ILA LP Model Solutions
Fall 2016

1.

Learning Objectives:

2.   The candidate will understand the relationship between product features, inherent risks, and the methods and measures to design and price products.

Learning Outcomes:

(2a)   Identify, assess, and develop appropriate assumptions to reflect factors such as product characteristics, risks, policyholder behavior, and company actions.
   • Describe and apply the uses of predictive modeling.

(2b)   Assess and critique performance measures, risk measures, and modeling approaches. Recommend their uses in product management.

(2c)   Develop and evaluate a product's performance, capital requirements, tax and regulatory requirements, and risk profile.

Sources:

Atkinson and Dallas, Life Insurance Products and Finance, Chapters 10 and 11

Commentary on Question:

Commentary listed underneath question component.

Solution:

Calculate the present value of profit as a % of premium using distributable earnings as the profit measure. Show all work.

Commentary on Question:

- *This question is testing candidates' knowledge of calculating one of the most common profit measures.*
- *A number of candidates incorrectly assumed a level net amount at risk for all years, which then impacted their premium and maintenance expense numbers, which then impacted subsequent numbers. However, partial credit was given, where appropriate.*
- *Some candidates incorrectly assumed acquisition expenses occurred every year.*
- *Product cash flow calculations were generally well done.*
- *Some candidates did not calculate the increase in the solvency reserve or the increase in the required capital.*
- *Most candidates did calculate the investment income on required capital; and many also calculated investment income on the solvency reserve. However, very few papers calculated the investment income on the cash flow.*

1. Continued

- *Distributed Earnings (DE) were calculated correctly in general, as were the present value of DE and the present value of premiums. Some candidates discounted using the incorrect 2.5 % rate, instead of the correct 3% rate. Some candidates assumed incorrectly that the premium was 7000 for all years, stated the present value of premiums was 7000 (as opposed to the present value of a series of 7000 decremented).*
- *Most papers did have a final answer for profit as a % of premium. Even if the final answer was not completely correct, partial credit was given where appropriate.*

DistEarn(t) = AfterTaxSolvEarn(t) - ReqCapIncr(t) + ATInvIncRC(t)
Profit%Prem(n) = PVProfit(n) / PVPrem(n)
NAAR(t) = NAAR(t-1) - SolvRes(t). NAAR(0) = inforce face amount at time zero

Time	-	1	2	3	4	5
Prem(t)	7,000	6,895	6,720	6,580	6,510	-
AcqExp(t)	8,000	-	-	-	-	-
MaintExp(t)	100	99	96	94	93	
DeathBen(t)	-	3,000	4,500	3,500	2,500	1,000
ProdCashFlow(t)	- 1,100	3,797	2,124	2,986	3,917	- 1,000
SolvRes(t)	-	15,000	25,000	20,000	10,000	5,000
ReqCap(t)	-	8,000	10,000	10,000	5,000	3,000
NAAR(t)	1,000,000	985,000	960,000	940,000	930,000	925,000
ResIncr(t)	-	15,000	10,000	- 5,000	- 10,000	- 5,000
ReqCapIncr(t)	-	8,000	2,000	-	- 5,000	- 2,000
CashflowInt(t)	-	- 28	95	53	75	98
InvIncSolRes(t)	-	375	625	500	250	125
ATInvIncRC(t)	-	200	250	250	125	75
ATSolvEarn(t)	- 1,100	- 10,856	- 7,156	8,539	14,242	4,223
DistEarn(t)	- 1,100	- 18,656	- 8,906	8,789	19,367	6,298
PV(DistEarn(t))	3,075	4,301	23,645	33,528	25,481	6,298
PV(Prem(t))	31,834	25,579	19,245	12,900	6,510	-
Profit as a % of Premium = 9.7%						

FORMULAS
Prem(t) = 7 * NAAR(t)
AcqExp(0) = 8* 1,000,000
Maintexp(t) = .10* NAAR(t) … with rounding
DeathBen …. Claims were provided in question
ProdCash Flow(t) = Prem(t)-Acq(t)-Maint(t)-DB(t)
SolvRes …. was provided in question
ReqCap ….. was provided in question
NAAR(t) = NAAR(t-1) -Solvres(t)
ResIncr(t) = SolvRes(t) - Solvres(t-1)
ReqCapIncr(t) = Reqcap(t) - Reqcap (t-1)

1. **Continued**

CFInc(t) = ProdCashFlow(t-1)*.025 rounded
InvIncRes(t) = .025* SolvRes(t)
ATInvIncRC(t) = ReqCap(t)*.025
DistEarn(t)=ATSolvEarn(t) - ReqCapIncr(t) +
ATInvIncrRC(t)
PVDistEarn(t) = sum of DE(t) * v (to exponent t)
discounting at 3 %
PvPrem(t) sum of Prem(t) * v (to exponent t)
Discounting at 3 %
Profit as % of premium(t) = PVProfit(t)/PvPremium (t)

2. **Learning Objectives:**
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• Describe and apply the uses of predictive modeling.

(2b) Assess and critique performance measures, risk measures, and modeling approaches. Recommend their uses in product management.

Sources:
Investment Guarantees, Hardy, Ch. 6

Life Insurance Products and Finance, Atkinson & Dallas, Ch. 13

LP-116-10: Variable Annuities, Kalberer and Ravindran, Ch. 10-11

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a) Assess how each of the four design changes may impact the following variable annuity pricing assumptions:

- Lapse
- Mortality
- Expense

Commentary on Question:
Candidates did very well on part a. To receive full credit candidates needed to describe how the assumption would change and give justification; not all assumptions and product design changes needed to be addressed to receive full credit. Other answers that provided correct justification were given credit.

Lapse Assumption
A. Minimal impact to lapses from a lower minimum initial premium.
B. The shorter surrender charge schedule will result in the spike in lapse rates after year 5 instead of year 7. Lowering the surrender charge percent in the first 2 years would result in a higher lapse rate. Increasing the surrender charge percent in years 4 & 5 would results in lower lapse rate.
C. Partial withdrawals would increase due to higher free partial withdrawal limit.
D. The company should consider developing a dynamic lapse formula for when the GMDB is in-the-money. If the policy has GMDB lapses would be lower.

2. **Continued**

Mortality Assumption
A. Minimal impact to mortality from lower minimum initial premium. Mortality assumptions are generally not as significant for variable annuities.
B. Minimal impact to mortality from shorter surrender charge schedule.
C. Minimal impact to mortality from higher free partial withdrawal limit
D. GMDB will introduce material mortality risk. Unhealthy lives may be more inclined to choose more generous benefits available under GMDB, which will lead to anti-selection and a higher mortality assumption.

