CSP-IU Model Solutions
Spring 2012

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:

(5b) Explain and distinguish the roles of capital from the perspective of capital, from the perspective of regulators, investors, policyholders and insurance company management.

(5c) Explain and apply the concepts, approaches and methods for determining Economic Capital.

- (i) Identification of the significant
- (ii) Selecting calculation methods appropriate to stakeholder's perspective
- (iii) Describing how a company would implement an Economic Capital program.

Sources:

Multi-Stakeholder Approach to Capital Adequacy (exc. Appendix)

Commentary on Question:

This question tested the candidates' understanding of the differing perspectives and needs of various stakeholders in determining capital adequacy and of a technique that integrates those perspectives.

Solution:

(a) Explain why the FRRRT approach might be useful to ABC for assessing capital adequacy.

Commentary on Question:

Areas where candidates performed well:

- Stating that a multi-stakeholder approach is required
- Recognizing regulators and rating agencies have different objectives
- Stating the 3 dimensions: financial variables, risk threshold, time horizon
- Importance of thresholds and recognizing the consequences of a rating downgrade

1. Continued

Common errors/omissions:

- Not identifying and discussing stakeholders other than regulators and rating agencies
- Not stating FRRRT requires measurement across the 3 dimensions and is a tool to rank priorities

Why the FRRRT approach might be useful to ABC for assessing capital adequacy:

- Capital adequacy management requires balancing sometimes conflicting requirements and objectives
- Economic and regulatory capital metrics typically reflect the risk tolerances, horizons, and preferences of specific, but not all, stakeholders
- With respect to capital, stakeholders are concerned with different financial variables, time horizons, and risk tolerances
- FRRRT evaluates capital adequacy across these 3 dimensions and is a tool to rank priorities
- With respect to time horizon, risks interact differently over time. Risks correlate and diversify differently over various time horizons. Capital adequacy as function of time may change
- Capital adequacy process must align needs of primary stakeholders of ABC
- ABC is experiencing rapid growth, and capital needs will change over time

(b) Identify and explain the steps for implementing the FRRRT.

Commentary on Question:
Areas where candidates performed well:

- Recommending dynamic/stochastic model
- Stating that distribution of results by financial variable, risk threshold, and time horizon is required

Common omissions:

- Not listing all 4 steps
- Not stating that process is iterative
- Not stating that results are presented in matrix form by financial variable, risk threshold, and time horizon
- Not stating need to map estimated point of downgrade point to CAR threshold

Step 1

- ABC needs a dynamic (stochastic) model to project the distribution of financial variables over 5 years.

1. **Continued**

- Calculate a distribution of results for each financial variable, risk threshold, and time horizon combination.
- ABC will evaluate RBC and CAR over each of the 5 future years, resulting in 10 separate estimates of capital
- ABC needs to map the estimated point of a downgrade to a CAR threshold.

Step 2

- Use model to calculate the probability of each of the financial variables falling below the risk threshold quantity in each year

Step 3

- Determine the probability of the company's S&P rating transitioning from the current rating to a rating at or below the mapped threshold, using external financial rating transition matrices to develop the probabilities

Step 4

- Iteratively adjust current capital to the point where the probability of falling below the risk threshold (step 2) in the projections equals the probability of the rate transitioning to a worse level in the transition matrices (from step 3).
- Repeat for all financial variable, risk threshold, and time horizon combinations
- A matrix of capital sufficiency/deficiency by time period and financial variables summarizes the results.

2. Learning Objectives:

6. The candidate will be able to integrate data from various sources into model office and asset/liability models.

Learning Outcomes:

(6c) Explain limitations of models and possible sources of error:
- (i) Quality of data
- (ii) Granularity of the model

Sources:

ILA-C114-07: Life Insurance Forecasting & Liability Models (exclude appendix)

Commentary on Question:

Commentary listed underneath question component.

Solution:

(a) Define the following with respect to forecast model validation:
- (i) Known Error Measurement
- (ii) Unknown Error Measurement

Commentary on Question:

This section was well answered by most candidates.

(i) Known error just means deviation between model and a known quantity

(ii) Unknown error arises from model simplification

(b) Define static and dynamic validation of models, and list their advantages and disadvantages.

Commentary on Question:

This section was well answered by most candidates.

Static validation compares known and modeled values as of the date from which the model projects, e.g. compare annualized gross premiums, face amount and reserve. It is analogous to a balance sheet validation.

Advantages of static validation are that if results compare favorably, the model can be trusted and if results do not compare favorably, we can be certain that there is a problem with the model.

Disadvantages of static validation is that a ratio of 1 does not guarantee a perfect model, the validation ratio only looks at one point in time and only one variable, it fails to capture the effect of interaction among variables.

2. Continued

There are two types of **Dynamic validation.** Prospective compares trend in actual historical with model's projected results and retrospective starts with current portfolio and runs model backward through time. It is analogous to an income statement validation.

Advantages of dynamic validation are that it is more robust than static and looks at many assumptions at once and their interaction.

Disadvantages of dynamic validation are that it is not always possible and reliable, historical data is not always available.

(c) Analyze the results and recommend a model simplification. Justify your recommendation.

Commentary on Question:
In general, the candidates did not give enough details on their calculation steps and did not specify well why they rejected each model; they only focused on the one that they suggested. Most of the candidates did not average the two components to derive the known and unknown errors.

Error = (Base Value – Model Value) / Base Value
Must use absolute value
Take average of premium and stat reserve for average unknown error
Take average of PV profits and value-based reserve for average unknown error

ERRORS	Annual Premium	Current Statutory Reserve	Average Known Error	Present Value of Future Profits	Value-Based Reserve	Average Unknown Error	Annual Savings ($)
Base	-	-		-	-		-
Scenario 1	2.0%	2.4%	2.2%	2.2%	1.9%	2.1%	0.80
Scenario 2	1.0%	2.0%	1.5%	1.7%	1.9%	1.8%	1.60
Scenario 3	9.0%	7.0%	8.0%	10.0%	7.1%	8.5%	1.80
Scenario 4	0.4%	1.0%	0.7%	15.0%	11.9%	13.5%	3.20
Scenario 5	0.0%	2.5%	1.3%	1.7%	2.4%	2.0%	2.88
Scenario 6	0.0%	3.0%	1.5%	3.3%	4.3%	3.8%	3.39

2. Continued

Model 1
Fairly accurate, introducing only a 2% error rate
Cost savings are only 10%, therefore giving up a fair amount of accuracy for only 10%

Model 2
Substantial savings (20%) for less than 2% error rate
Shows that a large number of age bands doesn't necessarily lead to a better model

Model 3
Very large error
Follow the more common pattern that the fewer the age bands the more the error

Model 4
Data count dramatically reduced leads to large savings
But not worth the savings when results would lack credibility

Model 5
Known error is now 0
Give away very little on unknown error
1.28M in additional savings

Model 6
Only 0.5M in additional annual savings
Error rates are doubled

Recommend model 5
Highest savings
Low error rates

3. Learning Objectives:

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

Learning Outcomes:

(3a) For traditional and financial reinsurance, explain the consequences and evaluate the effect on both ceding and assuming companies with respect to:
- (i) Risk transfer
- (ii) Cash flow
- (iii) Financial statement presentation
- (iv) Tax impact, and
- (v) Reserve credit requirements.

