends at year 3, the year-3 value, if treated as a maturity value and the surrender charge ignored, is 107,087.)

Step 2: Calculate the present value of each CSV using the statutory valuation rate (4.5%)

PV for Year 1 CSV = 95,893 x (1+4.5%)$^{-1}$ = 91,764
PV for Year 2 CSV = 101,889 x (1+4.5%)$^{-2}$ = 93,303

PV for Year 3 CSV = 106,016 x (1+4.5%)$^{-3}$ = 92,902
  (or 93,840 if treated as a maturity).

The CARVM reserve is the maximum of the present values which is 93,303.
(93,840 if year 3 is treated as a maturity.)

3.   Continued

        (ii) For each additional benefit considered, need to calculate the present value of each benefit based on their valuation basis for mortality and interest. Also, need to consider integrated benefit streams which involve combinations of benefits, would need to be considered. Then, the reserve is the greatest present value across all the integrated benefit streams.

(d)   Actuarial Guideline XXXIII classifies possible annuity benefit streams into two categories: non-elective benefits and elective benefits.

      Define these categories and list two examples of each.

Commentary on Question:
This part of the question tested the candidates' understanding that the key issue is whether the benefit arises from a contingent event or not. The issue is not whether the contract holder has a choice.

Non-elective benefits are benefits that are payable **after the occurrence of a contingent or scheduled event**, independent of a contract owner's election of an option specified in the contract.
Non-elective benefits include death benefits, disability benefits and nursing home benefits.

Elective benefits are benefit options that the contract holder is allowed to choose to receive in accordance with the terms of the contract, **with no other event needing to take place**.
Elective benefits include partial withdrawals, full withdrawals/surrenders and annuitizations.

4. **Learning Objectives:**
2. The candidate will understand valuation principles and methods of individual life insurance and annuity products issued by U.S. life insurance companies.

Learning Outcomes:
(2a) Compare and apply methods for life and annuity product reserves.

Sources:
Valuation of Life Insurance Liabilities, Lombardi, 4th Edition, Ch. 8 Actuarial Guideline 36

Commentary on Question:
This question tested the candidates' understanding of valuation methods for Equity Indexed Universal Life (IUL) according to AG 36. Candidates were required to perform a basic AG 38 calculation, as well as demonstrate knowledge of the nuances and implications of each approach. Understanding of CRVM for Universal Life (UL) is also required.

Solution:
(a) Contrast the following methods of valuation:

- Implied Guaranteed Rate Method (IGRM)
- CRVM with Updated Market Value (UMV)

  - IGRM is consistent with CRVM when: "Hedged as Required" criteria are met
  - IGRM also requires the insurer to provide a certification of compliance

  - Under IGRM, the implied guaranteed rate after the first term must be less than or equal to the max valuation rate

  - Indexed benefits cannot be greater than one year

  - CRVM with UMV is consistent with CRVM when : A certification regarding assumptions on MV of hedges used must be provided

  - CRVM with UMV does NOT have to meet hedged as required, or prerequisite criteria

  - CRVM with UMV does not allow an averaging of option costs in projection of guaranteed benefits after the initial term

  - CRVM with UMV requires re-calculation of the option values at each valuation date after issue

4. Continued

- CRVM with UMV requires projection of the fund and addition of an accumulated option cost, rather than translating the option cost into an implied rate

(b)

    (i)   Determine the Implied Guaranteed Rate in the current term, as of the issue date.

    (ii)   Determine the Implied Guaranteed Rate for terms after the first, as of the issue date.
Calculate the statutory reserve at the end of Year 1 for this policy.

Show all work.

Commentary on Question: *Candidates generally demonstrated understanding of the UL valuation, but not on the application to IUL. Most candidates were able to calculate the r factor and list some steps of the UL CRVM reserve calculation. Few candidates were able to determine the IGR for the terms after the first.*

i. Implied Guaranteed Rate = Guarantee Rate Floor + Current Option Cost x (1 + Max Val Rate) / Policy Value
Implied Guaranteed Rate = 1% + (80) x (1 + 4%) / 2,000

IGR = 1% + 4.16% = 5.16%

ii. Replace the Current Option Cost, with the 60mth cost which is 40

IGR = 1% + (40) x (1+4%) / 2,000 = 3.08%

iii. Using the UL CRMV reserving method, replacing the guaranteed rate with the implied guaranteed rate for projections:
Reserve = r x (PV Future Guaranteed Benefits when IGR used - PV Future NLPs)
- r x (Unamortized Expense Allowance)
r = Policy Value / GMF = 2,150 / 2,300 = 93.48%
PV Future NLPs at Y1 = (PVFB0 / PVGMP0) * PV GMPS at Y1

PV Future NLPs = (5,600 / 15,000) x 14,000 = 37.33% x 14,000 = 5,226.67

Reserve = 93.48% x (5,500 - 5,226.67) - 93.48% x 200 = 255.51 - 186.96 = 68.55

4. Continued

(c) Critique the following email based on the requirements of Actuarial Guideline 36 (AG 36):

From : Valuation Actuary
To : Chief Actuary
Subject : IUL Hedging Strategy and Reserving Implications

After performing the analysis we discussed, I am pleased to confirm our hedging program will qualify under the "Hedged as Required" criteria. Therefore, we will qualify to use the CRVM with UMV method.