Expenses
A. Decreasing the minimum initial premium would lower the average policy size, which would lead fewer policies to spread fixed expenses over.
B. Minimal impact to expenses from shorter surrender charge schedule
C. Minimal impact to expenses due to higher free partial withdrawal limit.
D. GMDB creates additional complexity including complicated administration, training for home office and/or distribution, which will increase the expense assumption.

(b)   Calculate the liability cash flow in year two (per thousand) assuming decrements occur at the end of year. Show all work.

Commentary on Question:
Very few candidates were able to correctly calculate the liability cash flow. Many were only able to calculate specific parts of the formula such as the fund value in years 1 and 2.

$$CF_t = {}_tp_x * F_o * S_t * (1 - m_{t-1}) * m_d + {}_1q_{x+1-1} * (G_t - F_0 * S_t * (1 - m_t))$$
$$CF_2 = .9 * 1000 * .9 * (1 - .0075) * .0025 + .0035 * (1030 - 1000 * .9 * (1 - .0075)^2)$$
$$CF_2 = 2.0098 + .5021 = 2.5119$$

$$CF_t = {}_tp_x * F_a * S_t * (1 - m_{t-1}) * m_d + {}_1q_{x+1-1} * (G_t - F_0 * S_t * (1 - m_t))$$
$$CF_2 = .9 * 1000 * .9 * (1 - .0075) * .0025 + .0035 * (1030 - 1000 * .9 * (1 - .0075)^2)$$
$$CF_2 = 2.0098 + .5021 = 2.5119$$

2.   Continued

(c)

   (i)   Describe five risk management strategies commonly used to mitigate VA guarantee risk.

   (ii)   Recommend an appropriate risk management strategy for the new GMDB rider. Justify your answer.

   (iii) Propose changes that the company could make to the product design to help manage the risks associated with the GMDB rider.

Commentary on Question:
Overall, candidates did well on part C.

For part (i) to receive full credit candidates needed to list as well as briefly describe risk management strategies. A common mistake was to list product design changes or other modeling techniques instead of risk management strategies.

For part (ii) candidates needed to recommend a risk management strategy and give justification. Different recommendations were given credit as long as reasonable and accurate justification was given.

For part (iii) candidates were able to correctly identify several product changes to minimize the GMDB risk.

   (i)   1) Naked or no risk management – Company engages in no formal risk management program. Capital provides for the claims associated with the guarantee.
          2) Static hedge - Company would replicate future cashflows at a certain point in time based on expected policyholder behavior and persistency by purchasing a series of exotic equity options; these often have high transaction costs.
          3) Semi-static hedge – Similar to a static hedge except the hedge would be adjusted periodically to allow for experience deviations as well as being refreshed with addition of new business to the portfolio.
          4) Dynamic hedging - Dynamically matching the "greeks" of the liability with the hedge portfolio which insulates the portfolio from small movements in the capital markets.
          5) Reinsurance - Using a third party to cede away a portion of all capital market and actuarial risks.

2.   **Continued**

   (ii) I would recommend using Dynamic Hedging.
        Complex products such as GMDB require a more sophisticated strategy to manage the risks. Dynamic hedging insulates the portfolios from small movements in the capital markets and by rebalancing it ensures that the underlying hedged position is managed against larger capital markets movements. This also allows for additional flexibility and potentially lower costs vs. static/semi-static hedge.

   (iii) Possible product design changes that could help manage the GMDB risks include:
- Increase the GMDB fee.
- Reduce or eliminate the 3% interest rate at which the single premium is accumulated.
- Change the open architecture fund structure or charge differently based on client's fund choice.
- Introduce a waiting period for when the GMDB is in effect.

3. **Learning Objectives:**
1.   The candidate will understand various insurance products, markets, and regulatory regimes.

Learning Outcomes:

(1b)   Evaluate insurance markets, consumer needs, distribution channels, and regulatory regimes.

(1c)   Construct, evaluate, and recommend product designs that are consistent with market needs, tax, and regulatory requirements, and company business objectives.

Sources:
Life Insurance and Modified Endowments Under IRC §7702 and §7702A, Chapters, 2, 3, 4, 6

Life Insurance Acceleration Riders, Filmore - Reinsurance Section, July 2013, pp. 35 – 38

Commentary on Question:
This question requires the candidate to demonstrate understanding and application of the Section 7702 of the Internal Revenue Code for a Universal Life plan. This question also tests the candidate's knowledge of Acceleration Riders.

Solution:
(a)   Calculate the following at issue:

   (i)   Guideline Level Premium (GLP)

   (ii)   Guideline Single Premium (GSP)

   (iii) 7-pay premium

   (iv)   Cash Value Accumulation Test (CVAT) maximum cash surrender value

   Show all work.

   Commentary on Question:
   In general, candidates did very well on this section. Most candidates were able to select the correct values and do the calculations. Many candidates were also able to demonstrate understanding of connection between CVAT and NSP.

   (i) $GLP = FA \times \frac{A_{50@4\%}}{\ddot{a}_{50@4\%}} / (1 - Expense\ Load)$
          $=150,000 \ \text{x} 0.3349/17.2930/ (1-0.08) = 3,157.54$

3. **Continued**

    (ii) $GSP = FA \times A_{50@6\%}/(1 - Expense\ Load)$
             =150,000 x0.2113/ (1-0.08) = 34,451.09

    (iii) $7 - pay\ Premium = FA \times \dfrac{A_{50@4\%}}{\ddot{a}_{50:7@4\%}}$
             =150,000 x0.3349/6.174 = 8,136.54

    (iv)   The CVAT test specifies that CSV should never be more than the net single premium (NSP) at all times.
        $NSP\ at\ issue = FA \times A_{50@4\%}$
                $= 150,000\ x0.3349 = 50,235$
       Maximum CSV as per CVAT guideline is 50,235

(b)   Determine the number of years the annual premium of 2,000 can be paid and still be qualified as a life insurance contract under IRC 7702.

Commentary on Question:
Candidates did well on this section. The majority of candidates were able to elaborate the relationship between cumulative paid premium and cumulative GLP and solve the number of years that 2,000 annual premium can be paid.

To comply with IRC 7702, compare future cumulative GLP (including GLP up to year 10) with future cumulative paid premium (including premium up to year 10) until cumulative paid premium exceeds cumulative GLP, that is,

Cumulative Paid Premium<=GP Limitation = cumulative GLP

Cumulative Paid Premium = Paid premiums for 1st 10 years + 2,000 for N years
Cumulative GLP = GLP for 1st 10 years + 1,100(Recalculated GLP) for N years
2,500x10+2,000xN <=3,157.54x10+1,100xN
Solve N = 7.31

Maximum of 7 (or 7.3) years from the time of decrease or up to year 17 (17.3) of the contract. Reduce to 1,100 afterwards to avoid violation of the guideline.

