ILA LFVU Model Solutions
Spring 2014

1. **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:
(5a) Explain and distinguish the roles of capital from the perspectives of regulators, investors, policyholders and insurance company management

(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 form 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:
Economic Capital Modeling: Practical considerations (same as ILA-C121-08)

Valuation of liabilities, 4th edition, Lombardi, ch.16 (excl. 16.6)

Economic Capital for Life Insurance Companies

Economic Capital Overview; Chad Runchey, August 2012

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a) Calculate the Authorized Control Level Risk-Based Capital under the statutory basis.

1.   Continued

Commentary on Question:
*Candidates generally answered this question correctly. Credit was also granted
to the candidates who used ½ ACL in their calculation. There was a typing error
with the notation, where the term C_{1a} was used instead of $C_{1o;}$ this did not affect
the calculation. The graders also made allowance for this typo by awarding
appropriate points where there was indication of confusion caused by the
incorrect notation.*

Life Covariance Calculation = C0 + C4a + Square Root of [(C1a + C3a)2 + (C1cs
+ C3c) 2 + (C2) 2 + (C3b) 2 + (C4b) 2]

Also, candidates need to understand ACL is actually the diversified sum, like
ACL Is a diversified capital level / amount

C0 = 100, C1a = 80, C2 = 1,800, C3a = 900
ACL = 100 + 0 + Sqr Root [(80 + 900) 2 + (1,800) 2] = 2,149.50

½ of ACL = 1,074.74 also accepted as correct answer

(b)

   (i)   Identify which basis produced a higher diversification.

   (ii)   Describe three factors which might drive the basis you identified above to
          produce higher diversification benefits.

Show your work.

Commentary on Question:
Candidates generally answered Part I correctly.

*Candidates were more challenged with Part II. Some candidates only described
the ACL formula without analyzing the correct factors that produce higher
diversification benefits. Many candidates only listed the factor instead of
describing as asked in the question. Few identified the correlation matrix
approach as a factor. Candidates who properly identified three factors were able
to correctly identify the differences in assumptions and the "one size fits all"
approach. Partial credit was given for factors that were described that were not
the main drivers but related to the solution.*

   (i)   Statutory diversification benefit = 2,880 – 2,149.5 = 730.5
          Economic diversification benefit = 1,638
          Economic basis produces the higher diversification benefit

1. **Continued**

If ½ ACL was used in part A, Statutory Basis was accepted as a correct response

(ii)   Factors that might contribute higher diversification benefits:
- Differences in underlying assumptions. Unlike with economic capital, the statutory basis uses assumptions prescribed by the local regulators.
- The statutory basis employed a one size fits all approach which might understate this company's diversification benefits; this common approach reflects an average industry view and may not apply to an individual company on a standalone basis. The economic basis reflects an approach that better reflects the business and underlying risks for a particular company.
- The statutory basis uses a modified correlation matrix approach to calculate the diversification benefits, which assumes correlation is symmetrical between the left and right tail. This might not reflect the true diversification for the industry or a particular company. Economic based calculations may employed copula or self-calibrated correlation matrix approach to better reflect the true diversification benefits between the risk categories.

2. **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 & Annuity Reinsurance, Tiller, 3rd Edition, Ch.6

Commentary on Question:
The goal of this question is to examine the candidate's ability to apply the concept of recapture to reinsurance on a YRT basis. First the candidate is expected to interpret recapture wording from a reinsurance treaty and determine the cash flow effect of a recapture fee. They will need to understand that the net impact of this recapture should be the increase in EV offset by the calculated recapture fee. Candidates will need these net results to evaluate whether to recapture the business or not. To receive full points, candidates will also need to note that EV analysis is only one way of evaluating this business case; there are many other ways such as looking at IRR, capital requirements etc. Candidates do not need to give full descriptions on these other consideration but will need to mentioned it in the answer in order to get full grading points.

For part b, the candidate is challenged to propose treaty wording to limit the risks of recapture from Rock's point of view.

Finally, the candidate is challenged to use their knowledge and explain why recapture is something that a reinsurer may not want to include without a cost.

Solution:
(a) Recommend whether Blue Jay should proceed with the proposed retention limit increase for new business only or on both new business and inforce. Justify your recommendation.

2. Continued

Commentary on Question:
Almost half of the candidates were able to answer this question by 1st calculating the recapture fee and calculate the net EV impact by considering the calculated recapture fee in it. Full points are given to the candidates who included the recapture consideration in the EV impacts and also stated other consideration in the "additional consideration" part of the model solution. Other candidates did not considered the recapture fee and just simply did an EV comparison pre and post increasing intention. Partial marks are given to these answers.

Recapture premium per 1000 Face Amount = 40*(16.5-13.5) + 30*(15-12.5) + 25*(13.5-11) + 18*(11-9) + 13*(73.5-60.5) = 462.5

Recapture premium payable to Rock Reinsurance is 462.5*1000 = 462,500

Change in EV for moving new business retention to 150000 per life is 1.2-1.4 = (0.2) million or a 200,000 decrease in EV

Increase in EV for increasing the inforce retention to 150000 per life is 6.2-5.1 = 1.1 million or 1,100,000 less the recapture premium of 462.500 = 637,500 total increase in EV for the inforce book.
For the total book of business, the increase in EV is 637,500 + (200,000) = 437,500

The increase in EV less the recapture payment is a positive amount, so moving to increased retention will improve the T10 block's profitability to Blue Jay Insurance.

Additional considerations:
Would prefer to leave reinsurance on the new business piece since it increases EV but need to increase retention on new business in order to increase retention on the inforce book.

EV is only one measure, should look at other information to make decision. Other information would include sensitivies, concentration of risk, reserve / capital levels, etc.