(3b) Describe the considerations and evaluate the appropriate reinsurance form from the ceding and assuming company perspectives.

Sources:

Life and Health Reinsurance, Chapter 5 and 6

Stochastic Analysis of Long Term Multiple-Decrement, Contracts, Clark and Runchey, January 2008 (Excluding Appendices)

ERM Specialty Guide, Chapters 1-6

Commentary on Question:

Commentary listed underneath question component.

Solution:

(a) For each method:

(i) Explain the allocation of risk between reinsurer and ceding company if the net amount of risk decreases.

Commentary on Question:

This part (a) tests the understanding of the calculation of the reinsurance retention on a YRT reinsurance basis using the three methods of Pro Rata, Level/Constant Retention and Constant Risk Reinsured.

1. For Pro Rata the net amount at risk (NAR) is a constant proportion between the ceding company and the reinsurer. As the NAR decreases both the ceding company and the reinsurer share in the decrease in the same constant proportion.
2. For Level/Constant Retention all of the NAR decrease is allocated to the reinsurer

3. Continued

3. For Constant Risk Reinsured the ceding company absorbs the decrease in the NAR.

(ii) Calculate the amount retained by the ceding company at time 5. Show all work.

1. Pro Rata
   NAR(5) = Face − Reserve(5) = 100,000 − 25,000 = 75,000
   Constant Percent Reinsured = 80,000/100,000 = 80%
   Retained amount at time 5 = 100,000 − .8 × 75,000 = 40,000
2. Level/Constant Retention
   Retained amount at time 5 = Retained amount at time 0
   = 100,000 − 80,000 = 20,000
3. Constant Risk Reinsured
   Retained amount at time 5 = Face − Reinsured Amount at time 5
   = 100,000 – 75,000 = 25,000

(b) Comment on the appropriateness of each statement from Random Life's perspective and recommend changes needed before is finalized.

Commentary on Question:
This part (b) tests the understanding of what provisions are appropriate to be in a reinsurance treaty.

(i) Neither party may unilaterally terminate the existing reinsurance agreement. Either party may terminate the treaty with respect to new business upon proper notification.

This provision is appropriate but a termination option should be added in the event of failure of the ceding company to pay premiums or the reinsurer to pay claims.

(ii) Active lives are recaptured, disabled lives are not recaptured.

This provision is not appropriate as all risks should be recaptured.

(iii) Once the recapture process has begun, the ceding company may not stop it.

No change is needed as this provision is appropriate.

(iv) If the reinsurer raises rates, Random Life has the right to recapture and seek reinsurance with another company.

No change is needed as this provision is appropriate

3. Continued

(v) Recapture is required if Random Life becomes insolvent.

This provision is not appropriate as it is discouraged by regulators.

(c) Explain the results of the model.

Commentary on Question:
This part (c) tests the understanding of how reinsurance impacts the costs flowing between the ceding company and the reinsurer.

If claims are below the 90^{th} percentile of the claim distribution, premiums paid to the reinsurer are greater than the claims received by the ceding company, which has a negative impact on the ceding company's asset balance.

If claims are above the 90^{th} percentile of the claim distribution, premiums paid to the reinsurer are less than the claims received by the ceding company, which has a positive impact on the ceding company's asset balance.

(d) Explain how the use of reinsurance is reflected in each of the following four themes of the ERM process as discussed in the ERM Specialty Guide:
(i) Risk Control
(ii) Strategic Risk Management
(iii) Catastrophic Risk Management
(iv) Risk Management Culture.

Commentary on Question:
This part (d) tests the understanding of how reinsurance impacts the Risk Management process.

(i) Primary objective of Risk Control is to maintain the risks that have been retained by the enterprise at levels that are consistent with the company risk appetite. Risk is transferred through the reinsurance process.
(ii) Strategic Risk Management is the process of reflecting risk and risk capital in the strategic choices that a company makes. Potential reinsurance programs can be evaluated against other strategic options in economic capital, in risk adjusted pricing and in capital budgeting.
(iii) Catastrophic Risk Management is the process of envisioning and preparing for extreme events that could threaten the viability of the enterprise. Through trend analysis and stress testing, the impact of events on the company is identified with and without reinsurance. Reinsurance is used to transfer the catastrophic risk.
(iv) Risk Management Culture is the general approach of the company to dealing with its risks. A positive Risk Management Culture incorporates ERM thinking into all decision making. Reinsurance is reflected in risk assessment as potential reinsurance is considered.

4. 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) Describe the MCCSR/RBC regulatory framework and the principles underlying the determination of Regulatory RBC.

(5c) Explain and apply the concepts, approaches and methods for determining Economic Capital.

Sources:

ILA-C121-08: Economic Capital Modeling: Practical Considerations

A Multi-Stakeholder Approach to Capital Adequacy

Economic Capital for Life Insurance Companies.

Commentary on Question:

The goal of the question is for the candidate to demonstrate that they understand the role of capital and the considerations of building an Economic Capital model. For part (a), the candidate is required to demonstrate knowledge of the role of RBC. In part (b), the candidate should consider whether each statement is valid and also whether alternatives exist to the given suggestions; the candidate should explain why the company may want to consider other alternatives.

The candidates did relatively well on this question, but could have provided more details, more justification

Solution:

(a) Evaluate each of the statements:

(i) "The purpose of RBC is to provide a "cushion" that will enable a company to survive over the short term"

Generally a correct statement
Purpose of RBC is a tool for regulators to identify weakly capitalized companies
RBC focus on risk that were an immediate threat to solvency

Factors are based on providing enough capital to absorb PV of greatest loss over the limited projection horizon for given risk

4. Continued

(ii) "RBC should not be used as the sole basis for determining Magnificent's target surplus"

Generally a correct statement
RBC is a minimum capital threshold
It is not company specific
Many companies set target surplus as multiples of RBC
RBC calculations are not intended to be precise; it is only a screening mechanism
Target surplus should be designed to meet needs of multiple stakeholders – regulators, policyholders, investors, agencies

(iii) "Even if Magnificent's RBC ratio falls to 140%, Magnificent is in good shape financially"

Incorrect
RBC between 100% and 150% falls into the Regulatory Action Level
Triggers the commissioner to issue an order specifying corrective actions to be taken

(b) Evaluate each of the statements:

(i) "We should use Value at Risk (VaR) to measure our risk because it is adequate from our shareholders' perspective"

The company should also consider Tail VaR or CTE, they are better at measuring low frequency high severity events, because it takes into account the shape of the tail of the distribution
From shareholder point of view VAR is adequate because once the net worth has been exhausted, they have lost the value of their shares and are not interested in the severity of further loss, but from the regulator point of view, the severity of losses is significant, because it will determine the losses to policyholders
VaR is however simple to use and understand and is widely known in the banking industry and in Solvency II in Europe

4. Continued

(ii) "Since life insurance liabilities have long-term risk exposure, it is best to use a multi-year liability runoff approach"

The company should also consider using a one year time horizon, it can help the company avoid complex and time consuming stochastic modeling, most regulators appear to be in favor of the one year time horizon, it is easier to explain, easier to include new business and it takes into account management actions (such as raising capital and hedging of risks). Runoff approach can give deeper understanding to long term liabilities, but may ignore management actions to some extent.