(c)   Describe the effect the following riders have on the Guideline Premium Limits:

Commentary on Question:
The majority of candidates were able to demonstrate the understanding of QAB/non-QAB treatment for disability and non-family term rider but only a few candidates were able to comment on how a qualified LTC rider is treated.

3. **Continued**

- Disability waiver benefit
  The charges are included in the Guideline premiums thereby increasing the maximum funding limits. This is an example of a QAB under law

- Qualified LTC rider
  As a qualified LTC rider, any charges for the rider deducted from the accumulation value (e.g. on a UL policy) are not treated as distributions for income tax purposes. However, the charges reduce the basis in the contract

- Term coverage on a non-family member business partner
  Charges are not included in the Guideline premiums. This is an example of a non-QAB under law.

4. **Learning Objectives:**
1. The candidate will understand various insurance products, markets, and regulatory regimes.

Learning Outcomes:
(1a) Describe insurance product types, benefits, and features including reinsurance.

(1b) Evaluate insurance markets, consumer needs, distribution channels, and regulatory regimes.

(1c) Construct, evaluate and recommend product designs that are consistent with market needs, tax and regulatory requirements, and company business objectives.
  - Evaluate the feasibility of proposed designs. Recommend designs.

Sources:
LP-105-07: Life and Annuity Products and Features

The Art and Science of Life Insurance Distribution, Actex, Ch. 3 - 7

LP-XXX-16: Introduction to Reinsurance, World Bank, April 2009, excluding appendices

LP-121-13: Life Insurance and Annuity Non-forfeiture Practices

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a) List the advantages of using the following:

  - Single-status last survivor
  - Dual-status last survivor

Commentary on Question:
Candidates who addressed the advantages of single & dual status last survivor did well on this part. Candidates who only provided definitions did not receive any credit.

Single Status
  - Values do not change markedly at the first death, resulting in smooth cash value policies
  - Simpler to administer, as do not have to maintain 3 sets of values
  - Agents to do not need to produce illustrations where values differ significantly depending on the timing of the first death

4. **Continued**

Dual Status
- More closely related to risk profile of the product
- Reduces risk of antiselection after the first death

(b) Describe how uninsurable lives impact the development of this product.

Commentary on Question:
Generally, candidates did not do well on this question. Many candidates recognized that a joint policy between a healthy life and uninsurable life is possible, but they did not list out specific considerations for the uninsurable lives as listed below.

Considerations for uninsurable lives:
- Last survivor policy can be issued with a life that is uninsurable, on a non-standard basis.
- It is important to distinguish between "insurable" and clearly terminal lives
- The uninsurable life must undergo normal underwriting and be deemed to have a life expectancy of at least one or two years
- The uninsurable must not increase the contagion factors
- Uninsurable life must not be highly rated

(c) For the following distribution channels:

- Call center- mediated direct response
- Worksite
- Multiple-line exclusive agent
- Career agent

(i) Describe each distribution channel.

(ii) Explain the appropriateness of each distribution channel for this product.

Commentary on Question:
Most candidates did well on this question.

For part i), some candidates struggled to differentiate a Multiple-line exclusive agent from a Career agent.

For part ii), some candidates neglected to fully explain their reasoning, which resulted in only partial credit.

4. **Continued**

Call-center mediated response
(i)   Provides personal assistance to potential customers calling in to learn about products and complete the sale. No face-to-face interaction.
(ii)   Not appropriate, product is too complex to buy without agent, even with call center assistance.

Worksite
(i)   Selling individual life insurance (not group) at a place of employment. Usually paid for via payroll deduction.
(ii)   Not appropriate, more suitable for small face amount policies sold to middle income employees

Multiple-line exclusive agent
(i)   Agents that sell only the products of their company or those companies from whom their primary company has a selling arrangement. Trained to be conversant in a wide range of both life and P&C products.
(ii)   Not appropriate, agents are usually uncomfortable with sophisticated applications required for estate planning

Career agent
(i)   An agent who is hired and trained by a specific life insurance company. This is an expensive distribution channel.
(ii)   Appropriate, agents receive training on products and there might be specialists to help with complicated cases

(d)   Explain four reasons your company might use reinsurance for this product.

Commentary on Question:
Candidates had some ideas but struggled to list four valid individual reasons to use reinsurance. Explanations as to why the reason were valid were often not clear or well thought out. Although catastrophic protection is a reason to use reinsurance, it is not relevant for this product. Candidates only needed to address 4 of the 5 reasons below.

1. Increased underwriting capacity
    *   will allow company to issue policies for larger amounts.

2. Expertise transfer
    *   reinsurer can provide expertise that the company may not have, especially for a new product.

3. Financing new business
    *   can help pay for first year commission, underwriting and issue costs

4. Continued

4. Surplus relief
   - will allow company to partially transfer risks off their balance sheet

5. Risk capital improvement and diversification
   - can issue more policies with the same amount of capital

(e) Recommend an appropriate method for determining nonforfeiture benefits for this product. Justify your answer.

Commentary on Question:
Most candidates did not do well on this part, as most did not fully understand what the question was asking. Many candidates listed nonforfeiture options, which did not receive any credit. Out of those who recommended a method, most chose the retrospective method, which is not appropriate for this product and received little to no credit.

The Prospective Method is appropriate for this product.
- It is easier to apply to traditional products, additional assumptions are needed for flexible premium products
- Nonforfeiture values are based on PV future benefits, expenses, profits, less PV future gross premiums
- All significant benefits within the contract are generally included in the calculation
- Changes in assumptions after policy issue change the resulting nonforfeiture values

(f) Recommend product design features that could be used to accomplish each of the following objectives. Justify your answers.

(i) Minimize the premium while maintaining an expected level of death benefit coverage.

(ii) Allow for full funding of the policy after the death of one of the insured lives.

Commentary on Question:
Most candidates did not do well on this part. Many candidates described a change in assumptions rather than a change in product design. Candidates also mistook the Par product for a UL product by mentioning changes to shadow accounts or COI options, which are not relevant for this product. Candidates performed relatively better in part ii) compared to part i).

4. **Continued**

(i)

- Use a mix of base coverage and term options, with a larger amount of term options to reduce the premium. Term options are cheaper than base coverage, so can offer a larger death benefit at lower cost.
- Offer higher dividends to allow faster purchase of PUAs, reduce cash values to reduce the premium
- Increase the surrender charge and/or increase the surrender period
- Use dividends to help pay for the premiums

(ii)

- Use a first-to-die term rider with decreasing death benefit. The decreasing death benefit amount can be designed to complete the funding on that first death.

5. **Learning Objectives:**
3. The candidate will understand actuarial requirements of product governance, implementation, operations, and management.