(b)

    (i)   Propose recapture clause conditions that Rock Reinsurance could include to limit the risks associated with Argo's recapture of their business.

2.   Continued

(ii)   Critique the pricing actuary's comments from Rock Reinsurance's point of view.

Commentary on Question:
(i) As long as candidates list any 4 of the following answers, he or she will receive full grading points. (ii) Candidates will need to mention all these points to get full grading points. Partial points will be awarded as long as candidates put down any points that are on the list. However, we also allocated partial points for candidates mentioning time to recoup initial expense from the reinsurance point of view.

(i)

- Argo may only recapture if Argo increases its maximum retention limits over those currently inforce and only at that time
- All business covered under the treaty must be recaptured, no picking and choosing individual cessions is permitted
- Once initiated, the recapture may not be stopped
- The business may not be recaptured and then ceded to another reinsurer for a period of "XX" years
- No recapture is allowed if Argo is increasing or getting stop-loss reinsurance as a justification for the increase in retention
- Argo must give Rock Re "XXX" days notice prior to its intention to recapture
- If portions of the reinsured policy have been ceded to more than one reinsurer, Argo must allocate the reduction in reinsurance so that the amount reinsured by each reinsurer after the reduction is proportionately the same as if the new maximum dollar retention limits had been in effect at the time of issue.
- Recapture is not available until the end of the "XXX"th policy year

(ii)   Recapture is a one-way option; it allows Argo to transfer over the inforce policies according to the stipulations in the recapture clause. Argo could use this option to cap Rock's profit potential by recapturing the policies when the experience is emerging better than expected and realizing the full profits themselves while Argo is left with nothing more than the recapture fee. If experience is poor, Argo could choose not to recapture the policies, leaving Rock and Argo to deal with the higher than expected claims.

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2. **Continued**

The timing of profit emergence as the PfAD's are released is important for recapture. Recapturing the policy before a major release of PfAD may result in the reinsurer not being able to meet their profit objectives if their recapture fee is not sufficient to compensate the foregone profits.

Since recapture is a one-way option that can cap the profits Rock earns, Rock has reason to charge higher YRT premiums for allowing it because it does have a cost if experience emerges more favorably than expected.

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

Learning Outcomes:
(3b) The candidate will be able to describe and assess the impact on reserves, capital, and/or income of emerging developments in International Finance Reporting Standards.

Sources:
Practical Guide to IFRS, PWC, (July 2013)

US: FASB exposure Draft (June 2013), pp. 24-64 (through to paragraph 834-10-50-37) plus Appendix A (pp. 376-39-405)

CAN: Insurance Contracts under IFRS – IASB (June 2013), pp. 13-64.

Commentary on Question:
This question is testing knowledge of IFRS insurance contract liability and its application to a sample insurance contract. Many candidates were able to list the components of IFRS insurance contract and two approaches to determining the discount rate under IFRS. On the application and calculation, only a few candidates were able to get the correct answer.

Solution:
(a)
   (i) Describe the three components of an IFRS insurance contract liability.

   (ii) You are given the following for a whole life portfolio:

Acquisition Costs (successful efforts)	150
Acquisition Costs (unsuccessful efforts)	200
Expected Present Value of Premiums	5,500
Expected Present Value of Claims	5,000
Assumed Value of Indifferent Fixed Cash Flows (excluding Acquisition Costs)	600

   Calculate the components described in (i). Show all work.

   (iii) Describe how these components are treated differently under FASB.

3. **Continued**

    (i)   Present value of fulfillment cash flows
- Explicit, unbiased and probability weighted estimate of future cash outflows less future cash inflows
- Determined by range of scenario that reflects the full range of possible outcomes

Risk Adjustment
- Measure compensation for uncertainty about amount and timing of cash flows

Contractual service margin
- Unearned profit amortized over coverage period

    (ii)   Present value of fulfillment cash flows
- = PV Claims + Acquisition Costs (successful and unsuccessful efforts) – PV Premiums
- = 5000 + 150 + 200 – 5500
- = -150

Risk Adjustment
- = 600 – (5500 – 5000)
- = 100

Contractual service margin
- = -PVCF – risk adjustment
- = -(-150) – 100
- = 50

    (iii)   Present value of fulfillment cash flows
- Unbiased and probability weighted estimate of future cash outflows less future cash inflows
- Determine the mean that considers all relevant information, need not quantify all possible scenarios

Margin
- Expected unearned profit
- Exclude acquisition costs with unsuccessful efforts

(b)

    (i)   Compare the two approaches to determine the discount rate under IFRS.

    (ii)   Calculate the IFRS discount rate based on each of the two approaches. Show your work.

3.   Continued

Commentary on Question:
Almost all candidates listed and compared the two approaches to determine the discount rate under IFRS. The calculations part was more challenging for candidates. Only a few could apply the concept correctly on the calculation.

(i)   Bottom up approach:
   - Differences in liquidity characteristics from assets traded
   - Adjustment to risk free rate for illiquid nature
   Top down approach:
   - Identify a discount rate on replicating portfolio
   - Deduct elements not included in liability
   - Eliminate expected credit losses and market risk premium for credit

(ii)   Bottom up approach:
   - = 2% + 1.5%
   - = 3.5%
   Top down approach:
   - = 5.9% - 1.2% - 0.7%
   - = 4%

(c)   For contracts that require the mirroring approach under IFRS:

   (i)   (*1 point*) Describe the criteria that would qualify contracts for this approach.

   (ii)   (*2 points*) Explain the measurement and decomposition of cash flows that is required.

   Commentary on Question:
   Generally, only a few candidates were able to identify the criteria (passing the risk of return to the policyholder) for qualifying contracts for the mirroring approach. Even fewer candidates were able to decompose fulfilment cash flows into three components. Many candidates mistakenly answered the question in terms of the mirroring approach for reinsurance.