(iii) "The Economic Capital model will consider all of our risks and allow us to always have much lower capital requirements due to the diversification effect."

It is not always true that the capital requirements will be lower since some risks may not be independent. Risk correlations can behave differently in extreme scenarios. The company may want to use copulas to model dependency between risks. Rating agencies have been skeptical about giving full credit for diversification.

5. Learning Objectives:

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

Learning Outcomes:

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

Sources:

Embedded Value: Practice & Theory, SOA, Actuarial Practice Forum, 2009

Commentary on Question:

Commentary listed underneath question component.

Solution:

(a) Identify the similarities and differences between AAV and EV.

Commentary on Question:

Generally this section was reasonably well answered - those that fared poorly simply did not list enough points

Similarities

- Both discount future cash flows
- Both consider the in-force business and required capital

Differences

- -AAV considers new business, EV does not
- -AAV expense assumptions are more market-oriented, EV's are more Company specific

(b)

(i) Identify each of the following statements as a characteristic of the explicit or implicit recognition of debt:

Commentary on Question:

The average for this section was approximately that of a random selection of the two elements.

5. Continued

1. Can be expanded to include other sources of capital

   Implicit (either accepted)

2. Risk discount rate is the weighted average cost of capital

   Implicit

3. Spread over the after-tax rate of return on invested assets is used

   Explicit

(ii) List the conditions that need to be satisfied for the results of the two methods to be identical.

Commentary on Question:
Candidates that did poorly simply did not provide the proper criteria.

Conditions for explicit to equal implicit
- Fair values for equity and debt are used in the weighted average cost of capital
- Debt stays at a constant percentage of the present value of distributable earnings throughout the projection period

(iii) Recommend a method for recognition of debt if only the book values of debt and equity are available and the value of debt is expected to fluctuate. Justify your recommendation.

Commentary on Question:
A number of candidates who did poorly listed points without making a recommendation or, similarly, made a recommendation without listing any justification.

Explicit recommendation of debt is recommended
- Due to the fluctuation in the value of debt
- Because implicit recognition requires the fair values of debt and equity

5. Continued

(c) Calculate the target IBV for 2011. Show all work.

Commentary on Question:
This was generally well answered. Those who did poorly typically only wrote down one or two parts of the solution. A number of candidates skipped this section.

Target IBV(t) = NB EIBV(t) + IFB EIBV(t)
NB EIBV(t) = VNB(t) × (1+RDR)^.5 − BP(t)
= 10,000 × (1.05^.5) − 2000
= 8,247
IFB EIBV(t) = [IBV(t−1) × (1+RDR)−BP(t)] + [(RDR−i(t)) × RC(t−1)]
IFB EIBV(2011) = [250,000 × 1.05−8000] + [(.05−.03) × 30,000]
= 255,100
Then Target IBV(2011) = 255,100 + 8247 = 263,347

6. Learning Objectives:

7. The candidate will be able to evaluate risks faced by a Company by virtue of the Company's products, assets and management strategies and practices and be able to evaluate the appropriateness of various methods of risk mitigation.

Learning Outcomes:

(7a) Identify, categorize and evaluate potential sources of risk in products including but not limited to mortality, morbidity and lapse.

(7c) Describe and evaluate the other risks an insurance company faces including operational, marketplace and expense risks.

(7e) Describe and apply methods of risk mitigation and hedging and to understand the limitations of such methods.

Sources:

ERM Specialty Guide

ILA-C124-10: S&P's Insurance Criteria: Refining the Focus of Insurer ERM Criteria

ILA-C116-07: Mapping of Life insurance risks

Commentary on Question:

The question was attempting to test general knowledge of ERM, application of risk management to a specific product and then to a specific event in a company. The question had a relatively even mixture of retrieval (a), comprehension (b) and knowledge utilization (c).

Solution:

(a) List and explain four objectives for pursuing ERM.

Commentary on Question:

Most candidates reasonably described several objectives of ERM. Some candidates saw just the "R" for Risk and focused solely on describing lists of risks rather covering Enterprise Risk Management. A few candidates wrote little more than four short lines and skipped the explain portion.

Want four of the following six objectives that organizations hope to achieve with ERM:

1. Competitive Advantage
   - ERM treats all risks as a combined portfolio and manages them holistically, instead of as independent risks.
   - Holistic approach agrees with Modern Portfolio Theory, where a reasonably safe portfolio may be constructed even if it contains a number of uncorrelated high-risk investments.

6. Continued

- ERM passively engages risk controls and actively pursues risk optimizations, further translating into value creation.

2. Strategic Goals
   - Organization needs both offensive and defensive strategies.
   - Organization needs to understand risk it is accumulating as being a market pioneer (early to market) might pave the way to being a market leader (no example to follow).
   - ERM can influence strategies by identifying opportunities and risks.
   - ERM provides a way for senior executives to translate vision into sound strategies.
   - Organizational effectiveness can be maximized by aligning ERM resources and actions with strategies.
   - Risk process can be carried out in context of where organization is headed, rather than just where it is today.

3. Shareholder Value
   - ERM can help organization achieve its objectives and maximize shareholder value.
   - Risk management supports overall economic growth by lowering cost of capital and reducing uncertainty.
   - Organizations that develop ERM process for linking critical risks with strategies can add value for shareholders.

4. Transparency of Management (Reduction of Agency Costs)
   - ERM involves setting risk appetite and policy, determining organizational structure, and establishing corporate culture and these tasks are closely allied to the work of the board.
   - With ERM in place, risk appetite and policy and corporate culture and values can more easily be communicated to employees
   - Senior executives with a significant portion of wealth tied to stock and options have an interest in the success of these incentives, results in alignment of management and shareholder interests.
   - Risk management provides managers with job security and protects their financial interests, which reduces agency costs.

5. Decision-Making
   - Senior managers need to evaluate business opportunities based not only on total returns, but also on risk-adjusted returns.
   - ERM requires integration of risk management into the processes of an organization.

6. Continued

- ERM is not just a defensive approach used to control downside risk and earnings volatility. It is also an offensive weapon used to support and influence pricing, resource allocation, and other decisions.

6. Policyholder as Stakeholder
   - Issuer normally incurs investment costs at issue and needs to keep policies inforce to help recover costs.
   - ERM improves risk transparency for regulators and ratings agencies.
   - Timely and effective communication and reporting assures policyholders that appropriate risk management strategies are in effect.
   - Policyholders will have more confidence in organization's ability to meet future obligations and are less likely to lapse.

(b) Lake Shore Life offers a variable annuity product with a GMDB (Guaranteed Minimum Death Benefit). The company currently monitors changes in account values caused by volatile equity markets.