Here are some highlights of our hedging program:
- *Hedging effectively covers 80% – 90% of the reserve equity exposure in any given period*
- *We have a system in place to monitor effectiveness*
- *If the difference between performance and expectations is ever above 25%, we must notify the commissioner that we are no longer "Hedged as Required"*

Relying on CRVM with UMV under Option Replication Hedging is considered a Type 2a computational method. Once we establish this reserving choice, we may later decide to move to a Type 1 method, but the reverse movement is not possible.

Compared to our basic UL reserving, AG 36 provides several differences:
- *AG 36 for IUL does not reference any Cash Surrender Value floor*
- *When determining the moving average volatility for reserving purposes, our capital markets team will use market data without any conservatism*
- *IUL is exempt from Asset Adequacy testing as long as we remain "Hedged As Required"*

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

- Hedged as required is not needed for CRVM with UMV

- 80 to 90% might not be sufficient to meet the "substantially covered" requirement of the standard
- It is required that a system be in place to monitor effectiveness, which is described here

4.   **Continued**

- Only at 35% do you need to notify the commission that you are no longer hedged as required. At 25%, you need only notify

- the commissioner and provide the impact on surplus of alternative reserving methods
- CRVM with UMV is a type 2 method, not type 2a

- Movements to other reserving approaches are allowed in both directions

- AG 36 requires projection using the UL CRVM standards, and thus would also be subject to the CSV floor
- The historical average prescribes a 3% volatility PAD that must be used for calculation
- IUL must still be asset adequacy tested, even if hedged as required

5. **Learning Objectives:**

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

Learning Outcomes:

(2a)   Compare and apply methods for life and annuity product reserves.

Sources:

LFV-802-07, U.S. Tax Reserve for Life Insurers, New Edition, Chapter 7 section 807(f) and Changes in the Computation of Reserves

Commentary on Question:

This question tested the candidates' understanding of how to determine tax deductions and the impact to taxable income due to various methodology changes typically encountered by life insurance companies. Candidates were expected to indicate if the statement was correct or incorrect and explain why. Candidates who understood the difference between a tax deduction and the impact to taxable income of a methodology change did well. However, many candidates were confused by these. Tax deductions impact taxable income only in the current year, while methodology changes may impact taxable income over a period of time.

Solution:

Evaluate each statement below:

A.   The opening reserve at January 1, 2017 is 123.0 million no matter how the new method is categorized.

B.   If the new method is determined to be a change in basis under Section 807(f):

   (i)   *2016 tax deduction is 3.0 million*

   (ii)   *3.0 million is spread into taxable income over 10 years*

C.   If the new method is determined to be a correction of a mathematical or posting error:

   (i)   *2016 tax deduction is 4.5 million*

   (ii)   *1.5 million is spread into taxable income over 10 years*

D.   If the new method is determined to be a change in facts or change in estimate, the 2016 tax deduction is 3.0 million.

E.   If the new method is determined to be a change in method of accounting governed by Section 446:

5. **Continued**

(i)   *2016 tax deduction is 3.0 million*

(ii)   *1.5 million is permanently excluded from taxable income*

A. The statement, "The opening reserve at January 1, 2017 is 123.0 million no matter how the new method is categorized." is correct since starting reserve balances should always reflect the latest revisions to tax reserves.

B. If the new method is determined to be a change in basis under Section 807(f), then:
   i. The 2016 tax deduction is equal to the December 31, 2016 tax reserve based on the old method of 126.0 million less the January 1, 2016 tax reserve based on the old method of 120.0 million, which equals 6 million, not 3 million as indicated in the statement. Thus, the given statement is incorrect.
   ii. The impact to taxable income due to a basis change under Section 807(f) is to spread the difference between the tax reserve at December 31, 2016 under the old method of 126.0 million and the tax reserve at December 31, 2016 under the new method of 123.0 million, or 3 million, into taxable income over the next 10 years, as indicated in the statement. Thus, the given statement is correct.

C. If the new method is determined to be a correction of a mathematical or posting error, then:
   i. The 2016 tax deduction is equal to the December 31, 2016 tax reserve under the new method of 123.0 million less the January 1, 2016 tax reserve under the new method of 118.5 million, or 4.5 million, as indicated in the statement. Thus, the given statement is correct.
   ii. The impact to taxable income due to a mathematical or posting error is to permanently exclude the difference between the January 1, 2016 tax reserve under the old method of 120.0 million less the January 1, 2016 tax reserve under the new method of 118.5 million, or 1.5 million, from taxable income, and not to be spread into taxable income over the next 10 years as indicated in the statement. Thus, the given statement is incorrect.