   (i)   Variable cash flows depend on underlying items where entity required to hold underlying items.
          Entity does not bear the risk of the return on underlying items.
   (ii)   Decompose cash flows into three components:
          - Variable cash flows: measure by reference to carrying value of underlying items

3. **Continued**

- Indirectly varying cash flows: measurement according to building block approach
- Fixed cash flows: measurement according to building block approach

4. **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.

7. The candidate will understand the professional standards addressing financial reporting and valuation

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

(7d) Explain the actuary's professional responsibilities to stakeholders including obligations under Sarbanes-Oxley.

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

Actuarial Aspects of SOX 404, Financial Reporter, December 2004

Commentary on Question:
This question tests the candidate's understanding of SOX 404 and the actuarial review process. Most candidates did well on parts (a) and (b), but not so well on part (c).

Solution:
(a)
    (i) Describe Burch's management responsibilities under SOX 404.

    (ii) Describe the key steps to implementing an effective financial reporting evaluation process within the COSO framework.

    Commentary on Question:
    Candidates generally did well on this part.

    (i) Burch's management responsibilities under SOX 404 are:
- Accept responsibility for effectiveness of ICFR
- Evaluate effectiveness of ICFR using suitable criteria
- Support evaluation with sufficient evidence, including documentation
- Present written assessment of effectiveness of ICFR as of end of most current year

    (ii) The key steps to implementing an effective financial reporting evaluation process within the COSO framework are:
- Plan implementation
  - Determine scope and approach
  - Identify timeline and resources
- Document design of controls
- Evaluate and document effectiveness of controls

4. **Continued**

- Communicate and correct any deficiencies discovered during evaluation
- Prepare management's written assertion about effectiveness of controls
- Prepare information needed by independent auditor to audit controls

(b)   Critique Ben's advice.

Commentary on Question:
Most candidates were able to draw the right conclusions on whether Ben's advice is appropriate or not, though some candidates did not write down enough information to support their conclusions.

Tom should reference the prior review. The prior review serves as a guide to planning the current review. It identifies where errors were made in the past and where certain components of the current review should be focused. It also serves as a guide to structuring the current report.

Tom should not reach out directly to individuals from different departments. Burch should choose one counterpart through whom all questions and answers funnel. One counterpart helps assure all information provided to Tom is consistent.

Tom should make sure all issues are documented and resolved. Immateriality can be a form of resolution. Materiality threshold should be decided in advance of review. Tom should also verify that the aggregate amount of immaterial items does not result in an inappropriate bias.

(c)

(i)   Compare and contrast simple random sampling with stratified random sampling.

(ii)   Determine whether or not you agree with Ben's suggestion by calculating and comparing the standard deviation of the sample mean under both approaches. Show all work.

Commentary on Question:
Candidates generally did very well on the first part. On the second part, most candidates struggled with the required statistical calculations and did poorly as a result.

(i)   In simple random sampling, each element of the population has the same probability of being chosen.

4. Continued

In stratified random sampling, the population is divided into smaller groups (known as strata), and a simple random sample is taken from each stratum in proportion to the stratum's size compared to the population. Stratified random sampling improves the accuracy of a statistical estimate if the characteristic being estimated and the characteristic(s) used to define the strata are not statistically independent.

(ii)   Standard deviation of sample mean using simple random sample (STDSM Simple)
STDSM Simple = $(Var(X) / n)^{0.5} = ((E(X^2) - (EX)^2) / n)^{0.5}$
Group A: $E(X^2) = 20^2 + 80^2 = 6,800$
Group B: $E(X^2) = 37^2 + 175^2 = 31,994$
Group C: $E(X^2) = 24^2 + 96^2 = 9,792$
$E(X^2) = (0.2 \times 6,800) + (0.3 \times 31,994) + (0.5 \times 9,792) = 15,854.20$
$E(X) = (0.2 \times 80) + (0.3 \times 175) + (0.5 \times 96) = 116.5$
STDSM Simple = $((15,854.20 - (116.5)^2) / 100)^{0.5} = 4.78$

Standard deviation of sample mean using stratified random sample (STDSM Stratified)

STDSM Stratified = $((Weighted\text{-}average\ variance\ of\ the\ strata) / n)^{0.5}$
$= (((0.2 \times (20)^2) + (0.3 \times (37)^2) + (0.5 \times (24)^2)) / 100)^{0.5} = 2.79$

STDSM Stratified is less than STDSM Simple, so Ben is correct.

5. **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.

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.

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

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:
(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

(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

(3b) The candidate will be able to describe and assess the impact on reserves, capital, and/or income of emerging developments in International Finance Reporting Standards.

(4b) Perform financial analysis on a product line or company.

Sources:
Practical Guide to IFRS, PwC, July 2013

LFV-100-07: Financial Reporting Developments

Life Insurance Products and Finance, Chapter 16

U.S. GAAP for Life Insurers, Chapter 8

5. **Continued**

Commentary on Question:
Most candidates did well on the recall and description of parts (a) and (b). The calculations in part (c) proved quite challenging as very few candidates appeared to understand the concepts of a variable payout annuity.

Solution:
(a) On June 20, 2013, the IASB published a revised exposure draft of IFRS standards for insurance contracts. For each of the following items, compare the treatment under the revised exposure draft with the treatment under Solvency II:

- Deferral of acquisition costs
- Determination of the discount rate
- Use of a contractual service margin

Commentary on Question:
Most candidates were able to identify at least a few points of comparison between the IFRS standards and Solvency II treatment.