Learning Outcomes:
(3a) Describe governance and implementation requirements, principles, and practices.
   • Describe and evaluate compliance with illustration regulations.
   • Describe operational requirements such as administration, marketing, reinsurance, and underwriting. Assess their impact on managing products.

Sources:
The Interstate Compact: Speeding Up the Speed-to-Market

Update on the Interstate Insurance Compact

Actuarial Guideline 49: A Closer Look

Commentary on Question:
This question tested the clients understanding of the interstate compact and AG49.

Solution:

(a) Explain why the domiciled Insurance Department may have an objection with the filing when it had been approved by the Insurance Compact.

   Commentary on Question:
   Many candidates realized the compact was not approved in all states but they failed to state what that could mean for JBB. Very few candidates mentioned that states could opt out of standards.
   Candidates also mentioned that other requirements needed to be met.

   Candidates that did poorly tended to (1) think that the state could still object after compact approval, even if state was member or (2) just restated the objections in Part B.

   If the domiciled state is not one of the 43 compact approved states, the form can be disapproved.
   If the form is not filed through the compact, it is subject to unique form filing requirements of state it is filed in.
   If the domiciled state opted out of any uniform standard, then the state could object to this provision of the form.
   Compact doesn't supersede requirements other than form specific ones; objection could be for a non-form requirement (e.g pricing and advertising requirements).

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5. Continued

(b)   Assess the reasonability of each objection. Justify your answer.

Commentary on Question:
For i., few candidates answered this correctly. Many forgot to adjust for the hedging cost.
For ii, many candidates answered this correctly
For iii, most candidates realized additional disclosures were needed, but few candidates were able to describe the requirements for each one.

(i)   AG49 states if insurer uses hedging program for IUL, the assumed earned interest rate for DCS can't exceed 145% of the general account net investment earnings rate, less hedging cost.
145% (5% - 90bp) = 1.45 * .041 = 0.059
5.9% is the maximum assumed interest rate allowed, not 6%
Objection is reasonable

(ii)   AG49 limits difference between assumed illustrated rate credited to borrowed amounts and the illustrated loan rate charged on those same funds to 100bp annually
Max illustrated rate is 4%, not 4.2%
Objection is reasonable

(iii)   AG49 requires 3 additional disclosures – objection is reasonable
a. First, assume all premiums credited to fixed account. For loans, the credited rate can't exceed the charged rate on those funds.
b. Second, provide maximum and minimum values of geometric average annual return of 10,000 calculated to determine maximum illustrated index credited rate.
c. Third, show table with historical index changes over last 20 years, side by side with IUL credited interest rates over the same period

(c)   With respect to using the Insurance Compact for the new application and LTC rider forms:

(i)   Describe the benefits.

(ii)   Describe the potential approval issues.

Commentary on Question:
Many candidates were able to mention 1 or 2 benefits. Some candidates described LTC benefits (instead of benefits of filing with Compact).Most candidates incorrectly assumed approval and launch could not be received within 4 months.

5.   Continued

Compact has defined speed to market by providing final disposition in less than 60 days.
Compact provides enough state approvals at one time to launch product, reduces uncertainty of target launch.
Compact provides more consistency across markets; one form can be used in 43+ states and eliminates state variations.
Marketing and administering one version reduces challenges for home office and field.

Compact approval depends on provisions of the LTC application and rider form.
LTC rider must meet uniform standards adopted by compact.
States may have opted out of uniform standards for LTC.

Given the maximum time for compact filing is 60 days, it appears that compact approval could be received in time to meet the 4 month goal.

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   • Describe and apply the uses of predictive modeling.

(2c)   Develop and evaluate a product's performance, capital requirements, tax and regulatory requirements, and risk profile.

Sources:
Atkinson & Dallas, Life Insurance Products and Finance, Chapters 10, 11, 13

LP-114-09: CIA Research Paper, Life Insurance Costing and Risk Analysis, June 2008

LP-110-07: Policyholder Dividends

Commentary on Question:
Commentary: the candidates generally did well on part a), most showed good understanding of the 3 interest rate risks. For part b), many candidates confused product design with the product strategies (e.g. suggested changing investment mix as potential a product design change). However, most candidates were able to identify obvious product design flaws such as changing the surrender charge structure and reducing the crediting rate. Part c) was not done well as the majority had difficulties in drawing knowledge from the right readings.

Solution:
(a)   Describe the conditions under which the following types of interest rate risks occur:

   (i)   Disintermediation risk

   (ii)   Guarantee risk

   (iii)   Liquidity risk

Commentary on Question:
Comments: The cognitive skill of this part of the questions is comprehension. To get full credit, candidates need to identify the interest environment along with other factors that contributed to the risk and the outcome. This question was generally done well. Majority of the candidates were able to describe the 3 risks accurately.

6. **Continued**

(i) Risk of selling assets at a loss to fund substantial cash outflows during rising interest rates.
E.g. rising interest rates -> policyholders would loan from, withdraw from or surrender to invest elsewhere at higher interest rates, while the company has to sell long term assets to fund these cash flows at a lower market value

(ii) Risk that interest rates guaranteed in a product will exceed earned interest rates
E.g. significant portion of product's cash flows in invested long after guarantee is set and there is a chance it will not be able to earn the rate guaranteed.

(iii) Risk that company will not be able to raise the cash needed to fund obligations
E.g. occurs because most liabilities are paid on demand and assets are invested long term. If there is a run on the bank, assets have to be sold at discounted price to raise cash quickly enough.

(b) With regard to managing interest rate risk for the new product:

(i) Propose specific product design changes

(ii) Propose other strategies not related to product design

Commentary on Question:
Comments: The cognitive skill of this part of the questions is analysis. To get full credit, candidates need to describe the design changes and strategies identified below. Reasonable solutions not listed below were also accepted. Most candidates were able to identify the 3 product design changes listed below. However, many confused product strategy with product design as changing the investment mix was commonly listed as a potential product design change.

Product Designs: *full credit was given if the candidate proposed four strategies including (but not limited) to the following:*

(i) Increase surrender charge rate / extend the surrender charge period
(ii) Change the fixed loan rate to a variable loan rate,
(iii) Reduce the guaranteed crediting rate to minimize the risk that earned assets will not exceed the guaranteed crediting rate
(iv) Add a maximum limit on the proportion of the cash value available for withdrawal without policy surrender
(v) Add loyalty bonuses in later policy years

6. Continued

Product Strategies: *full credit was given if the candidate proposed two strategies not related to product design*

(i)   The use of reinsurance to limit risk
(ii) Limiting the sales volumes - through either number of sales or size of sales
(iii) To reduce liquidity risk, RFB should diversify the portfolio away from Real estate (not liquid) to more liquid asset classes.

(c)   Assess whether each of the following statements is true or false for the new product. If a statement is false, justify your answer.