Commentary on Question:
Many candidates did not seem to fully understand what a Guaranteed Minimum Death Benefit (GMDB) rider is when sold as a rider on a deferred variable annuity and then answered with lists of risks that were either not relevant to this product (e.g. underwriting) or contrary to the product (e.g. longevity, disintermediation). It is important to tailor the answer to the product being discussed as different risks apply to different products.

For monitoring, many candidates overemphasized hedging and underemphasized simpler reporting that is readily available. GMDB benefits are frequently not hedged. Monitoring is designed to illuminate any developing problem, not necessarily to solve it.

(i) Identify and explain other risks associated with this type of product.

1. Product design risk – Fees should cover benefits, expenses and profit.
   - If equity return↓ then AV↓ Fees↓ Benefits↑ Profits↓. GMDB has equity market risk.
   - Mortality is considered not correlated with equity returns. GMDB has mortality risk.
   - GMDB has minimal or no: underwriting, longevity, interest or disintermediation risk.

6. Continued

2. Policyholder behavior risk
   - Lower partial withdrawals and lapses may increase or decrease gains depending on product design and market situation.
   - Behavior risk from benefit election rates and asset allocation choice.
   - Insufficient experience exists for most products of this type to provide much assumption-setting guidance.

3. Risk modeling risks
   - Models are not as robust as reality and investment alternatives available to the policyholder may have variations that are too complex to model.
   - Financial markets do not always behave as modeled.

4. Financial reporting risk
   - Short-term financial statement recognition of gains and losses may be different between embedded policy options and hedges
   - Gains and losses from hedging program that are based on market values or economic value of risk may have financial statement treatment that is different from embedded policy options

5. Large variable annuity losses may arise from:
   - Significant underpricing of guaranteed benefits
   - Failure to offset or hedge embedded options exposing organization to losses above risk tolerance.
   - Product designs that cannot be hedged.
   - Failure to recognize the potential volatility of revenue streams based on equity portfolio value can lead to losses.

(ii) List additional ways the company can monitor its equity risk.

Other potential items to monitor:
- Amounts of guaranteed benefits outstanding
- Degree to which potential risks of underlying base revenues are hedged
- Degree to which guaranteed benefits are hedged
- Sources of gains and losses
- Benefits categorized by level of in-the-moneyness
- Volumes of policies in extreme situations due to uneconomic base policy provisions
- Asset allocations
- Metrics such as VaR, CTE, and various sensitivities through the “Greeks”

6. Continued

(c) Lake Shore Life recently experienced a large systems failure, which led to numerous customer complaints. Recommend a plan of action to help the company control these types of risks in the future.

Commentary on Question:
Most candidates answered this section reasonably well and higher scores were available if the answer was tailored to the specific issue mentioned. Some candidates mentioned outsourcing or reinsurance, which were both inappropriate actions for this much more immediate situation.

1. Risk Identification - Use company or industry experience to identify risks
   - May use top-down (risk management staff, operational management) and bottom-up processes to identify risks
   - Focus on highest priority risks depending on severity of exposure and resources available

2. Risk Monitoring – Use key risk indicators (such as transaction counts, expected loss) that are summarized and reported to management

3. Risk Limits and Standards – Establish and document standards of company practice for each risk
   - Perform training on standards and then monitor compliance with the standards

4. Risk Management – Identify a high-level manager to own each risk; manager is responsible for reporting successes and failures as well as identifying weaknesses for future improvement
   - A compliance officer may be appointed
   - Document IT strategy and procedures, as well as checks on systems security, data integrity, new systems testing, backup facilities
   - Develop a policy for data access, distribution and communication security
   - Establish plans to provide service continuity under a wide range of business disruption scenarios
   - Practice emergency scenario testing of business continuity disruptions
   - Establish procedures to minimize impact of computer viruses on the company's operating environment
   - Identify sources and consequences of possible reputation risks; will crossover with other risk areas
   - Establish crisis management procedures, including media training

6. Continued

5. Risk Learning - Analyze the losses from this incident and identify the causes of it
    - Use lessons learned from this incident to update procedures

7. Learning Objectives:

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

Learning Outcomes:

(2c) Calculate liabilities under U.S. statutory, U.S. tax, U.S. GAAP, and DAC assets under U.S. GAAP for the following products:

- (i) Traditional life insurance
- (ii) Term life insurance
- (iii) Universal life insurance
- (iv) Universal life insurance with secondary guarantees
- (v) Deferred annuity
- (vi) Payout annuity
- (vii) Variable annuity with guaranteed minimum death benefits
- (viii) Variable annuity with guaranteed living benefits
- (ix) Equity-indexed annuities
- (x) Equity-indexed life insurance
- (xi) Variable life insurance with guaranteed minimum death benefits
- (xii) Riders

Sources:

US GAAP For Life Insurers

Commentary on Question:

The question was trying to test basic formulas for FAS 97 DAC and SOP reserve.
It was a very straightforward question with minimal math.
Many candidates ignored the given that all values were already PV'd to time 0. A simple reading of the directions would have gotten more candidates more points.

Solution:

(a) Calculate the total DAC balance at the end of Year 1.

K% for DAC = PV (Deferrable Expenses / Commissions) / PV (EGPs) where PVs are discounted at the credited rate.

In this case, K% = (900 + 200) / (600 + 500 + 400 + 700) = 50% - no need to discount any of the given numbers since everything is already discounted to issue.

DAC = K% X PV(EGPs) – PV (Deferrable Expenses)

DAC(EOY 1) = 50% × (500 + 400 + 700) * (1.05) – 200 * 1.05 = 630 – all given values are as of issue so you need to accumulate values ahead one year to get end of first year values

7. Continued

(b) Calculate SOP 03-1 liability at the end of Year 1.

Benefit Ratio % for SOP = PV (Benefits) / PV (Assessments) where PVs are discounted at the credited rate.

In this case, BR% = (200 + 200 + 300 + 500) / (1000 + 800 + 600 + 600) = 40%

SOP = PV (Benefits) − BR% X PV(Assessments)

SOP(EOY 1) = [(200 + 300 + 500) − 40% × (800 + 600 + 600)] * (1.05) = 210

(c) Calculate the impact of retrospective unlocking on the Year 2 Total DAC balance.

If second year EGP is zero, new K% = (900 + 200) / (600 + 0 + 400 + 700) = 64.7%.

DAC = K% × PV(EGPs) − PV (Deferrable Expenses)

Original DAC(EOY2) = 50% × (400 + 700) * (1.05)^2 – 0 = 606.38

New DAC(EOY2) = 64.7% × (400 + 700) * (1.05)^2 – 0 = 784.72

DAC unlocking is 784.72 − 606.38 = 178.34

(d) Calculate the impact of the prospective unlocking on the SOP 03-1 liability.

Investment income is part of assessments so increase to assessments is 100 per year in the last 2 years.

BR% = (200 + 200 + 300 + 500) / (1000 + 800 + 700 + 700) = 37.5%

Original SOP(EOY 2) = [(300 + 500) − 40% × (600 + 600)] * (1.05)^2 = 352.80

New SOP(EOY 2) = [(300 + 500) – 37.5% × (700 + 700)] * (1.05)^2 = 303.19

SOP unlocking is - 49.61.

Ignoring the interrelationship between the change in SOP and EGPs for simplicity.