Deferral of acquisition costs:
- IFRS: Implicit deferral of direct acquisition costs
- Solvency II: No deferral of acquisition costs

Determination of the discount rate:
- IFRS: Principles based process, use top-down or bottom-up approach to match risks consistent with liabilities. Current rates and rates locked in at inception are needed.
- Solvency II: Prescribed methodology, with rates based on swap curve plus a matching adjustment or counter-cyclical premium. Only current rates are needed.

Use of a contractual service margin:
- IFRS: Used to eliminate day one gain, so profits are realized as margin is released
- Solvency II: No contractual service margin

(b) Gibraltar sells variable annuity products containing embedded derivatives subject to FAS 133. Describe the hedgeable risks of these products and the different types of hedges available to mitigate these risks.

Commentary on Question:
Candidates generally did very well on this part. Most candidates did an adequate job describing both the hedgeable risks and types of hedges.

5. **Continued**

Hedgeable risks:
- Market Price risk: Risk of loss due to fluctuation in market prices
- Interest Rate risk: Risk of loss due to changes in interest rates
- Foreign Exchange risk: Risk of loss due to fluctuation in foreign currency exchange rates
- Credit risk: Risk of loss due to other parties not honoring their obligations

Types of hedges available:
- Fair Value hedge: Hedges exposure to changes in fair value of recognized assets or liabilities
- Cash Flow hedge: Hedges exposure to variability in expected future cash flows of recognized assets or liabilities

(c)   Under U.S. GAAP:

(i)   Calculate the expected gross profit for 2014. Show your work.

(ii)   As of December 31, 2014, assume the unit value is 13.2 and the policy is still inforce. Calculate the mortality gain or loss for 2014. Show your work.

Commentary on Question:
Very few candidates did well on this part. Common mistakes included thinking of the mortality risk as the payment of death benefits rather than the continued benefit payments of a payout annuity, and a general unfamiliarity with the mechanics of changing benefit payments and account balances in a variable payout annuity.

(i)   Expected Contract Account Balance at End of Year (EAB)
- = (50,000 x 1.06) - 6,500 = 46,500

Expected Contract Benefit Payment at End of Year (EBP)
- = 8,400 x 1.06 / 1.05 = 8,480

Expected Gross Profit (EGP)
- = M&E Charges - Expenses + Mortality Assessment +
- Account Value Released on Death - Benefit Payments

Account Value Released on Death
- = EAB x Expected Mortality Rate

Benefit Payments
- = EBP x (1 - Expected Mortality Rate)

EGP = (50,000 x 0.01) - 21 + 6,500 + (46,500 x 0.05) - (8,480 x (1 - .05))
- = 1,248

5. **Continued**

    (ii)   Actual Investment Return
- $= (13.2 / 12) - 1 = 10\%$

        Mortality Assessment updated for Actual Investment Return
- $= 6,500 \times 1.1 / 1.06 = 6,745$

        Actual Contract Account Balance at End of Year
- $= (50,000 \times 1.1) - 6,745 = 48,255$

        Actual Contract Benefit Payment at End of Year
- $= 8,400 \times 1.1 / 1.05 = 8,800$

        Actual Mortality Rate = 0% (since contract is still in force at end of year)

        Mortality Gain
- = Mortality Assessment + Account Value Released on Death - Benefit Payments
- $= 6,745 + (48,255 \times 0) - (8,800 \times (1 - 0)) = -2,055$
- = Mortality Loss of 2,055

6. **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.

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:
(1c) Compute the U.S. federal taxable income of a life insurance company.

(2b) Recommend and justify appropriate valuation assumptions under the following standards
 (i) U.S. Statutory
 (ii) U.S. GAAP
 (iii) U.S. Tax

Sources:
LFV-802-07: U.S. Tax Reserves for life Insurers (Formerly ILA-C802-07)
- Chapter 2 Tax-Basis Reserves Generally
- Chapter 7 Section 807(f) and changes in the Computation of Reserves

LFV-800-07: IASA Life and Accident and Health Insurance Accounting Chapters 8 pp. 12-16 and 12 pp 1-15 & 32-33 (Formerly ILA-C800-07)

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a) List the six categories of deductible reserves, as defined by Section 807(c) of the Internal Revenue Code. Give an example of each.

   Commentary on Question:
   Most students knew at least two of the categories. There was a lot of opportunity to get partial credit. Some students listed out the six categories but left out examples of each and lost half of the points even though the example was the easier aspect of the question. Generally well answered.

   - Life insurance reserves
     o Example: reserves on life insurnce contracts, or active life reserves on non-cancellable A&H contracts
   - Unearned premiums and unpaid losses
     o Example: unearned premium, or claim reserves and claim liabilities for cancellable A&H contracts

6. Continued

- Amounts necessary to satisfy the obligations under insurance and annuity contracts, but only if such obligations do not involve life, accident, or health contingencies
  - Example: SCNIs
- Dividend accumulations
  - Example: pension plan deposit administration funds
- Advance premiums and liabilities for premium-deposit funds
  - Example: premiums already paid that are not yet due
- Reasonable special contingency reserves under contracts of group term life insurance or group A&H coverage for the provision of insurance on retired lives, premium stabilization, or a combination
  - Example: group term life & health premium-stabilization funds

(b) Determine whether KVV qualifies as a life insurance company for U.S. federal income tax purposes. Justify your answer.