A.   *The dividend actuary, along with senior management, is responsible for setting the aggregate amount of dividends to be distributed. The annual dividend scale should vary in proportion to the major sources of earnings.*
B.   *The goal of a dividend scale is to pay out all of the annual earnings to policyholders.*
C.   *A fixed loan rate with direct recognition of loans should have a material impact on dividends as they are adjusted regularly with the new money rates.*
D.   *All reinsurance should be reflected in the dividend formula.*
E.   *It is acceptable for RFB to include its home office real estate in the portfolio used to back the UL product.*

Commentary on Question:
Comments: The cognitive skill of this part of the questions is knowledge utilization. To get full credit, candidates need to answer True or False correctly and provide their reasoning. Subpart A is in fact a 2 part question, with the first part being false and the second part being true. "partially true" and "partially false" were accepted as long as the candidates provided reasonable explanation. About ½ the candidates answered this question correctly as illustrated in the referenced study notes

A.   False, Partially False, Partially True
     The Company's Board of Directors is responsible for setting the aggregate amount of dividends to be distributed. The dividend actuary and senior management only make recommendations to the board

B.   False
     The goal of a dividend scale is to pay out most of the annual earnings to policyholders. The company should retain sufficient earnings to meet future obligations and grow the company.

6. Continued

C. True or False if provided reasonable explanation
Fixed loan rate with direct recognition should have an immaterial impact on dividends as the dividend formula reflects the earnings separately on the non-loaned and loan portions of the cash value

OR

Fixed loan rate is not adjusted regularly with new money rates

D. False
Only risk reinsurance should be reflected in the appropriate dividend component as an expense. Financial reinsurance, which is used to manage total surplus, is generally not reflected

E. False
Only active invested assets should back the dividend scale

7.   **Learning Objectives:**
1.   The candidate will understand various insurance products, markets, and regulatory regimes.

3.   The candidate will understand actuarial requirements of product governance, implementation, operations, and management.

Learning Outcomes:
(1a)   Describe insurance product types, benefits, and features including reinsurance.

(3a)   Describe governance and implementation requirements, principles, and practices.
   • Describe and evaluate compliance with illustration regulations.
   • Describe operational requirements such as administration, marketing, reinsurance, and underwriting. Assess their impact on managing products.

(3b)   Apply practices related to product management.
   • Describe how to monitor and evaluate actual experience such as benefits, persistency, and utilization including the use of experience studies and supplementary data sources.
   • Describe and assess practices related to data quality.
   • Recommend changes to non-guaranteed elements such as credited rates and policyholder dividends.

Sources:
LP-XXX-16: Introduction to Reinsurance, World Bank, April 2009, excluding appendices

ASOP #23 Data Quality (excl. Transmittal Memo and Appendices), May 2011

Commentary on Question:
This question evaluated the candidate's comprehension of reinsurance concepts in the context of pricing, and their ability to apply data governance principles in a reinsurance scenario.

Solution:
a)
   (i)   Calculate the benefits reimbursed under each treaty. Show your work.

   (ii)   Determine whether it would be optimal for these treaties to be written by an offshore or domestic reinsurer from a tax perspective. Assume no income tax for offshore reinsurer.

7. **Continued**

Part i) was testing the comprehension cognitive skill. Most candidates were able to use the formula to calculate benefits for excess of loss and quota share treaties. However, many candidates applied all treaties to the total benefit amount, instead of applying the treaties in order. Another common error was applying the stop loss treaty by policy instead of in aggregate.
Part ii) was testing the analysis cognitive skill. Many candidates did not perform the calculations to determine which was optimal, instead stating that offshore is better due to lower taxes. This received little credit. Candidates who performed the calculation in aggregate rather than by treaty were also given full credit.

(i) Treaty 1: Formula is Max(Min(Benefits - Priority , Capacity),0)
Policy A is 40, Policy B is 0, Policy C is 0, Policy D is 100. Total Treaty 1 is 140

Treaty 2: Treaty 2 applies after Treaty 1. Treaty 2 Benefits are Benefits less Treaty 1 payments. Formula is Treaty 2 Benefits x Quota-Share %
Policy A is 20, Policy B is 12, Policy C is 0, Policy D is 60. Total Treaty 2 is 92
Treaty 3: Treaty 3 applies after Treaty 1 and 2, and is applied in aggregate.
Treaty 3 Benefits are Benefits less Treaty 1 and Treaty 2 Payments.
Total paid out by Treaty 1 and Treaty 2 is 232 (140 + 92). Net benefit remaining is 370 - 232 = 138. Treaty 3 is 58 = Min(138 - 80, 60).

(ii) Excise Tax is 3% x Reinsurance Premium ; Income Tax is 35% x Income
Treaty 1: Excise is 1.2 and Income is 10.5. Offshore is optimal.
Treaty 2: Excise is 3.0 and Income is 2.8. Onshore is optimal.
Treaty 3: Excise is 0.6 and Income is 5.25. Offshore is optimal.

(b) Critique the following statements regarding the reinsurance program between your company and the reinsurers:

A. *"In our quota-share treaty, the reinsurer will fund all benefit payments, in exchange for us sending the reinsurer any premiums and increases in reserve."*
B. *"Regulators do not allow us to use any low quality reinsurance counterparties."*
C. *"Captive insurance companies originated as vehicles to provide greater financial flexibility to insurance companies."*
D. *"Standard treaty terms give the policyholder a direct claim over the reinsurer in the event of the direct insurance company's insolvency."*
E. *"Standard treaty terms allow either party to independently dispute a claim."*

7. Continued

Commentary on Question:
This section was testing the knowledge utilization cognitive skill. To receive full marks, candidates needed to not only identify if a statement was incorrect, but also to identify the reason. Candidates generally did well on this section, with the exception of statement C which many candidates identified as correct.

A. Incorrect. Reinsurer will fund the quota share percentage only, and the insurer will not fund the increase in reserve.
B. Incorrect. Banning low quality reinsurers is not typical, but reinsurance credit and capital requirements may be impacted.
C. Incorrect. Captives were originally used by large industrial conglomerates interested in keeping risks within the group.
D. Incorrect. Policyholder has no claim on the reinsurer in most cases.
E. This statement is correct.

(c) Critique the memo for compliance with ASOP 23 and identify any missing elements necessary to be in compliance.

Commentary on Question:
This section was testing the knowledge utilization cognitive skill. Almost all candidates received some credit for this question. To receive full credit, candidates needed to identify several elements of the memo that complied with ASOP 23, and several items that were missing. Some candidates identified missing items but did not comment on the items correctly included and therefore received less credit. Other candidates listed elements required by ASOP 23 with no reference to the memo. These answers received little credit.

Note that the answer below is more than was required for full credit and does not represent all possible answers.