D. If the new method is determined to be a change in facts or change in estimate, the 2016 tax deduction is equal to the December 31, 2016 tax reserve under the new method of 123.0 million less the January 1, 2016 tax reserve under the old method of 120.0 million, or 3 million, as indicated in the statement. Thus, the given statement is correct.

E. If the new method is determined to be a change in method of accounting governed by Section 446, then:
   i. The 2016 tax deduction is equal to the December 31, 2016 tax reserve under the new method of 123.0 million less the January 1, 2016 tax reserve under the new method of 118.5 million, or 4.5 million, not 3 million as indicated in the statement. Thus, the given statement is incorrect.

5. **Continued**

ii. The impact to taxable income due to a change in method of accounting governed by Section 446 is equal to the January 1, 2016 tax reserve under the old method of 120.0 million less the January 1, 2016 tax reserve under the new method of 118.5 million, or 1.5 million, will be included in taxable income as according to Section 481 (with increases to taxable income spread into income over 4 years and decreases to taxable income spread into income over 1 year), and will vary based on the life insurer's particular circumstances, which is not indicated in the statement. Thus, the given statement is incorrect.

6. **Learning Objectives:**

4. The candidate will understand basic financial management, capital management and value creation principles and methods in a life insurance company context.

Learning Outcomes:

(4a) Assess financial performance, including analyzing and interpreting the financial performance of a product line or company.

(4f) Explain and apply methods in earnings management and capital management.

(5a) The candidate will understand the various forms of reinsurance, and be able to, with respect to both the ceding and assuming parties, analyze and evaluate:
   (i) Risk transfer considerations
   (ii) Cash flow mechanics
   (iii) Accounting and financial statement impacts
   (iv) Reserve credit considerations

Sources:

LFV-818-16: Introduction to Source of Earning Analysis

Life, Health and Annuity Reinsurance, Tiller, 4th edition, Ch. 4

Commentary on Question:

This question tested the candidates' ability to analyze a of source of earnings statement and reinsurance structures.

Solution:

(a)

   (i) Describe the key types of drivers that can cause profit to emerge differently than anticipated in a Source of Earnings analysis.

   (ii) Assess each of the following statements using a Source of Earnings analysis. Justify your answer.

      A. *Premiums were a key driver in the decline in earnings.*

      B. *Stable investment income had a minimal impact on earnings.*

      C. *Mortality experience had a favorable impact on earnings.*

      D. *Surrender experience can be summarized by combining the impact from surrenders and change in reserves. Total surrender experience had an unfavorable impact on earnings.*

      E. *Persistency was worse than expected, fueling the decline in premiums.*

6. Continued

> *F.   Stable expenses had a minimal impact on earnings.*

Commentary on Question:
Candidates generally performed well on this part of the question. For part (i) most candidates adequately described what the key drivers are, and how they caused the profitability to emerge differently than the SOE analysis. For part (ii), candidates had to assess each statement against the impact of actual earnings from 2015 to 2016. Candidates received partial credit if they only focused on actual versus expected earnings in each year without connecting it back to the difference in earnings between the two years.

The intent of statement D was to have candidates assume the first sentence ("Surrender experience can be summarized by combining the impact from surrenders and change in reserves") as factual and assess the second sentence. However, many candidates assessed the initial sentence to be incorrect and never answered the addressed the second sentence. As a result, statement D was deemed to be defective and all candidates received full credit for statement D.

(a)(i) Profit will emerge differently if experience deviates from valuation assumptions.

Key drivers include:
1. Mortality: Actual death claims differ from the reserves released for claims.
2. Surrenders: Surrender benefits paid differ from the associated reserves released.
3. Expenses: Actual expenses paid differ from the maintenance expense reserves released.
4. Investment Income: Net investment earnings differ from the increase in reserves due to the unwinding of discounted liability cash flows.
5. Premium: Actual premium differs from the change in reserves for net premium.

6. **Continued**

(a)(ii)

Premium loading: GP - NP; Gross Premium less Net Premium			
	2015	**2016**	**Change**
Premium Loading	$2,900	$2,700	($200)
A. The premium loading shows that premiums had little impact on earnings.			

Interest: ia (0V+GP-Expa) - i (0V+NP-Exp); Actual Interest less Expected Interest			
	2015	**2016**	**Change**
Interest	$2,000	($300)	($2,300)
B. The investment did not perform as expected and has an unfavorable impact on earnings. In fact, the main driver of the decline in earnings is from investments.			