8. Learning Objectives:

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

Learning Outcomes:

(1h) Develop, use and recommend methods for performing actuarial reviews of reserves

Sources:

ASOP 10 – Methods & Assumptions for Use in Life Insurance Company Financial Statements Prepared in accordance with GAAP

Actuarial Review of reserves and related annual statement Assets and Liabilities

ASOP 21 – Responding to or Assisting Auditors or Examiners in connection with Financial Statements for all practice areas.

Commentary on Question:

This question was testing the ability of the candidate to analyze data in financial statements of US life insurance companies, and specifically to develop, use and recommend methods for performing actuarial reviews of reserves.
The cognitive level of the question was basic recall of information, with some analysis. This question awarded the majority of points for coming up with a "list" on all parts. However to get a maximum score some explanation was necessary.
Part (a) was fairly straightforward. Most candidates knew to use company specific data, and if not available, to use industry data instead. Most candidates did not comment on having assumptions be specific to the particular product or line of business being valued.
Part (b) was more of a "list" question and most candidates were able to comment on at least one or two items from the list. This indicated that even those who did not score well were aware of what material they needed to recall, but they just weren't able to recall more than one or two items from the list.
In part (c) most candidates mentioned that the responding actuary must respond in a reasonable timeframe, and they listed at least some of the items used in coming up with the assumption basis that the responding actuary must be prepared to discuss. However, most candidates did not comment on the need for the responding actuary to discuss known circumstances that had a significant effect.

Solution:

(a) Describe guidance in ASOP 10 (Methods and Assumptions for Use in Life Insurance Company Financial Statements Prepared in Accordance with GAAP) for:

(i) Best Estimate Assumptions

8. Continued

The best estimate assumption should be reasonable and reflect the most likely outcome of events. Given two assumptions deemed equally likely, select the one that produces the larger liability or the smaller asset.

Items to consider:

- Characteristics and magnitude of company's business
- Maturity of company and growth rate
- Prior experience and trends
- Medical, economic, social, technological developments

The assumptions in total reflect all pertinent areas of expected future experience and are specific to the product or line of business being valued. Assumptions should be comprehensive and internally consistent. Consider all available pertinent data. Data should be company specific, if available. If not available, consider industry data or data from similar companies and adjust as appropriate.

(ii) Best Estimate Assumption with Provision for Adverse Deviation.

Consider the degree to which each assumption is subject to risk in total and at each future duration in setting the PfAD. The PfAD should be reasonable.

Consider the PfAD relationship to the best estimate. The GAAP net premium should not be larger than the gross premium after the PfAD is applied.

Also, the aggregate net GAAP liability with PfAD should be equal to or exceed the aggregate net GAAP liability without the PfAD.

(b) The company is partially through audit planning with a clear understanding of the objective and planning the review in advance. Explain the remaining principles common to any audit or audit plan.

Write down all questions, issues and concerns then resolve them as the review progresses. Immateriality is a form of resolution.
Sampling principles:

- Smaller than statistically significant samples may be used since the review process does not allow all elements to be fully explored.
- With the objective of discovering important errors, pay attention to the following:

8. Continued

- New plans, new benefits, new assumptions or methods, recent changes of processes or systems.
- Stratification of the sample so that to the greatest extent possible, all significant methods and procedures used in obtaining aggregate results are being tested.

If the review is periodic, the prior review should always be referenced, because:

- It can serve as a guide to planning the current review.
- It can point out where errors were made in the past and where certain components of the current review should be directed. Follow up on corrective action recommended.

If the review is of sufficiently grand scale, the customer should choose a counterpart to the reviewing actuary through whom to funnel questions and answers.

If reviewing numerical accuracy, reviewer should have physical possession the item or document he is "checking to."

Leave no links of the assembly trail untested. Check reserves in total back to individual policies and forward to financial statement figures.

In writing up the report of the review, certain principles apply:

- Present a brief description of the review processes used.
- Describe the nature of the operation being reviewed.
- If periodic, the review report should be consistent with prior reports.
- Customer should be permitted to review the first draft prior to finalization for feedback:
  - To confirm the facts as stated in the report.
  - Even if the facts are correctly stated, there may be reasons for the customer's approach.
- State all observations and recommendations in specific and measurable terms.

(c) Outline the actuary's response to the auditor using the guidance of ASOP 21 (Responding to or Assisting Auditors or Examiners in Connection with Financial Statements for All Practice Areas).

The responding actuary must be respond to reasonable requests in a timely manner. This includes requests for relevant information such as data, analyses, and sample calculations.

The responding actuary should be prepared to discuss:

- Data used
- Source of prescribed assumptions, if any
- Methods used
- Basis for assumptions that are not prescribed assumptions.

8. Continued

The responding actuary should also be prepared to discuss known circumstances that had a significant effect:

- Changes in operating environment
- Trends in experience
- Product or plan changes and changes in product mix or demographic mix
- Changes in the entity's methods, policies, or procedures or in statutory valuation bases
- Compliance with relevant new or revised accounting rules, laws and regulations or other government promulgations

9. Learning Objectives:

1. The candidate will understand basic 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 issued by U.S. life insurance companies.

Learning Outcomes:

(1a) Construct the basic financial statements for a life insurance company under U.S. GAAP and Statutory accounting methods and principles.

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

(2c) Calculate liabilities under U.S. statutory, U.S. tax, U.S. GAAP, and DAC assets under U.S. GAAP for the following products:
- (i) Traditional life insurance
- (ii) Term life insurance
- (iii) Universal life insurance
- (iv) Universal life insurance with secondary guarantees
- (v) Deferred annuity
- (vi) Payout annuity
- (vii) Variable annuity with guaranteed minimum death benefits
- (viii) Variable annuity with guaranteed living benefits
- (ix) Equity-indexed annuities
- (x) Equity-indexed life insurance
- (xi) Variable life insurance with guaranteed minimum death benefits
- (xii) Riders

Sources:

US GAAP for Life Insurers

Commentary on Question:

The question was meant to lead the candidate through a discussion of shadow adjustments, first in general purpose, then in a theoretical approach, then in a specific situation with actual values. Note the correct calculations are very simple.
The question involved a little retrieval in (a) and mostly comprehension in (b) and (c).

Solution:

(a) Explain the purpose of the FAS 115 shadow adjustments.

9. Continued

Commentary on Question:
Most candidates understood the asset-only side of the SFAS 115 adjustment, fewer the effects on actuarial items like reserves and DAC. Some candidates did not understand the effect is on shareholder equity, not income even though the adjustment may flow through Other Comprehensive Income (OCI).

1. SFAS 115 requires that Unrealized Holding Gains and Losses (UHG&Ls) on Available for Sale (AFS) assets be recognized in a separate component of shareholder equity.

2. SFAS 115 requires that this separate component of shareholder equity also recognizes what the collateral effects would be on actuarial items (Reserves, DAC, etc.) if AFS assets were sold on the statement date, realizing any unrealized gains to avoid confusing users of GAAP financial statements with an otherwise distorted presentation.