Critique of the memo:
- Actuary is not required to audit the data
- Data needs to be sufficiently current (data is stale)
- Data has known limitations which have been identified
- Described reliance on Valuation Actuary for the database
- Correctly refers to source of data
- Correctly stated deviation from compliance with Standards due to state law

Additional items required:
- Should add statement describing how data was enhanced and/or adjusted to address issues
- Should describe cost and feasibility of getting alternate data
- Should describe nature of work performed 2 years ago

- Should describe process used to evaluate data
- Should identify limitations in use of results or unresolved concerns
- Describe any uncertainty bias

8.

Learning Objectives:

2.   The candidate will understand the relationship between product features, inherent risks, and the methods and measures to design and price products.

Learning Outcomes:

(2a)   Identify, assess, and develop appropriate assumptions to reflect factors such as product characteristics, risks, policyholder behavior, and company actions.

   • Describe and apply the uses of predictive modeling.

(2b)   Assess and critique performance measures, risk measures, and modeling approaches. Recommend their uses in product management.

Sources:

LP-114-09: CIA Research Paper, Life Insurance Costing and Risk Analysis, June 2008

SOA Research 2014 - Modeling of Policyholder Behaviour for Life and Annuity Products, pp. 9 - 16, 23 - 33, 45 – 67

Stochastic Modeling Text - Intro, Sections 1-4, Intro, I - I.B.2, I.E, II.A.1 - II.A.3, III, IV.A - IV.A.9, IV.B.2-4,IV.B.6,IV.C.3

Commentary on Question:

In general the question aimed to test candidates' knowledge of stochastic modeling and its application in costing.

Solution:

(a)   Identify circumstances under which stochastic modeling is appropriate or inappropriate for ULSG products.

   Commentary on Question:
   This question was generally well done; the majority of candidates were able to obtain partial marks, with many obtaining full marks for their answers. Some candidates only explained why stochastic modeling should be used or why it shouldn't be used (not both) and therefore missed the opportunity for more credit.

   Circumstances where stochastic modeling is appropriate fall under the following categories:
   • When required by regulation and/or standards of professionalism
   • When analyzing extreme outcomes or "tail risks" that are not well understood
   • When using certain risk measures, such as Value at Risk (VaR) or Conditional Tail Expectation (CTE)
   • When certain percentiles are required
   • When one wants to understand where stress tests fall in the broader spectrum of possible outcomes

8. **Continued**

Circumstances where stochastic modeling may be inappropriate:
- When it is difficult or impossible to determine the appropriate probability distribution
- When it is difficult or impossible to calibrate or validate the model

(b) Explain whether you would suggest stochastic or deterministic modeling for the following assumptions:

    (i) Expenses

    (ii) Premium persistency

    (iii) Stock market projections

    (iv) Reinsurance rates

    (v) Lapses

Commentary on Question:
Most candidates answered this question very well. For full marks, candidates should use the criteria found in the paper 'LP-114-09: CIA Research Paper, Life Insurance Costing and Risk Analysis, June 2008' when rationalizing their decisions. Partial marks were awarded for answers that showed good reasoning.

    (i) **Expenses** – Ideal to model this assumption <u>deterministically</u> since it has low volatility, and the impact on the results of the costing exercise is low.

    (ii) **Premium persistency** – Ideal to model this assumption <u>stochastically</u> since there is a high level of correlation among individual policies, there can be high volatility, and the impact on the results of the costing exercise is high.

    (iii) **Stock market projections** – Ideal to model this assumption <u>stochastically</u> since there is a high level of correlation among individual policies, there can be high volatility, and the impact on the results of the costing exercise is high.

    (iv) **Reinsurance rates** – Ideal to model this assumption <u>deterministically</u> since it has low volatility.

    (v) **Lapses** – Ideal to model this assumption <u>stochastically</u> since there is potential for high volatility due to policyholder behavior in relation to other variables such as in-the-moneyness of the guarantee, level of interest rates, product competitiveness in the market and the impact on the results of the costing exercise is very high.

8. Continued

(c)   Explain the effect on lapse assumptions of the following:

   (i)   Different guaranteed crediting rates

   (ii)   Changes in market interest rates

   Commentary on Question:
   Candidates generally did quite well on this question – almost all were able to correctly identify the effect on lapses, and many were able to provide adequate justification.

   (i)   Policy lapse rates are negatively correlated to guaranteed crediting rates.

   Higher contractual guaranteed crediting rates result in increased value of the guarantee. When a guarantee is more in the money, the policyholder is earning a higher crediting rate than what otherwise might be available in the market thus it is more valuable to the policyholder, resulting in fewer lapses. Higher guaranteed crediting rates are therefore more valuable to policyholders.

   (ii)   Policy lapse rates are positively correlated with changes in market interest rates.

   When market interest rates increase, it is less likely the minimum rate guarantee will kick in and therefore lowering the guarantee's value, leading to higher lapses.

(d)   The company does not have sufficient computing power to use the full set of scenarios that have been generated. Describe three approaches that will allow the use of a stochastic model despite this constraint.

   Commentary on Question:
   This question was generally very poorly done. Many candidates listed alternatives to stochastic models instead of addressing approaches to reducing computing power for stochastic modeling, as asked in the question. Those receiving credit described any three of the four noted options.

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8. Continued

Options that are available include:

1. Use of simplifying assumptions

    Simplifying assumptions help avoid the requirement of complex modeling. When using this method, however, it is important to ensure that these simplified assumptions do not introduce bias or unreasonable results.

2. Reduce the number of scenarios

    The number of scenarios to be run is dependent on the use of the projection and materiality of results. Fewer scenarios are needed to calculate expected values than are needed for percentiles due to the required increased precision.

3. Variance reduction techniques

    These allow the user to generate results with fewer scenarios. It is important to note that these techniques are generally focused on improving the efficiency of projecting the mean, while tail risk measures may not be improved by their use.

4. Reduction in projection frequency

    Determination of the frequency to be used would consider the volatility of the assumption over the time frame. Care needs to be taken to ensure that any approximations made do not introduce bias.

9. **Learning Objectives:**
1. The candidate will understand various insurance products, markets, and regulatory regimes.

2. The candidate will understand the relationship between product features, inherent risks, and the methods and measures to design and price products.

Learning Outcomes:
(1b) Evaluate insurance markets, consumer needs, distribution channels, and regulatory regimes.

(2a) Identify, assess, and develop appropriate assumptions to reflect factors such as product characteristics, risks, policyholder behavior, and company actions.
  • Describe and apply the uses of predictive modeling.

Sources:
LP-102-07: Equity Indexed Annuities: Product Design and Pricing Consideration

LP-123-13: NAIC Standard Nonforfeiture Law for Individual Deferred Annuities
Hardy, Investment Guarantees, Chapter 13

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a) Determine whether each design satisfies the Post-2003 Standard Nonforfeiture Law for individual deferred annuities, if the 5-year Constant Maturity Treasury rate is 2.4%.