Commentary on Question:
Typically well answered. A lot of credit given for stating the more than 50% rule, and for attempting a calculation. Partial credit given even if answer was incorrect… point of question was to understand the 50% rule and do a calculation to validate

To be taxed as a life insurance company, more than 50% of an insurance company's total reserves must
be life reserves or unearned premiums & unpaid losses on guaranteed renewable or noncancellable A&H policies

Total reserves include life reserves, unearned premium & unpaid losses on GR & NC A&H policies, unearned premiums & unpaid losses not included in the prior item, and all other reserves required by law

Calculation:
Life Company Ratio = (Life Ins Res & UPR & Unpaid Loss on GR & NC A&H Business)/(Total Reserves)
= (800 + 500 + 40 + 25) / (All reserves except deficiency reserve) = 1,365/2,150 = 63%

Yes, the company qualifies as a life insurance company

(c) Calculate the adjusted total tax reserves, as of 31 Dec 2013, for federal income tax filing purposes. Show all work.

6. **Continued**

Commentary on Question:
Very few students got both the adjustments… it was typically one or the other.
Majority of points were given based on the noting of the adjustments and not the
calculation itself.

Tax reserve cannot exceed stat reserve, so the A&H Active Life Reserve - NC/GR
tax reserve amount is capped at 500
Unearned premiums and unpaid losses for cancellable policies are subject to a
20% haircut (i.e. only 80% of the reserve amount is counted for tax reserve
purpose)

Adjusted total tax reserves = 750 + 500 + 680*.8 + 40 + 50*.8 + 25 + 35*.8 =
1,927

(d)   Determine whether or not each item is a "change in basis," as described in the
Internal Revenue Code Section 807(f). Justify your answer.

Commentary on Question:
Majority of students got some or all credit in this question. Some students did not
justify their answer even though it was specifically requested in the question.

- Interest rate changed from 4% to 6%
  - This is a change in interest rates, and any change in factors used to
    calculate reserves is a change in basis adjustment within the meaning of
    Section 807(f)
- Correction from not holding waiver of premium reserves for disability
  disabled lives (although such reserves are held for active lives) to holding
  them
  - This is a correction of an error, and, hence, not a change in basis
- Policies are converted from collectively renewable to guaranteed renewable
  - This is a change in facts, and, hence, not a change in basis
- The assumption of the timing of death benefit changed from « end of month »
  to « mid-month »
  - This is a change in basis
- Failure to properly adjust reserves by a percentage factor of 90% due to a
  defect in computer software
  - This is a correction of an error, and, hence, not a change in basis
- Correction from method (i) to method (ii) as follows :
  Calculate disabled life reserves by using two components :
  - Future benefits due during the first two years of disability for claims in
    their first two years
  - Future benefits due for claims beyond their 24-month period as of the
    valuation date

6. **Continued**

Calculate disabled life reserves similar to above but add a third component : benefits due after 24 months of disability for claims that had not yet reached their 24th month as of the valuation date
o This correction is a change in method under Section 807(f) because it's the correction of an error in "actuarial judgment"; that is, this is a change in basis

7.   **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:
  (v)   Separate Accounts
  (vi)   Embedded options
  (vii)   Derivatives
  (viii)   Secondary guarantees

Sources:
SOP 05-1, Financial Reporter, March 2006

Commentary on Question:
This question tests the ability of the candidate to apply the concepts of SOP05-1 to the three options provided. A number of candidates did not connect the question with SOP05-1 (as it might not have been clear what "policyholders can amend their contracts" meant), in which case partial credit was given for answers that attempted to explain the impact assuming the SOP did not apply. Candidates that connected the question with SOP05-1 generally did well on Option 1 and Option 3; however, they scored lower on Option 2 as it was a bit trickier.

Solution:
Explain the impact on the GAAP DAC asset and GAAP unearned revenue liability (URL) of exercising each option. No calculations are required.

Accounting for amendments to existing contracts is covered by SOP05-1. If the feature being added meets the exclusion criteria in the SOP, then other accounting statements are looked to for guidance (i.e., the SOP does not apply). If the feature being added does not meet the exclusion criteria in the SOP, then the accounting treatment depends upon whether or not the feature is integrated with the base contract, and if it is integrated, whether or not the feature substantially changes the contract.

The impact on DAC and URL of exercising each option is summarized below, assuming the option does not meet the exclusion criteria in the SOP:

Option 1: The additional death benefit is an integrated feature, since the benefit amount can only be determined in conjunction with the balances related to the base contract. The additional death benefit also results in a substantially changed contract, since an additional premium is required and significant mortality risk is introduced. The existing DAC and URL are therefore written off, and new DAC and URL are established based on the characteristics of the amended contract.

7.   Continued

Option 2: The crediting rate change is an integrated feature, since it directly impacts the amount of interest credited on the balances related to the base contract. However, it is unclear whether the change results in a substantially changed contract. Further testing is needed to determine the significance of the change. If the change is determined to be significant enough to result in a substantially changed contract, then the existing DAC and URL will be written off. Otherwise, the existing DAC and URL will continue to be recognized as part of the amended contract.

Option 3: The exchange is an integrated feature, since it requires the contract holder to give up the deferred annuity. The exchange also results in a substantially changed contract, since significant mortality risk is introduced and there is a change in revenue classification. The existing DAC and URL are therefore written off.

8. **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.

7. The candidate will understand the professional standards addressing financial reporting and valuation

Learning Outcomes:
(2a) Describe and differentiate between valuation assumptions under the following standards:
  (i) U.S. Statutory
  (ii) U.S. GAAP
  (iii) U.S. Tax
(7a) Explain the role and responsibilities of the appointed/valuation actuary.

(7c) Identify and apply actuarial standards of practice relevant to financial reporting and valuation.

Sources:
Valuation of Life Insurance Liabilities,Ch 15 The Valuation Actuary in the US

US GAAP For Life Insurers, Second Edition, Ch 6 Universal Life Insurance

US GAAP For Life Insurers, Second Edition, Ch 4 Traditional Life Insurance (SFAS 60 & 97)

Commentary on Question:
This question was answered fairly well. Most candidates demonstrated adequate knowledge of professional standards related to reporting and valuation. The distribution of the marks on all three parts were fairly even.