Deaths: (q-qa)(DB-1V); Expected Deaths less Actual Deaths			
	2015	**2016**	**Change**
Deaths	($1,500)	($700)	$800
C. The mortality experience did have a favorable impact on earnings.			

Surrenders: (w-wa) CSV; Expected Surrenders less Actual Surrenders			
	2015	**2016**	**Change**
Surrender	$4,000	$4,200	$200
D. Surrender experience can be summarized by combining the surrender and change in reserve. However, the actual impact on earnings is minor since the two pieces sum to 0.			

Persistency: (wa-w) 1V; Actual Reserve released less Expected Reserve released due to Surrenders			
	2015	**2016**	**Change**
Persistency	($3,700)	($3,900)	($200)
E. Persistency was actually better than expected and had little impact on earnings. These amounts were calculated by extracting the balancing item between the actual earnings and other drivers of change. 2015: (2.300) – (2,900 + 2,000 – 1,500 + 4.000 – 1.400) = -3.700 2016: (300) – (2,700 – 300 – 700 + 4200 – 1.700) = -3.900			

Expenses: (Exp - Expa); Expected Expenses less Actual Expenses			
	2015	**2016**	**Change**
Expenses	($1,400)	($1,700)	($300)
F. The expenses do have little impact on earnings.			

6. Continued

(b) Evaluate which of the following reinsurance arrangements would have been most advantageous for QRS Life over the past two years of financials. Justify your answer.

- Coinsurance
- Yearly Renewable Term

Commentary on Question:
Candidates generally did well on this part of the question. This question was dependent on the responses given in part (a), and candidates received full credit if they were consistent with part (a) and well-reasoned.

- Coinsurance would be the most appropriate for ABC Life.

  - Coinsurance provides reinsurance for all risks including investment risk that ABC Life is suffering from.
  - Simplest and cleanest to administer

- Yearly Renewable Term (YRT) would not be appropriate for ABC Life

  - YRT provides reinsurance for mortality and morbidity risks, but ABC Life currently does not have a need.

7. **Learning Objectives:**
1.   The candidate will understand U.S. life insurance company financial statements and reports.

Learning Outcomes:
(1d)   Describe, apply and evaluate the appropriate accounting treatments for insurance products, separate accounts, assets,, derivatives and reinsurance.

Sources:
US GAAP for Life Insurers, Herget et. Al., Ch. 8 and Ch. 13

LFV-100-07: Financial Reporting Developments Accounting for Derivative Instruments and Hedging Activities: A Comprehensive Analysis of FAS 133 Overview and Appendix C only.

LFV-819-16: Greenwich Treasury – Derivative Accounting & Hedging

Commentary on Question:
This question tested candidates' knowledge of embedded derivative instruments from SFAS 133.

Solution:
(a)
        (i)   Describe the three conditions required for an embedded derivative to be bifurcated from the host contract and accounted for as a derivative under SFAS 133.

        (ii)   Identify any embedded derivatives and determine if bifurcation is required for each of the following products:

                • Variable payout annuity with a period certain and guaranteed minimum payments
                • Market-value adjusted (MVA) annuity
                • Equity indexed annuity (EIA)

        Commentary on Question:
        This part of the question required candidates to state the three conditions for an embedded derivative to be bifurcated and accounted for as a derivative under SFAS 133. Some candidates listed descriptions of an embedded derivative, which is not the intent of the question. Few candidates could state all three conditions required for bifurcation.

        In part (ii), most candidates determined whether bifurcation was required, but often did not correctly identify which part of the product would be an embedded derivative.

---

7. **Continued**

(i)

1. The economic characteristics and risks of the embedded derivative instrument are not clearly and closely related to the economic characteristics of the host contract.

2. The host contract, including the embedded derivative, is not remeasured at fair value under otherwise applicable generally accepted accounting principles, with changes in fair value reported in earnings as they occur.

3. A separate instrument with the same terms as the embedded derivative instrument would be a derivative under SFAS 133.

(ii)

Variable Payout Annuity with a period certain and guaranteed minimum payments

The guaranteed minimum payments are generally considered an embedded derivative under SFAS133. The additional amount paid to meet the minimum guarantee would need to be bifurcated from the Variable Payout Annuity.

Market-value Adjusted (MVA) Annuity

Both the underlying annuity and the MVA feature are affected by the same interest rates. They are considered clearly and closely related to each other. Therefore, SFAS 133 does not apply here.

Equity Indexed Annuity (EIA)

The EIA return portion of the annuity contract that credits an amount exceeding the guaranteed value is not considered clearly and closely related to the host annuity contract, and should therefore be bifurcated and valued as an embedded derivative.