Show all work.

Commentary on Question:
To receive full credit for this question the candidate had to demonstrate an understanding of the non-forfeiture calculation.
Maximum credit was given when candidates recognized that for Designs Y & Z the law is satisfied in some years but not others.
Most candidates received at least partial credit on this question.

The standard non-forfeiture law requires that the guaranteed account value is at least 87.5% of the premiums accumulated at a rate of at least 1% and at most 3%. This rate is based on the 5 year CMT less 125 bps. Since this is an EIA, there is a further reduction in the rate.

9. **Continued**

Design X:
Since the GMAV includes a percentage of premium and accumulation rate that both exceed that required by the standard non-forfeiture law, the GMAV will satisfy the non-forfeiture law in all years.

Design Y:
Within 12 years, 87.5% accumulated at 1.15% will exceed 100% of premiums. Therefore this GMAV will not satisfy the non-forfeiture law beyond that point.

Design Z:
For the first 6 years, 80% accumulated at 3% will be less than 87.5% accumulated at 1.15%, so unless a higher amount before the 7th year it will not satisfy the non-forfeiture law. After 7 years the GMAV is sufficient.

(b)   Describe the advantages and disadvantages of the hedging program for each design.

Commentary on Question:
To receive full credit the candidate has to be able to distinguish between and explain the advantages and disadvantages of each design.
Most candidates received partial credit for this question, however, only a handful received full credit.

Design X:
Advantages:
(i)   It is easy to create a precise static hedge using call option spread.
(ii)   These are widely available contracts.
(iii)   The static hedge provides a known up-front cost.

Disadvantages:
(i)   Depending on sales volumes and frequency of new index segments being created, the cost and administrative complexity in managing the option portfolio may cut severely into the profit margin.

Design Y:

Advantages:
(i)   Avoids the need to purchase what would be more complex customized OTC options
(ii)   instead using futures or other instruments.

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9. Continued

Disadvantages:
(i)   Requires constant rebalancing.
(ii)   Cost is not known in advance and will depend on volatility over time.
(iii)   No downside protection like an option.
(iv)   This may cause losses if the market moves faster than rebalancing.

Design Z:

Advantages:
(i)   A static hedge would be reliable known cost for a binary option,
(ii)   unlike a dynamic hedge which would have an quickly moving delta when the underlying is near the strike price

Disadvantages:
(i)   May not be sure to be able to buy the binary options on all the indices in the future,
(ii)   since it is somewhat exotic and
(iii)   may not have enough volume to be worthwhile for an OTC dealer

(c)   Calculate the highest participation rate possible given the above assumptions. Show all work.

Commentary on Question:
Most students struggled or possibly misunderstood this question and calculated a participation rate of 75% = 3.0%/4.0%
Candidates were assigned partial credit for correct calculation of any section below.
The candidate needed to recognize how to value the appropriate call spread for a given cap and participation rate. Points were assigned for demonstrating the knowledge of setting up the call spreads and calculating the costs associated with the participation rates that could be used given the available options. Additional points were also allocated for identifying the correct maximum participation rate. <Note that this question required the student to take the general hedging information in the EIA note with the formulas in the Hardy chapter>

The static hedge consists of a call spread, purchasing an at the money call, and selling an out-of-the money call.

The strike price of the out of money call is the index level increased by the cap divided by the participation rate

9. **Continued**

The 2050 strike would be the out of money call used with 5% cap & 200% participation, at a cost of 200%*(price of 2000 strike call minus price of 2050 strike call) = 200%*(8%-5.5%)= 5.00% (cost too high)

The 2100 strike would be the out of money call used with 5% cap & 100% participation, at a cost of 100%*(price of 2000 strike call minus price of 2100 strike call) = 100%*(8%-4%)= 4.00% (cost too high)

The 2150 strike would be the out of money call used with 5% cap & 66.667% participation, at a cost of 66.667%*(price of 2000 strike call minus price of 2150 strike call) = 66.667%*(8%-3.50%)= 3% (cost ok)

The 2200 strike would be the out of money call used with 5% cap & 50% participation, at a cost of 50%*(price of 2000 strike call minus price of 2200 strike call) = 50%*(8%-3%)= 2.5% (cost ok)

Thus the highest participation rate is 66.667% for a 5% cap with a maximum of 3% hedging cost.

(d) Describe the risks that would affect an equity index annuity provider's investment strategy if the level of lapses turns out to be higher or lower than expected when pricing the product.

Commentary on Question:
Candidates were given full credit for describing the risks listed below, however, candidates did not need to list all but provide adequate information as an explanation.
Most candidates got the first 2 risks but few got the last 2.

The first is normal risk associated with fixed income annuities.
Fixed income portfolio backing a guarantee. You will have both reinvestment risk if rates go up when lapses are low and disintermediation risk if lapses increase when interest rates drop.

The second is the funding of the index credit.
If policyholder surrenders before the end of the index period then company is over hedged.
Depending upon level of lapses assumed compared to actual you can be over or under hedged. If lapses lower than expected could lead to purchasing additional hedges at higher cost.

10.   **Learning Objectives:**
1.   The candidate will understand various insurance products, markets, and regulatory regimes.

2.   The candidate will understand the relationship between product features, inherent risks, and the methods and measures to design and price products.

Learning Outcomes:
(1b)   Evaluate insurance markets, consumer needs, distribution channels, and regulatory regimes.

(2a)   Identify, assess, and develop appropriate assumptions to reflect factors such as product characteristics, risks, policyholder behavior, and company actions.
   • Describe and apply the uses of predictive modeling.

Sources:
LP-107-07: Experience Assumptions for Individual Life Insurance and Annuities

LP-134-15: Digital Distribution in Insurance: A Quiet Revolution, Swiss Re, 2014

Report on the Lapse and Mortality Experience of Post-Level Premium Period Term Plans. May 2014, pp.3-98

"Term Mortality and Lapses", Product Matters, August (62) 2005,

Atkinson & Dallas, Life Insurance Products and Finance, Chapters 10, 11, 13

Commentary on Question:
The question in general was centered around LO's #1 and #2. It was testing to see if the candidate can explain the inherent differences in the various life insurance products, namely a UL product sold through an agent and a Term Life product sold through the internet.

The candidate also needed to demonstrate an understanding of differences in the two markets and characteristics of the purchasers in each market.

Also, an understanding of the assumptions used in each product's pricing, namely lapse and mortality, and how these assumptions behave throughout the life of the product. And also understand how assumptions will differ by risk class(age or gender, e.g.). LO #2a, developing appropriate assumptions to reflect factors such as product characteristics and policyholder behavior was key in this question.