Solution:
Critique the Chief Actuary's suggestions.

ASOP 22 gives guidance to the actuary in providing a statement of actuarial opinion relating to asset adequacy. Cashflow testing is not always necessary, however ASOP 22 requires the actuary to make this judgment. The items that the actuary should consider whether to cashflow test or not:
- The sensitivity of liability cashflows to changing investment environments
- The composition of assets supporting reserves
- Any significant reinvestment risk

8. **Continued**

ASOP 22 gives some situations where cashflow testing might not be necessary:
- Situations where a gross premium valuation or prior cash flow analysis has shown the results to be relatively insensitive to economic changes
- Situations where experience is demonstrated to be less severe than provided for in the reserves
- Products where the cashflows are relative insensitive to changes in economic environment
- Short-term products

As the company sells UL and VA products, it is very unlikely for the company to fulfill the criteria above. Being a new company does not exempt the company from cashflow testing.

The Standard Valuation Law adopted by the national commissioners contains the requirements for an Appointed Actuary. The appointed actuary is a qualified actuary who is appointed by the board of directors. A qualified actuary is a member in good standing with the American Academy of Actuaries, who is qualified to sign statements of actuarial opinion. It doesn't appear that the new actuary is a good candidate for the role as he doesn't have much experience in the products that Fast Life sells.

Fast Life sells term, VA and UL products. Term products fall under FAS60, which uses best estimate assumptions with a PAD. UL products fall under FAS97, which uses best estimate assumptions. As the company is fairly new, pricing mortality assumptions could be used for best estimates. A mix of industry tables and experience from other companies could be used as well. Statutory mortality assumptions are prescribed and are very conservative and thus inappropriate to use for best estimate assumptions.

9.   **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:
(2b)   Recommend and justify appropriate valuation assumptions under the following standards
        (iv)   U.S. Statutory
        (v)   U.S. GAAP
        (vi)   U.S. Tax
(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:
Valuation of Life Insurance Liabilities, Lombardi, Chapters 1, 4, and 5

Commentary on Question:
Essentially, the question was testing the candidates understanding of the assumptions and methodology of establishing reserves for traditional products under the US Statutory Valuation standard. The first part was about the assumptions and most important differences with US GAAP valuation. The second part required a demonstration of candidates' grasp of how to calculate reserves under Net Level Premium, Full Preliminary Term and CRVM methods. Finally, candidates were required to show that they understood the minimum required standard under US Statutory valuation. Candidates did well in all aspects of this question except where they either failed to show and explain their formula or failed to justify their recommendation(s) when required (as in (b)(iii)) to do so.

Solution:
(a)   Critique the student's recommendation.

       Explicit assumptions are required for mortality and interest rate. Acquisition and maintenance expenses are implicitly allowed for in the conservatism of the methods used.
       Because the focus under statutory valuation is on solvency, the assumptions are necessarily conservative and are locked in at issue. Mortality assumptions and interest rates depend upon the year of issue of the policy.
       Assumptions are prescribed under state valuation laws.

9. Continued

(b)

    (i)   Calculate the reserve at the end of policy year 5. Show your work.

    (ii)   Explain why the reserve differs under the three methods.

    (iii)   Indicate whether or not each method is appropriate for statutory valuation. Justify your answer.

    (i)   Notation:
PVFB(t) = present value of future benefits at end of policy year t

PVFP(t) = present value of future valuation premiums at end of policy year t

Resv(t) = reserve at end of policy year t
c(t) = cost of insurance for policy year t
ä(x:n) = present value of life annuity due of 1 per year starting at age x and lasting for n years
EACRVM = CRVM expense allowance

Net level premium method (NLP)
PVFP(5) = (PVFB(0) / ä(40:15)) x ä(45:10)
= (35,406 / 12.06) x 8.63 = 25,336
Resv(5) = PVFB(5) - PVFP(5)
= 40,274 - 25,336 = 14,938

FPT
PVFP(5) = (PVFB(1) / ä(41:14)) x ä(45:10)
= (36,339 / 11.41) x 8.63 = 27,485
Resv(5) = PVFB(5) - PVFP(5)
= 40,274 - 27,485 = 12,789

CRVM
EACRVM = (PVFB(1) / MAX(ä(41:14), ä(41:19))) - c(1)
= (36,339 / 14.28) - (100 x 2.03 / 1.03) = 2,348
Resv(5) = (NLP reserve at end of policy year 5) - (EACRVM x ä(45:10) / ä(40:15))
= 14,938 - (2,348 x 8.63 / 12.06) = 13,258

    (ii)   Reserves differ due to their treatment of expenses
NLP provides no expense allowance

9.   **Continued**

FPT provides an expense allowance so that the terminal reserve at the end of policy year 1 is 0
CRVM provides an expense allowance equal to the smaller of the FPT expense allowance for the given plan of insurance and the FPT expense allowance for a 20-pay limited payment life contract

(iii)   CRVM is appropriate since it is the prescribed minimum method
NLP is appropriate since it produces a reserve in excess of the prescribed CRVM minimum
FPT is not appropriate since it produces a reserve less than the prescribed CRVM minimum

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:
(4a)   Describe and calculate performance measures.

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

LFV-106-07: Merger and Acquisitions, Chapter 4 (Sections 4.1-4.6)

Commentary on Question:
This question tests knowledge of Embedded Value with some description (a); some calculation of an EV (b-i); and some simple analysis of how EV might change when circumstances change (b-ii). Candidates answered parts a and b-ii significantly better than part b-i. See the commentary for the individual parts.

Solution:
(a)   Describe three ways in which embedded value differs from actuarial appraisal value.