(b)

You are given the following information for a 1 year point-to-point equity indexed annuity subject to FAS 133:

- Deposit: 100,000
- Initial guaranteed value: 100,000
- Index: S&P 500
- Participation: 100%
- Cap: 4%
- Guaranteed minimum rate: 0%
- Surrender charge: 0%

7. **Continued**

Assume:
- Surrender rate at the end of year 2: 100%
- Discount rate: 2%

	Deposit Date	End of Year 1	End of Year 2
S&P 500 Index	1000	1050	1100

(i)   Calculate the excess benefits.

(ii)   Calculate the value of the embedded derivative at issue.

(iii)   Calculate the value of the host contract at issue.

Show all work.

Commentary on Question:
This part of the question required candidates to identify excess cash flows and apply appropriate formulas to calculate the Host and Value of Embedded Derivative (VED) at issue.

Common errors included calculating separate excess benefits for Year 1 of $4,000 and Year 2 of $4,160 ($108,160 less $104,000). The excess benefit is only applicable at the end of Year 2 upon surrender of the contract. Some candidates discounted guarantee value to issue as the VED.

Partial credit was given to candidates who demonstrated that they understood correct concepts involved in the calculations, even if the values did not result in the correct answers.

(i)
Guaranteed value = 100,000 * (1 + 0% min guar)^t = 100,000 at end of Year 1 and Year 2 (t = years)

End of Year 1 Index account = 100,000 * [1+ min (4% , (1050 / 1000) - 1)]
                                                    = 104,000

End of Year 2 Index account = 104,000 * [1 + min (4% , (1100 / 1050) - 1)]
                                                    = 108,160

7.   Continued

Maturity benefit paid on surrender at end of year $2 = 108,160$

Guaranteed benefit paid on surrender at end of year $2 = 100,000$

Excess Benefits = Maturity benefit – Guaranteed benefit = 8,160

(ii)
VED at issue $= 8,160 / (1.02)^2 = 7,843$

(iii)
Host contract at issue = Deposit - VED = 100,000 - 7,843 = 92,157

8. **Learning Objectives:**

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

Learning Outcomes:

(2b) Evaluate, calculate, and interpret liabilities and DAC assets.

(2c) Recommend and justify appropriate valuation assumptions.

Sources:
US GAAP for Life Insurers, Ch. 6

Commentary on Question:
This question tested the candidates' understanding of GAAP accounting (i.e. SOP03-1, DAC, and URL) in the context of a VUL contract with a no-lapse guarantee and an LTC rider.

Solution:

(a) Propose a detailed method to determine whether this new product requires additional reserves under SOP 03-1.

Commentary on Question:
This part of the question required the candidates to apply SOP03-1 to a product with multiple features (i.e. variable contract, no lapse guarantee, and LTC rider). Candidates received full credit when they provided responses that covered all 3 components (i.e. that there's often a separate charge for the LTC rider and that a variable contract should include some stochastic analysis to capture scenarios where there might be profits followed by losses in different economic scenarios). Most candidates were able to identify that SOP 03-1 is needed in a profits followed by losses situation, but few candidates specified that each benefit should be tested separately. Many candidates did not consider the need for stochastic analysis.

Additional reserves are required if the amounts assessed to the policy holder are assessed for the insurance benefit such that there is expected to be a pattern of profits followed by losses.
The base mortality feature must be tested separately from each additional benefit feature, therefore the first step will be to identify each feature that requires its own separate test.
Tests will be required for (1) the base mortality feature, (2) the no lapse guarantee, and (3) the LTC rider.

---

8. Continued

> For each separate test, the next step is to determine which assessments apply for a specific feature. If the additional rider/benefits have an explicit charge for the feature, these charges are presumably the assessments that should be used for the profits followed by losses test. The other possibility is that there are some implicit charges in the contract that can be used in the assessments for this test. This will need to be shown to not be inconsistent with pricing, the marketplace, etc. If the COI charges cover both base mortality and NLG feature, then the COI should be allocated for these tests.
>
> Given the effect that the capital market risks in the variable subaccounts has on the insurance benefit features, a stochastic process could be developed so that the market risk is reflected. Then some threshold, such as a specific # of scenarios that result in profits followed by losses, would have to be developed to make the determination that the reserve is needed.
>
> Alternatively, it may be possible to describe a deterministic method. If so, adequate justification should be given for why the credited rate used appropriately represents whether profits followed by losses is expected.

(b) Compare and contrast the types of assumptions used in the DAC and SOP 03-1 calculations.

Commentary on Question:
*Many candidates failed to address the question directly. Candidates typically compared and contrasted the calculations and components (i.e. deferred expenses, EGPs, and/or assessments) of DAC/SOP03-1. However, the question asked about the **assumptions** behind these components.*

SOP 03-1 assumptions should be consistent with those used in determining estimated gross profits (EGP) for purposes of amortizing DAC, however the SOP 03-1 liability should be calculated over a range of scenarios. This will result in many assumptions being the same between the two, specifically where it is not necessary for an assumption to vary by scenario.