3. These collateral effects are referred to as shadow adjustments.

(b) According to *US GAAP for Life Insurers*, there are 6 primary shadow adjustments that a U.S. life insurance company may need to calculate. Outline the theoretical approach for determining the adjustment and the impact that the adjustment has on shareholder equity for each adjustment that Sunset needs to calculate.

Commentary on Question:
Most candidates described some form of a theoretical approach to determine the adjustments. Some candidates mistakenly described DAC unlocking in some form, a few in intricate detail. The question was deliberately vague as to what kind of adjustments might be needed in this case (eliminating most of them in the assumptions section) and most candidates focused on a shadow DAC adjustment solely.

<u>Deferred annuities need a shadow DAC adjustment</u>

1. Recalculate DAC as if realization of UHG&Ls on AFS assets had taken place on the statement date. Call it DAC′.
2. Recalculation involves using the same modeling approach, methodology, and assumptions as those used for the primary DAC used in the GAAP income statement, with the addition of the following:
   - Current period gross profits are adjusted to include direct effect of UHG&Ls.
   - Future gross profits are adjusted to include direct effect of UHG&Ls.
3. Shadow DAC adjustment equals DAC′ minus DAC.
4. Adjustment↓ Shareholder Equity↓ the two are directly related.

9. Continued

Deferred annuities and Payout annuities need shadow loss recognition adjustment

1. Determine incremental effect on future GAAP book profits as if UHG&Ls on AFS assets had been realized
2. If the impact results in future book losses, shadow loss recognition is amount of additional reserve needed to eliminate future losses, floored at zero.
3. Shareholder equity is reduced by any positive shadow loss recognition adjustment.
    - No other shadow adjustments are required

(c) Calculate Sunset's FAS 115 shadow adjustments for the current year end, assuming that Sunset uses the alternative (weighted-average amortization percentage) approach instead of the theoretical approach to calculate the shadow DAC adjustment. Show all work.

Commentary on Question:
Most candidates attempted some form of Shadow DAC adjustment calculation. A common mistake was to say that Amortization% = PV(Deferred Expense) / PV(Gross Profits), thus ignoring the existing DAC balance on the existing block that must also be recovered out of future profits. A less common mistake was to assume that the 150 of gains is in addition to the 500 of PV(Gross Profits), when in fact it is a portion of the PV(Gross Profits) and there is only 350 remaining after the shadow adjustment is completed.

Frequently, candidates did not describe whether the shadow adjustment they calculated increases or decreases shareholder equity. While it is counterintuitive that a shadow adjustment when there are gains decreases shareholder equity, this is an important aspect of understanding the concept. It is not sufficient to indicate the magnitude without indicating the direction.

Very few candidates attempted to calculate a shadow loss recognition adjustment.

Shadow DAC adjustment

1. Prospectively, DAC = Amortization% * PV(Gross Profits) – PV(Deferred Expenses)
2. Therefore, Amortization% = {DAC + PV(Deferred Expenses)} / PV(Gross Profits)
3. Alternative approach assumes Shadow DAC adjustment can use DAC Amortization%

9. Continued

For deferred annuities

1. Amortization% = {270 + 30} / 500 = 0.60
2. UHG&Ls on AFS assets = AFS Asset Market Value – AFS Asset Reported Value
3. UHG&Ls on AFS assets = 3,150 – 3,000 = 150 (These are gains, so DAC′ < DAC)
4. Shadow DAC adjustment = Amortization% * UHG&Ls on AFS assets * (-1)
5. Shadow DAC adjustment = 0.60 * 150 * (-1) = -90
6. DAC′ = DAC + Shadow DAC adjustment = 270 – 90 = 180
7. Alternatively, Shadow DAC adjustment = DAC′ – DAC = 180 – 270 = -90

- Shareholder equity decreases by 90, gain↑ shareholder equity↓
- Can check by: Amortization% = {DAC′ + PV(Deferred Expenses)} / PV(Gross Profits′)
- Where PV(Gross Profits′) = PV(Gross Profits) – UHG&Ls = 500 – 150 = 350
- Amortization% = {180 + 30} / 350 = 0.60, Amortization% did not change so it works
- For payout annuities, no shadow DAC adjustment as no DAC is present, DAC′ = 0

Shadow Loss Recognition adjustment (SLR adjustment)

1. SLR adjustment = Max [0, GPR′ – (Policyholder Liabilities – DAC′)]
2. Where GPR′ = GPR assuming all AFS assets sold and reinvested
3. Deferred annuities: SLR adjustment = Max [0, 2,680 – (3,000 – 180)] = 0
4. Payout annuities: SLR adjustment = Max [0, 720 – (700 – 0)] = 20

10. Learning Objectives:

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

Learning Outcomes:

(1b) Describe the structure of the U.S. Annual Statement and explain the purpose of its major exhibits and schedules.

(1h) Develop, use and recommend methods for performing actuarial reviews of reserves.

Sources:

Valuation of Life Insurance Liabilities

ILA-C102-09: Actuarial Review of Reserves and Other Annual Statement

Life & Health Reinsurance

Commentary on Question:

Candidates were expected to identify applicable exhibits and schedules from statutory statements that would contain data related to EasyUL and how to apply that data to the analysis of the block

Solution:

(a) Identify which statements, schedules or exhibits you would expect to see, and the type of actuarial reserve reported in each.

Commentary on Question:

Areas where candidates performed well:

- Identifying statements and exhibits at high level (balance sheet, Summary of Operations, Exhibit 5)
- Focus on importance of change in and absolute level of reserves

Common omissions/errors:

- Not mentioning data with respect to claims
- Not providing enough detail with respect to items within Exhibit 5
- Mentioning Exhibit of Life Insurance: provides in-force counts, but not reserve figures
- Not mentioning Exhibit 8

- Balance Sheet- Liabilities – Aggregate reserves for all life contracts (Exhibit 5)
- Balance sheet - Liabilities - Contract Claims - Life (Exhibit 8, Part 1)
- Analysis of Operations by Lines of Business -Ordinary Life Insurance - Death Benefits (paid claims + changes in Exhibit 8 reserve)

10. Continued

- Summary of operations – Increase in aggregate reserves for life contracts (increase in Exhibit 5 reserves)
- Analysis of Operations by Lines of Business - Ordinary Life Insurance - Increase in aggregate reserves for life contracts (changes in Exhibit 5 reserve)
- Analysis of Increase in Reserves During the Year (Exhibit 5 net reserves)
- Exhibit 5 Aggregate Reserve for Life Policies - Section A life insurance (basic policy reserve)
- Exhibit 5 – Reinsurance
- Schedule S – assumed and ceded reserves
- Exhibit 8 Claims for Life and A&H Contracts Part 1 - Liability End of Current Year - Ordinary Life Insurance - Incurred but unreported

(b) State the formula that the Analysis of Increase in Reserves During the Year is based on, including definitions for all variables used.

Commentary on Question:
Most candidates performed well in this section.