   Commentary on Question:
   Candidates were generally able to distinguish between embedded value (EV) and actuarial appraisal value (AAV). A few candidates described them as being different without explanation. For example, claiming discount rate "is different" between EV and AAV is not sufficient without a reason or a brief comparison between EV and AAV values.

   • Actuarial Appraisal Value (AAV) usually assigns a value to the contribution from future new business. Embedded Value (EV) does not.
   • AAV typically uses a higher discount rate than EV.
   • AAV reflects market expense expectations. EV uses more company specific expense assumptions.

(b)   Assume no change in future assumptions.

   (i)   Determine the embedded value at 31 Dec 2013. Show your work.

   (ii)   Explain what the impact on Embedded Value might be with respect to each of the following events:

      • An increase in the target RBC Ratio from 200% to 225% during 2013.
      • BWF expects a 10% reduction in expected expenses in the forecast of distributable earnings.

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10. Continued

- A transaction which replaces some of the equity capital with debt capital paying 10%.

Commentary on Question:
Candidates were generally able to list the main formulas for EV, ANW and Inforce Business Value (IBV). Some candidates became confused between PVs with annual amounts. Virtually all candidates had trouble "moving" a PV from one year to the next. The PV at the end of a prior year has the next year's annual cost and the PV at the end of the next year, assuming any cash flows are adjusted for timing.

Some candidates didn't have reasonableness checking on answers, sometimes close to doubling the EV, ANW and IBV in a year, which is clearly impossible given the data in the question.

Candidates generally did well on the statements. On the first statement some candidates confused "target" with "actual" as it is only a potential change in EV if actual surplus changes. On the second statement most candidates answered correctly.

On the third statement some candidates did not realize the original Risk Discount Rate (RDR) of 15% is the equity cost. The equity cost is NOT the quantity (RDR – After-tax Surplus Earnings) which in this case was 10% (=15%-5%). A company could pay 15% for equity or 10% for debt, so clearly debt is better to the extent debt may be substituted for equity. This concept is critical to understanding EV.

(i)   EV = Adjusted Net Worth (ANW) + Inforce Business Value (IBV)
      ANW = Required Capital (RC) + Free Surplus (FS) + Non-Admitted Assets
      IBV = PV_Book_ Profit (PVBP) – PV_Cost_of _Capital (PVCoC)

The entire calculation is about manipulating the above formulas to answer the question. Use 2012 Values to find unknowns and then recalculate for 2013.

EV_{2012}	= 5,000 as a given in the text of the question
ANW_{2012}	= RC_{2012} + FS_{2012} + Non-Admitted Assets$_{2012}$
ANW_{2012}	= 1,400 + 500 + 100 = 2,000
IBV_{2012}	= EV_{2012} – ANW_{2012} = 5,000 – 2,000 = 3,000
$PVBP_{2012}$	= 4,000 as a given
$PVCoC_{2012}$	= $PVBP_{2012}$ – IBV_{2012} = 4,000 – 3,000 = 1,000; Or
$PVCoC_{2012}$	= $PVBP_{2012}$ – (EV_{2012} – ANW_{2012}) = 4,000 – 3,000 = 1,000

10. Continued

BP_{2013} = After-Tax Income$_{2013}$ = 1,000
CoC_{2013} = $RC_{2012} * (RDR - i_t)$ = 1,400 * (0.15 - 0.05) = 140

To adjust a PV from one year to the PV of the next year, generally:
PV_n = (PV_{n-1} − Amount during $_n$ adjusted for timing to $_{n-1}$) * (1+RDR)

Alternatively:
$PV_n = PV_{n-1} * (1+RDR)$ − Amount during $_n$ adjusted for timing to $_n$

$PVCoC_{2013}$ = $(PVCoC_{2012} - CoC_{2013}) * (1 + RDR)$
= (1,000 − 140) *1.15
= 989

$PVBP_{2013} = (PVBP_{2012} - BP_{2013} / (1+ RDR)^{0.5}) * (1 + RDR)$
= (4,000 − 1,000 / (1.15)$^{0.5}$) * (1.15)
= 3,528

$IBV_{2013} = PVBP_{2013} - PVCoC_{2013}$
= 3,528 − 989
= 2,539

Note: With no new sales in 2013, IBV should generally decrease (and it does).

RC_{2013} = RC_{2012} + Increase in RC in 2013 = 1,400 + 400 = 1,800
FS_{2013} = FS_{2012} + Increase in FS in 2013 = 500 + 400 = 900

$ANW_{2013} = RC_{2013} + FS_{2013}$ + Non-Admitted Assets$_{2013}$
ANW_{2013} = 1,800 + 900 + 100   (*Non-Admitted Assets$_{2013}$ was a given*)
= 2,800

$EV_{2013} = ANW_{2013} + IBV_{2013}$
= 2,800 + 2,539
= 5,339

10. Continued

In table format (a way to track values for this kind of question):

Variable	PV_{2012}	2013	Timing	PV_{2013}
RC	1,400	400	EOY	1,800
FS	500	400	EOY	900
Non-Admitted Asset	100	0	EOY	100
ANW (= RC + FS + Non-Admitted Asset)	2,000	-------	-------	2,800
BP	4,000	1,000	Mid-Year	3,528
CoC	1,000	140	BOY	989
IBV (= PVBP – PVCoC)	3,000	-------	-------	2,539
EV (= ANW + IBV)	**5,000**	-------	-------	**5,339**

EOY = End of Year, BOY = Beginning of Year.

(ii)

- Increase in target RBC Ratio has no effect on EV. Required surplus is based on an actual amount. A target RBC ratio change only affects EV if the actual amount of required surplus changes.