Some assumptions, by necessity, are different by scenario, and therefore additional assumptions would come into play for SOP03-1 that are not needed for DAC EGPs. For example, if your scenarios reflect a distribution of potential separate account returns, you would need to have an assumption about the volatility of those returns, while the DAC projection may be a single deterministic path.

8. **Continued**

Also, some assumptions may be needed for DAC EGPs that are not needed for SOP03-1. For example, a maintenance expense assumption that is not needed for the calculation of SOP03-1.

(c) Calculate the revised DAC balance at the end of year 1.

Show your work.

Commentary on Question:
Candidates were generally able to demonstrate knowledge of the key calculation components. There were alternative ways that calculations could receive full credit. For example: (1) if candidate stated his/her assumption about timing of assessments/EGPs/deferred expenses (i.e. BOY, mid-year, EOY) and correctly applied that impact to the interest component; (2) if candidates used the prospective formulas for SOP03-1 and DAC correctly rather than the retrospective versions; (3) if various intermediate values were rounded to a different number of digits.

SOP 03-1 reserve_t = (Mean Assessments_t * Benefit Ratio - Mean Benefits_t) * $(1+\text{credited rate})^{0.5}$
Benefit Ratio = PV(Benefits)/PV(Assessments)

Benefit Ratio = 7,744/26,406 = 29.3%
SOP 03-1 reserve (Year 1) = (5,594 * 29.3% - 1,342) * $(1.065)^{0.5}$ = 306.5

Revised DAC balance_t = (Revised DAC balance_t-1 + Deferrals_t) * (1+credited rate) - Revised EGP_t * [PV(Deferrals) / PV(Revised EGPs)]
Revised EGP_t = EGP_t - (SOP 03-1 reserve_t - SOP 03-1 reserve_t-1)
Revised EGP (Year 1) = 4,252 - (306.5 - 0) = 3,945.5
PV(Deferrals) = 7,500 --> only have deferrals in first year
Revised DAC balance (Year 1) = (0 + 7,500) * (1.065) - 3,945.5 * (7,500/17,991)
= 6,342.7

(d) The product development team would like to add a first year premium load to the product to cover ongoing policy expenses.

Describe the implications this change could have on the SOP 03-1 reserves.

Commentary on Question:
Candidates that recognized the circular issue that exists with URL and SOP03-1 calculations generally did well on this part of the question.

8. Continued

As this is compensation to the insurance enterprise for services to be provided in future periods that are not earned in the period assessed, it should be reported as unearned revenue and an Unearned Revenue Liability (URL) must be established

Amounts collected over a period significantly shorter than the period for which the contract is subject to mortality and morbidity risks should be recognized in income and be considered assessments for purposes of testing for profits followed by losses

Therefore, inclusion of the feature will change the likelihood of having profits followed by losses and affect whether SOP03-1 reserves should be set up in the first place.

Further, because the change in URL is added to the assessment base and the change in SOP03-1 reserve must be included in the EGPs which are used to amortize the URL, this creates a circularity issue.

Because the calculation of the SOP 03-1 liability is circular, many iterations may be needed to arrive at the appropriate amount.

9.

Learning Objectives:
3. The candidate will understand and apply emerging financial and valuation standards, principles and methodologies.

Learning Outcomes:
(3a) Describe, evaluate and calculate the impact on reserves, income, capital, and processes of emerging developments in Statutory and U.S. GAAP reporting, International Financial Reporting Standards, and Solvency Modernization.

(3b) Compare and contrast rules-based and principles-based approaches.

Sources:
Fundamentals of a Principle-Based Approach to Statutory Reserves and Risk Based Capital for Life Insurance

Commentary on Question:
This question tested the candidates' knowledge of Principle-based approach to statutory reserves and risk based capital.

Solution:
(a) Critique each of the following statements about the Principle-Based Reserves (PBR) framework:

   A. *Except for term and universal life products, all other products would use the current statutory reserve method as the Net Premium Reserve (NPR).*

   B. *NPR will never be less than the cash surrender value.*

   C. *The prescribed interest rates for determining present values for the NPR and for the current reserve method use the same basis.*

   D. *For policies that are reinsured, the ceding company and the assuming company must use the same assumptions.*

   E. *A company can use its own mortality experience when setting mortality assumptions, but the method for determining the mortality margin is prescribed.*

   F. *Based on credibility and exposure of company experience, mortality improvement factors can be applied until the period when company mortality grades to the industry mortality table.*

   G. *When setting expense assumptions, information technology development costs and other capital expenditures must be recognized in the current year.*

9. Continued

H. Expense efficiencies resulting from an acquisition cannot be recognized.

I. Both the deterministic reserve and stochastic reserve are determined in aggregate. Net premium reserve is determined on a seriatim basis.

J. When determining the stochastic reserve, discount the negative of the projected statement value of the general account using the one year US Treasury interest rates for each projection year.