Common omissions/errors:

- Defining premium as gross amount received or not as valuation net premium
- Defining interest as actual amount credited or not as tabular
- Applying account value rollup formula in place of reserve increase
- Applying formula for life annuities or interest-only products

- Formula for Analysis of Increases in Reserves: $0M + P + I - C - VD - VT = 1M$
- 0M and 1M are beginning and ending reserves
- P = valuation net premium
- I = tabular interest
- C = tabular cost
- VD = reserve released by death
- VT = reserve released by other terminations

(c)

(i) Explain possible ways to analyze the trend in reserves.

(ii) Explain the impact of no new business for the past three years on the reserve trend analysis.

10. Continued

Commentary on Question:
Areas where candidates performed well:

- Mentioning formulas from Formula I group
- Mentioning analysis of reserves in relation to in-force amounts

Common errors/omissions:

- Not stating limitations of Formula I with respect to fund-type products
- Not stating analysis of reserves released due to death or termination
- Not stating examination of Exhibit 5 for unusual changes and/or omissions
- Not stating increase in mortality cost or stability in reserve change if no new business written

- Analysis of Increase in Reserves Checks - compare trend of each line item over three years
- Average tabular mortality rate: C/(average amount at risk) , amount at risk = amount inforce - reserve where amount inforce is from Exhibits of Life Insurance, reserve is from Exhibit 5, and c tabular cost is from Analysis of Increase in Reserves (not as useful for UL because reserve depends on fund value)
- Compare Exhibit 5 detail and make sure no categories were omitted
- Look for unusual changes in Exhibit 5
- (Account Value - Reserves) / Amount of insurance inforce is useful trend for UL if Account Value is available
- Compare trend of each line on Exhibit of Life Insurance; these give a base expectation for how the Analysis of Increase in Reserves would trend
- No new business, average tabular mortality rate expected to increase as insureds age
- No new issues, reserve per $1000 changes more stable with renewal business only

11. Learning Objectives:

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

Learning Outcomes:

(2c) Calculate liabilities under U.S. statutory, U.S. tax, U.S. GAAP, and DAC assets under U.S. GAAP for the following products:

- (i) Traditional life insurance
- (ii) Term life insurance
- (iii) Universal life insurance
- (iv) Universal life insurance with secondary guarantees
- (v) Deferred annuity
- (vi) Payout annuity
- (vii) Variable annuity with guaranteed minimum death benefits
- (viii) Variable annuity with guaranteed living benefits
- (ix) Equity-indexed annuities
- (x) Equity-indexed life insurance
- (xi) Variable life insurance with guaranteed minimum death benefits
- (xii) Riders

Sources:

ILA-C802-08: US Tax reserves for Life Insurers

Valuation of life insurance liabilities

USGAAP for life insurers

Commentary on Question:

Commentary listed underneath question component.

Solution:

(a) Calculate statutory reserve liability and deferred premium asset as of 12/31/2011. Show all work.

Commentary on Question:

This part was well answered by nearly all candidates but a number of candidates dropped points by not properly defining the Deferred Premium Asset that is required whenever Mean Reserves are used.

$${}_tMV_x = (1 - h)({}_{t-1}V_{x:n} + P_{x:n}) + h_tV_{x:n}$$

Where

- ${}_tMV_x$ = Mean Reserve
- h = Elapsed duration from prior policy anniversary
- ${}_{t-1}V_{x:n}$ = Terminal reserve at duration t

11. Continued

$P_{x:n}$ = Valuation net premium

Whenever mean reserves are use a deferred premium asset should be set up to adjust for the overstatement involved in using a full annual premium in the mean reserve calculation. The sum of the modal net premiums due but not paid after the valuation date is the Deferred Premium Asset. Only one modal net premium is due after the valuation date, hence the Deferred Premium Asset is $P_{x:n}/4$.

(b)

(i) Perform a loss recognition test for this block using 12/31/2011 valuation. Show all work

Commentary on Question:
This was a test of the conditions that trigger a Loss Recognition Event. Essentially, a Loss Recognition Event is triggered when the Net GAAP Reserves is not as big as the Minimum Liability Requirement. Candidates were expected to state what the Net GAAP Reserve means as well as define the Minimum Liability requirement both of which are used in the test. A good number of candidates lost valuable points because they did not understand the rationale for the test as well as the mechanics of the test itself. Enough information was not available to calculate the reserves but the examiners awarded points based upon the approach and concepts brought into the situation by the candidates.

Loss recognition is done by comparing Net GAAP Reserves with the Minimum Liability Requirement.
Net GAAP Reserve = GAAP Reserve minus Deferred Acquisition Costs
Minimum Liability Requirement is based upon a Gross Premium Valuation
Gross Premium Reserve equals PV of Future Benefits and Expenses minus PV of remaining future Gross Premiums

Mid Benefit Reserves: $\frac{1}{2}(TBR_{t-1} + TBR_t)$ or $(1 - h)*TBR_{t-1} + h*TBR_t)$
Where
h is elapsed duration from prior policy anniversary to the valuation date
TBR_t is the terminal reserve at duration t

Whenever mid terminal reserves are used; an Unearned Premium Reserve is required
GAAP Reserve = mid Terminal Reserves plus Unearned Premium Reserve

Net GAAP Liability = GAAP Reserves minus DAC

11. Continued

Minimum Liability Requirements = PV(future benefits & expenses) minus PV(future gross premiums)
= 60,000 – 45,000
= 15,000

Loss Recognition Test : Net GAAP Liability minus Minimum Liability Requirement

(ii) Determine whether this loss recognition test performed results in a premium deficiency. Show all work.

Commentary on Question:
The first part of the question tested the concept and this part tested the application of the concept of Loss Recognition. Candidates that did well in the first part generally did well in this part as well as it was a straightforward application of the testing rules.

There is a loss recognition if Net GAAP Liability is less than the Minimum Liability Requirement.

(iii) List the appropriate order of adjustment to eliminate the premium deficiency if a loss recognition test results in a premium deficiency.

Commentary on Question:
This section of the question tested the candidates' ability to recall the adjustments as well as the order of the application of those adjustments that must be made when a Loss Recognition test is failed. A good number of the candidates were able to reproduce the required adjustments. Some knew the adjustments but could not recall the order of their application and lost some points.

Required adjustments are as follows:

(a) Remove any Provisions for Adverse Deviation
(b) Write down DAC
(c) Set up a premium Deficiency reserve if (a) and (b) insufficient

(c) Calculate the following:

Commentary on Question:
Candidates did not do well on this part of the question which was a test of how well they understood the treatment of changes in the bases of calculations.

11. Continued

(i) Change in tax reserve amount that will be amortized over 10 years beginning in 2012.

Because of the change in basis the amortizable amount over 10 years is the difference between the tax reserves at year end 2010 on the old basis minus the tax reserves at year end 2010 on the new basis.

That is, 10,600 minus 10,185 which equals 415 (in thousands).

(ii) Amount of tax reserve deduction in 2011

The deduction in 2011 is the difference between the tax reserves at year end 2010 on the old basis minus the tax reserves at the start of 2010 (end 2009) also on the old basis.

That is 10,600 minus 10,000 which equals 600 (in thousands).

(iii) Opening tax reserve balance at January 1, 2011.

This is the ending reserves at year end 2010 on the new basis which is 10,185.