- A reduction in expected expenses increases book profit and increases EV. A secondary effect is a change in EV due to the difference between valuation interest rate and the RDR.

- As equity cost is equal to the initial RDR of 15% and the debt cost is 10%, substituting debt for equity reduces the RDR and increases EV. In this case, weighted average cost of capital is reduced by substituting debt for equity.

11. **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:
(5c) Explain and describe the concept and roles of Economic Capital including:
- (iv) Identification of the significant risk components
- (v) Selecting calculation methods appropriate to stakeholder's perspectives
- (iii) Describing how a company would implement an Economic Capital Program

Sources:
Economic Capital Overview: Chad Runchey, August 2012

Economic Capital for Life Insurance Companies, SOA Research Paper, Feb 2008, Chapters 1 and 3-6

LFV-121-08: Economic Capital Modeling: Practical Considerations

Commentary on Question:
Generally, candidates did not fully answer this question. It is possible that the candidates may not have been expecting an Economic Capital question since it is a topic associated more closely with Risk Management. This is one possible reason for why the candidates did not seem prepared.

Solution:
(a) Recommend which of the following two models is more appropriate for the LTC product:

- The Cash Flow Runoff model, or
- The One Year Mark To Market model.

Justify your recommendation.

- The cash flow runoff model finds the level of assets required at the beginning of a given scenario to satisfy all the obligations through the end of the projection period. The level of required assets on all scenarios is then ranked to form a distribution. Economic Capital is defined by applying a chosen metric to this distribution (either Conditional Tail Expectation or Value at Risk) and deducting the current value of the liabilities.
    - o This method is useful if the primary interest is defined as meeting all Long-Term Care policyholder obligations over a long term horizon at a given confidence level.

11. Continued

- o This method removes all accounting elements and focuses on what amount of assets is required to meet all liability cash flows under a particular scenario for the Long-Term Care product.
- o Multi-year horizon in this method can provide a deeper understanding of risks for the Long Term Care product.
- o This method is difficult to produce given the resources (knowledgeable personnel, computer software, time required to produce results, etc.) required.
- Under the one year mark to market model, Economic Capital is the minimum market value of surplus, which is the market value of assets less the market-consistent value of liabilities, such that the probability at the end of the year is greater than zero at a high confidence level. This must be examined annually on an ongoing basis.
  - o Long Term Care morbidity and mortality emerge slowly over time and a realistic and meaningful one year shock probability distribution may be difficult to specify.
  - o This method typically excludes evaluating long-term management actions (variations in asset strategy, reinsurance strategy, raising additional capital, restricting dividends, etc.) which are available during the Long Term Care coverage period.
  - o Measures the company's exposure to market value fluctuations of assets and liabilities in the balance sheet due to shocks in risk assumptions over one year.
  - o This method is generally viewed as being easier to understand and explain, especially to non-technical audiences.

(b) Identify and describe the aspects of modeling the morbidity risk for the LTC block.

- Morbidity risk is highly dependent on plan types, definitions and exclusions.
- Trend risk addresses how future morbidity experience might evolve relating to medical advances and health care policies. Judgment is necessary in using historical statistics and experience to estimate a distribution of possible future changes in incidence rates.
- Volatility risk addresses frequency and severity of claims. Some volatility might offset over successive durations. This risk decreases as exposures increase.
- Catastrophe risk is linked to claims arising from the severe economic event or disasters impacting covered disability. The frequency and severity of claims needs to be considered as well as timing of incidence by duration.
- Uncertainty risk addresses past experience not being representative of future assumptions. Impact of prior losses due to pricing mistakes must be considered.

11. Continued

(c) LWS's Chief Financial Officer has made the following statements:

(i) *"The LTC Economic Capital models used by LWS should be based on stochastic analysis."*

(ii) *"Since Economic Capital is greater than the capital reported in the GAAP balance sheet, the capital held by LWS is adequate."*

Critique each statement.

(i) Points to consider for the statement "The LTC Economic Capital models used by LWS should be based on stochastic analysis" are as follows:
- Stochastic analysis is done by projecting future cash flows based on multiple scenarios for which probability distributions are defined.
- The stochastic liability runoff approach brings in all risks during the runoff as well as all actions available in an integrated and interactive way, but it is difficult to incorporate all possible actions.
- Stochastic analysis may be more useful for evaluating interest rate risk as calibrating interest rate scenarios for stress tests is difficult.
- Stress test analysis is done by projecting future cash flows based on a set of particular scenarios that occur in the tails, but probabilities might not be specified.
- If primary risks cannot be reliably represented by probability distributions then the types of scenarios that cause losses need to be identified in a stress test analysis. If a confidence level is needed, the occurrence probability of the stress scenarios can be estimated by actuarial judgment.
- The one year mark to market often relies on deterministic adverse scenario analysis to examine longer terms risks and their management.
- Calibrating appropriate stress tests to a target level can be challenging, particularly where risk interactions exists.

(ii) Points to consider for the statement "Since Economic Capital is greater than the capital report in the GAAP balance sheet, the capital held by LWS is adequate" are as follows:
- Under the runoff approach, Economic Capital is the total asset requirement at a given confidence level such that the asset cash flows runoff the liabilities over the projection horizon. Economic Capital is the total asset requirement (TAR) less the value of the liabilities.
- Under the one year mark to market approach, Economic Capital only makes sense in a market value balance sheet where a company's exposure to market value fluctuations of assets and liabilities are analyzed

11. Continued

- In both cases, they are different measures of risk and not directly comparable to GAAP capital, which has different rules for measuring assets and liabilities. They are designed for different purposes and audiences. Economic Capital may not measure all risks that capital is intended to cover.
- What is important is comparing the total asset requirement under the chosen Economic Capital method with assets the company holds on the same accounting basis.