Commentary on Question:
Candidates were required to provide a brief comment justifying why the statement was true or false, which they generally did. Some candidates did not clearly indicate "True" or "False" for each statement. Some candidates were correct whether a statement was "True" or "False" yet did not provide a correct reason.

The statement had to be entirely true to be true, otherwise it was considered false. Statement B is an example where statement was incomplete and therefore false.

A. Except for term and universal life products, all other products would use the current statutory reserve method as the Net Premium Reserve (NPR).

   False:
   - UL without secondary guarantees may use current statutory reserve method (CRVM). Term and UL with secondary guarantees use different lapse rates for NPR compared to CRVM.

B. NPR will never be less than the cash surrender value.

   False:
   - NPR shall not be less than the greater of cost of insurance to the next paid to date or the policy cash surrender value.

C. The prescribed interest rates for determining present values for the NPR and for the current reserve method use the same basis.

   True:
   - For NPR, prescribed interest rates used in determining the present values use the same basis used in the current CRVM approach.

9. Continued

D. *For policies that are reinsured, the ceding company and the assuming company must use the same assumptions.*

False:
- Assumptions and margins should be appropriate for each party in the reinsurance transaction, thus mirror-image reserving is not required.

E. *A company can use its own mortality experience when setting mortality assumptions, but the method for determining the mortality margin is prescribed.*

True:
- A company may use its own mortality experience to the extent experience is relevant and credible with a method prescribed for mortality margins.

F. *Based on credibility and exposure of company experience, mortality improvement factors can be applied until the period when company mortality grades to the industry mortality table.*

False:
- Use of mortality improvement beyond the valuation date is prohibited.

G. *When setting expense assumptions, information technology development costs and other capital expenditures must be recognized in the current year.*

False:
- Company may spread certain information technology costs and other capital expenditures over a reasonable number of years.

H. *Expense efficiencies resulting from an acquisition cannot be recognized.*

False:
- Company shall reflect expense efficiencies due to merger or acquisition when future costs to achieve the efficiencies are also recognized.

I. *Both the deterministic reserve and stochastic reserve are determined in aggregate. Net premium reserve is determined on a seriatim basis.*

True:
- Deterministic reserve and stochastic reserve are determined in aggregate. NPR is a "floor" reserve and determined contract-by-contract (seriatim).

9. **Continued**

J. When determining the stochastic reserve, discount the negative of the projected statement value of the general account using the one year US Treasury interest rates for each projection year.

False:
- Discount value of the negative of the projected statement value of general account and separate account assets using 1.05 multiplied by the one year US Treasury rates in effect at beginning of each projection year.

(b) Describe the risks the deterministic and stochastic exclusion tests are meant to identify under the PBR framework.

Commentary on Question:
This part of the question tested the candidates' understanding the types of risk each of the exclusion tests is designed to detect. Candidates were more likely to describe the stochastic exclusion test as detecting policies that are insensitive to interest rate and market risk than to describe the deterministic exclusion test as detecting policies where the normal operation with an assumed premium level will mature the obligation. Some candidates did not describe the NPR "floor" as likely to be the final reserve when these exclusion tests are passed.

- Deterministic reserve amount represents a statement value of assets that, when projected with all premiums and investment income, would fully mature the obligations. Actual statement value exceeding deterministic reserve indicates some likelihood of passing deterministic exclusion test.

- Stochastic reserve assumes interest-rate movements and equity performance. Policies relatively insensitive to interest rate and equity returns are likely to pass stochastic exclusion test.

- When passing either exclusion test it is likely NPR is not less than the appropriate deterministic or stochastic reserve.

(c) Under the current rules based statutory method, BNA Life Insurance Company performs C-3 Phase 1 testing as part of its annual risk-based capital (RBC) testing. The result is a low RBC ratio that suggests BNA may be weakly capitalized.

The Chief Actuary states "*This is not a major concern because we will soon be moving to a principle-based approach; the current statutory method is formulaic but under the new PBR method, we will be allowed to more accurately reflect our own risks and prove we are not poorly capitalized.*"

---

9. Continued

Critique this statement.

Commentary on Question:
Candidates generally understood the Chief Actuary's statement was incorrect with some variance on how incorrect or what parts might be incorrect. Some candidates did not indicate that C-3 analysis might change somewhat under PBR especially in relationship to more advanced approaches to determining solvency.

Some candidates described a connection between PBR and capital where an increase or decrease in reserve affects amount of Total Adjusted Capital and thus RBC ratio as (Total Adjusted Capital / Required Capital). A few candidates mentioned reserves for business issued under pre-PBR reserve standards would not change to a new method after PBR is in use. For these additional reasons drastic changes to a current low RBC ratio are unlikely.

Chief Actuary's statement is inaccurate:
- AAA evaluated the interest rate and market risk (C-3) component and concluded there are no differences in the basic nature of these risks between current and PBR methods, therefore C-3 capital should be determined using common methodologies.