12. Learning Objectives:

1. The candidate will understand basic 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 issued by U.S. life insurance companies.

Learning Outcomes:

(1e) Describe and critique the framework and principles used in the calculation of reserves under a Fair Value approach.

(2b) Recommend appropriate valuation under the following standards:
- (i) U.S. Statutory
- (ii) U.S. GAAP
- (iii) U.S. Tax
- (iv) Fair Value Accounting

Sources:

SFAS 157 Fair Value Measurement

ILA-C810-10: AAA Practice Note on FAS157 & 159

FAS157 Staff Position Paper

US GAAP for Life Insurers

Commentary on Question:

Solution:

(a) State the objective of fair value accounting.

The objective of fair value measurement system is to determine:
- The price received to sell an asset
- The price paid to transfer a liability
- In an orderly transaction
- Between market participants
- At a specified measurement date
- An exit price
- Consistent with capital markets
- Not as an individual policyholder would value based on his or her own personal need and utility function

12. Continued

(b) Summarize the fair value hierarchy of valuation inputs.

The fair value hierarchy prioritizes the inputs to valuation techniques used to measure fair value into three broad levels.

- Level 1 inputs - quoted prices (unadjusted) in active markets for identical assets or liabilities
- Level 2 inputs - inputs other than Level 1 quoted prices that are observable
  - Either directly or indirectly
  - Quoted prices for similar assets or liabilities in active markets
  - Quoted prices for identical or similar assets in markets that are not active
    - (Not active = few transactions, prices not current, or quotes vary substantially over time)
  - Inputs other than quoted prices that are observable for the liability
    - Examples: interest rates, yield curves, volatilities, default rates (give 1pt credit for any correct example)
  - Market-corroborated inputs
- Level 3 inputs - unobservable inputs for the asset or liability
  Level 3 inputs - shall reflect assumptions market participants would use in pricing the asset or liability (objective of FV remains the same)\judgment

(c)

(i) Define the three approaches to valuation that may be used to determine fair value.

- Market Approach
  - Uses prices and other relevant information generated by market transactions involving identical or comparable assets or liabilities
- Income Approach
  - Uses valuation techniques to convert future amounts to a single present amount
  - Measurement is based on the value indicated by current market expectations about future amounts
- Cost Approach
  - Measurement is based on the amount that currently would be required to replace the service capacity of an asset
  - Current replacement cost

(ii) Evaluate which of these approaches would be most suitable for the valuation exercise.

12. Continued

- Market approach not useful in valuing embedded options in insurance contracts, given the uniqueness of the embedded options and the general lack of any direct market for trading these options (the lack of a direct market for insurance liabilities is a recurring theme in the fair value readings).
- Cost approach relates to the fair value of real assets
- Cost approach not useful in valuing embedded options in insurance contracts
- Given the nature of the liabilities in question, income approach is most likely to be used

(d) Assess where within the hierarchy the fair value measurement of embedded options is likely to fall.

- The level in the fair value hierarchy within which the fair value measurement in its entirety falls shall be determined based on the lowest level input.
- That is significant to the fair value measurement in its entirety.
- If any significant input is level 3, then the fair value estimate is considered a level 3 estimate.
- Many significant inputs to the valuation of the embedded options will be level 3 inputs.
- Therefore, the resulting fair value measurement is a level 3 estimate.
- Significant inputs include:
  - Swap Curve /interest rate - Level 2
  - Short term volatility and correlations - Level 2
  - Long term volatility and correlations - Level 3
  - Lapses/annuitization/mortality/exercise - Level 3
  - Withdrawals - Level 3

(e) Critique the Chief Actuary's suggestion regarding the use of traditional GAAP assumptions in a Fair Value valuation exercise.

- Traditional GAAP assumptions are based on best estimate assumptions plus a provision for adverse deviation (PAD).
- The best estimate assumptions and PADs are based on the actuary's judgment (entity-specific).
- FV should contain assumptions about the assumptions market participants would use in pricing the liability (market-specific).
- GAAP assumptions are locked in at issue (until a loss recognition situation arises).
- FV reflects price at a specified measurement date.
- If there is significant uncertainty in the cash flows associated with the FV measurement, a risk premium (risk margin) should be considered.

12. Continued

- The risk margin is not the same as the PAD.

- PAD is used to introduce conservatism into fair value calculation.
- Risk margin represents the best estimate of the price a market participant would require for bearing such risk.
- Traditional GAAP assumptions doesn't work well for fair value practice.

13. 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) Describe the US Risk Based Capital (RBC) regulatory framework and the principles underlying the determination of Regulatory RBC, and be able to compute RBC for a life insurance company, including:
- (i) Identification of significant risk components
- (ii) Identification of specialized product RBC requirements
- (iii) Interpreting results from a regulatory perspective
- (iv) Implementation under emerging US principle-based approach

(5c) Explain and apply the concepts, approaches and methods for determining Economic Capital.
- (i) Identification of the significant
- (ii) Selecting calculation methods appropriate to stakeholder's perspective
- (iii) Describing how a company would implement an Economic Capital program.

Sources:

Economic Capital: The Controversy at the Water Cooler

Transitioning to RBC C3P3

ILA-C121-08: Economic Capital Modeling: Practical Considerations

Economic Capital for Life Insurance Companies

Commentary on Question:

Commentary listed underneath question component.

Solution:

(a) Calculate C3P3 capital requirement at CTE90, based on the information given, assuming Stochastic Amount is the only non-zero Total Asset Requirement (TAR) component.

Commentary on Question:

This section was very well done by most of the candidates. Some candidates lost marks by replacing the starting asset with the reserve.

Scenario Amount = Starting Asset + GPCAD
The worst 10% of the scenarios have amounts of 2900 and 3100
CTE(90) = average(2900,3100) = 3000
Then TAR = 3000 (as no other nonzero components)

13. Continued

Capital Requirement = TAR - Stat Reserve = 3000 - 2500 = 500

(b) Critique the accuracy of the manager's statements.

Commentary on Question:
A number of candidates lost marks by listing items without tying them back to the manager's statement.

The manager is incorrect about using your own scenario generator. You can do so if the generator meets certain calibration criteria. Or you can use the American Academy of Actuaries scenarios.
The manager is also incorrect about the number of scenarios. There is no required number of scenarios as long as the number run is sufficient to capture the underlying risk.

(c) Explain why are European insurance companies typically set capital at a higher target security level and run more scenarios compared to US principle based approach.

Commentary on Question:
Candidates that did poorly missed the key reasoning that the shortness of the time horizon necessitates a higher target security level and the higher security target security level necessitates more scenarios.

- Liability runoff approach with a long time horizon preferred by US regulators
- Conditional Tail Expectation (CTE) requires knowledge about the extreme tail of the distribution - more demanding to calculate
- European regulators have adopted a one year mark to market approach this Value at Risk (VaR) approach is widely known in the banking industry and under Solvency II
- Both approaches have their advantages and disadvantages
- VaR is simple to understand
- VaR is less demanding to calculate but can miss outliers
- CTE is a coherent measure and can be aggregated
- The short term horizon under VaR means a higher target security level is required
- Reaching this higher security level necessitates many more scenarios