Lastly, the candidate needed to explain and evaluate the different profit measures of a typical life product and how to use these measures help determine an ideal product to meet the company's objectives.

10. Continued

Most candidates provided an answer to this question and were able to demonstrate a basic understanding of the Learning Objectives. A few were able to demonstrate a strong proficiency of the LO's and receive a perfect or near-perfect score. Many candidates provided a listing-type solution and while the lists were relevant, they were not taking the next step to draw a meaningful conclusion or recommendation, which was one of the key objectives of the question.

Solution:

(a) HLR wants to distribute the term product directly through the internet instead of the traditional agent/broker channel used for its current UL product. Assess the impact of this distribution method on mortality and lapse assumptions.

Commentary on Question:
The question was testing the candidate's knowledge of differences in distribution systems, and how those differences will affect the pricing assumptions of a life product. In accordance with LO #2, they needed to identify appropriate lapse and mortality assumptions when switching from one life product and distribution to another.

While many candidates identified that the internet differs from the agency model, they did not always come to the ideal conclusion on how this distribution will affect lapse and mortality. Many candidates gave opposite conclusions, or no conclusion at all and provided a vague list. For example, many candidates said that mortality would decrease because younger consumers typically purchase through the internet.

Other candidates did come to the correct outcome, but their rationale/explanation was not consistent with the items in the rubric.

While most of these candidates received partial credit for their answers, very few received full credit in this section.

The internet provides a platform to customers that allows them to comparison shop by price fairly easily. This pricing environment can lead to product commoditization and will most likely lead to increased churn and higher lapses than a UL product sold through an agent.

Commoditization typically leads to aggressive pricing methods by carriers in order to secure a higher ranking with the aggregator websites. These customers that are seeking out the cheapest quotes are typically higher-risk customers that want the ease of purchasing through the internet. This adverse selection will lead to higher mortality rates.

10. Continued

(b)

    (i)   Explain why the current UL lapse assumptions are not appropriate for the new term product.

    (ii)   Recommend a lapse assumption pattern appropriate for the proposed term product. Justify your answer.

    (iii)   Describe how the recommended lapse assumption pattern for the proposed product would differ for a female age 55. Justify your answer.

Commentary on Question:
This question section was testing the candidate's knowledge of different life products and what appropriate assumptions would be for each product. They needed to identify the differences in assumptions between UL and Term lapse assumption and determine if these differences are significant enough to change the assumption values. The question, part (i), should have led the candidate to a starting point to explain why assumptions needed to change. The main thrust of this question was centered on the fact that the Term Life product had a significant increase in premium at the end of the initial term, the jump ratio.

The question also asked the candidate to recommend an appropriate lapse assumption for the term product.

Lastly, the candidate was asked to evaluate how assumptions would differ for a different class of policyholder, namely switching from a male to a female and a different age.

Many candidates were able to identify correctly why the assumption for UL is not appropriate. They keyed in on the jump ratio as well, which was important. However, a number of candidates failed to even recommend a lapse pattern. Many candidates only talked about the concept of "buyer's remorse" and how that would affect lapses, for example.

Most candidates did have the general idea and progression of lapse assumptions by duration, but did not conform to the magnitude of the changes in the grading rubric. While partial credit was given for recommending a reasonable lapse pattern, full credit was reserved for those that followed closely to the pattern outlined in the rubric.

10. Continued

Lastly, most candidates understood that the lapse assumption would differ between age and gender. However, few understood the direction it should go and most candidates provided a countering solution. Very few picked up on the fact that there were opposing forces in play (change in gender is one direction and increase in age was an opposing direction).

Many candidates did not provide a reasonable conclusion to this last section, and only provided a vague answer.

A typical term life policy will experience a shock lapse after the initial term period ends. This is due to the large increase in premiums after the initial guaranteed premium period. This does not exist for a UL product.

A better lapse pattern assumption for this new term product would be a level 4% for the first 20 years and then a shock lapse of 70% at the end of the initial premium period. This is to account for the jump in premium after year 20. Year 21 would still have a higher lapse rate, around 30%, and then down to 10% in years 22 and beyond.

When increasing the issue age from 50 to 55, you should expect an increase in the shock lapse due to this. This is due to the increase in the premium jump ratio, which is correlated to issue age. Not only does the ratio percentage increase, the dollar amount of jump can be significant. Further, older issue age policyholders may have less insurable need at the end of the level premium period.

When switching from male to female, you should expect a decrease to the shock lapse. Females will tend to have a lower premium jump ratio than males at most ages.

These two changes are offsetting, so the effect is dampened somewhat. You should expect the shock lapse to be slightly higher as issue age increase to premium would be dominant over the impact of the gender switch.

(c) Compare the expected impact on mortality and lapse assumptions between the proposed and alternate premium patterns.

Commentary on Question:
The main learning objective here is how the premium pricing schedule of each proposal will effect policyholder behavior, so part of LO #2a. The focus was on the premium jump ratio of each proposal and how that will effect lapses and mortality assumptions in the pricing.

10. Continued

Most candidates understood and could explain the concept of the premium jump ratio and how that will impact lapses and mortality. They were able to come to the correct outcome that lapses will increase and mortality will worsen due to the higher premium jump ratio for the proposed product, and that the unhealthy lives will remain. Many candidates actually calculated the jump ratio between the two proposals.

Impact on Lapses-the premium jump ratio is the ratio of the premium in the year following the level premium period to the level premium amount. So, in this case it is premium in year 21 over premium in year 20. Policies with lower jump ratios will experience lower shock lapses than policies with larger premium jump ratios. Premium Pattern B has a much higher jump ratio than Pattern A, so pattern B will have a higher shock lapse than A.

Impact on Mortality-Most health policies will lapse at the end of the level premium period. There is a substantial anti-selection level occurring after the level premium period as the healthy individuals can re-underwrite at a better rate. The unhealthy people will remain. Product B will have an even higher level of mortality deterioration because of the higher shock lapse and premium jump ratio, so even more unhealthy lives remain.

(d) Shareholders are willing to contribute significant capital but require an ROI of at least 15%. Recommend a product design based on profitability metrics. Justify your recommendation.

Commentary on Question:
This section was testing the candidate's knowledge of profit measures and financial characteristics of insurance products. It was also testing their ability to critically assess and evaluate each product and recommend one that best meets the company's goals.

Most candidates were able to identify Design C as the optimal choice. Full credit was reserved, however, for those candidates that demonstrated they went through and evaluated every design option listed and provided thoughtful commentary on each one.

If shareholders require a 15% ROI, then Design B can be eliminated as their ROI < 15%. Design C has the highest Value of New Business, but has the highest strain, and a middle-ranking break-even year. Since shareholders are willing to contribute a significant amount of capital, I would recommend Design C, since C maximizes company profitability.