- NAIC has opined that under a PBR approach companies still need to have adequate capital including solvency control levels triggering different degrees of regulatory intervention.

- NAIC recognizes that under a PBR approach companies should be allowed to use more advanced approaches to determining solvency (including using internal models, company-specific assumptions, etc.). Reserves and capital should be based upon the same risk measures using consistent models.

While BNA's RBC results could change under a PBR approach, they cannot assume a drastic change from poor results to good results will occur even after transition. Company will be exposed to the same interest rates and market risks.

10.

Learning Objectives:
5.   The candidate will understand the nature and uses of basic reinsurance arrangements used by life insurance companies.

Learning Outcomes:
(5a)   The candidate will understand the various forms of reinsurance, and be able to, with respect to both the ceding and assuming parties, analyze and evaluate:
(i)   Risk transfer considerations
(ii)   Cash flow mechanics
(iii)   Accounting and financial statement impacts
(iv)   Reserve credit considerations

Sources:
Life, Health and Annuity Reinsurance, Tiller, 4th Edition, Ch.11

US GAAP for Life Insurers, Herget et. Al., Ch. 17.4 to 17.7 (pp. 527-561)

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

Solution:
(a)
(i)   Summarize how risk categories are used to determine whether reserve credit is allowed under statutory regulations.

(ii)   Contrast the risk transfer requirements between U.S. GAAP FAS 113 and statutory regulations.

Commentary on Question:
Candidates generally did not do well on this part of the question. Candidates were able to identify the need for significant risk transfer in order to receive reserve credit; however, most candidates did not define "significant".

(i)   if a risk category is significant for a product, the risk must be transferred to receive reserve credit
- "significant" is defined depending on the risk category and product type
- risks are broadly divided into 6 categories
- products are broadly divided into 17 types

10. Continued

(ii)   Under statutory regulations, risks prescribed as significant must be transferred.

Under FAS 113:
- must be reasonably possible that reinsurer will realize a significant loss
- "significant" is not rigidly defined; the end result may differ from statutory regulations

(b)   The following terms appear in a proposed reinsurance treaty between ABC Life and XYZ Re:

A.   *On a coinsurance basis, ABC Life will cede 75% of future whole life and universal life sales with XYZ Re.*

B.   *XYZ Re will pay renewal expense allowances sufficient to cover all renewal commissions and premium taxes on the reinsured portion of the business.*

C.   *If sales of new business fall below 3 million in direct premium in the first 2 years of the agreement, ABC Life will pay XYZ Re an additional 1.5% load on the reinsurance premium for existing ceded business.*

D.   *In return for an extremely generous first year expense allowance, ABC Life guarantees the performance of the ceded block for 5 years.*

E.   *Settlements between ABC Life and XYZ Re will occur quarterly to help reduce administrative expenses.*

F.   *Any disputes arising between ABC Life and XYZ Re will be resolved with preference to industry custom and practice rather than strict legal interpretation of the treaty.*

Evaluate each term relative to the NAIC Life and Health Reinsurance Agreement Model Regulation, specifically when an asset may be established or a liability reduced for a reinsurance transaction.

10. Continued

Commentary on Question:
Candidates generally did well on statements A, C, D and E. On statement B, candidates generally did not identify that renewal allowances must cover all renewal expenses on reinsured business. Few candidates properly evaluated statement F as being acceptable (such a statement may introduce the need for arbitration in the event of a dispute, which may or may not be desirable, but it is not unacceptable).

A. acceptable, assuming all significant risks are coinsured
B. unacceptable, since renewal allowances must cover all renewal expenses on reinsured business
C. unacceptable, since ceding company cannot pay reinsurer amounts not realized from reinsured business
D. unacceptable, since ceding company cannot guarantee future performance of reinsured business
E. acceptable
F. acceptable

(c) Calculate an appropriate mod-co interest rate for 2015. Show all work.

Commentary on Question:
Candidates who understood that the Exhibit 2 Rate is a reasonable proxy for the mod-co interest rate generally did well on this part of the question. Some common omissions include "investment income due and accrued" and "borrowed money" in the X and Y components.

The Exhibit 2 Rate (E2R) can be used as the mod-co interest rate

$$E2R = [2 \times (I + NCG)] / [X + Y - I - NCG]$$

I = net investment income for year
NCG = net capital gains for year (capital gains less capital losses)

X = end of year cash and invested assets plus investment income due and accrued less borrowed money

10. Continued

Y = X at end of prior year

Calculate E2R
- I = 2
- NCG = 5 - 1 = 4
- X = 99 + 30 - 10 = 119
- Y = 99 + 30 - 10 = 119
- E2R = [2 x (2 + 4)] / [119 + 119 - 2 - 4] = 12 / 232 = 5.2%