

ILA LPM Model Solutions

Spring 2021

1. Learning Objectives:

1. The candidate will understand the designs and risks of the common life and annuity products and features, as well as the methods and metrics used to design and price these products.
3. The candidate will understand common issues and practices related to In Force and New Business Product Management, and how experience studies are designed and used for evaluating past experience and for setting assumptions.
5. The candidate will understand the role of the Investment Actuary and the Portfolio Management Process in the Life Insurance company context, as well as the common forms of Fixed income securities and their uses, and the methods and processes used for evaluating portfolio performance and asset allocation.

Learning Outcomes:

- (1b) Describe and evaluate methods and metrics used to design and price these products, and assess their profitability.
- (3d) Describe and evaluate the challenges insurers face in a low and potentially rising interest rate environment.
- (5c) Describe and assess the role of and significant considerations related to the design and function of asset allocation strategies.
- (5g) Describe the principles of Liquidity Risk Management in an insurance company portfolio management context.

Sources:

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

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

LPM-149-19: Ch. 11, pp. 499-502 of Life Insurance Products and Finance, Atkinson and Dallas

LPM-153-19: Life in-force Management: Improving Consumer Value and Long-Term Profitability

1. Continued

Transition to a High Interest Rate Environment: Preparing for Uncertainty, SOA Research, Jul 2015, Executive Summary, section IV: parts C (1-4 & 8-11 only), D, E & H

LPM-162-19: Liquidity Risk Management: Best Risk Management Practices

Managing Investment Portfolios, Maginn, John L. and Tuttle, Donald L., 3rd Edition, 2007 - Ch. 3: Managing Institutional Investor Portfolios (section 4.1)

Managing Investment Portfolios, Maginn, John L. and Tuttle, Donald L., 3rd Edition, 2007 - Ch. 5: Asset Allocation (sections 2-4)

Commentary on Question:

Commentary listed underneath question component.

Solution:

- (a)
- (i) Describe two risks to BXP due to a significant rise in future interest rates.
 - (ii) Recommend strategies to address these risks.

Commentary on Question:

This question required the candidates to describe two risks and actions that BXP could take to mitigate these risks. The majority of candidates correctly described disintermediation risk and identified actions that could be used to mitigate this risk. Many candidates understood that there was a liquidity risk, and many were able to suggest a change to the asset portfolio to mitigate this risk.

- (i) Risks
 - a. Disintermediation Risk:
 - BXP may face disintermediation risk as interest rate rises significantly, where policyholders surrender the policies for better yield elsewhere.
 - b. Liquidity Risk:
 - Since BXP is primarily invested in 30-year fixed income securities, they will need to sell their long-duration assets at a discount, which causes BXP to realize capital losses. Since the market value of assets is lower than anticipated when the policies were first established, additional funds may be required to fund the liabilities.
- (ii) Strategies
 - a. Increasing the surrender charge period will discourage policyholders from surrendering. A surrender charge period of 5-10 years would be appropriate.

1. Continued

- b. Adding a market value adjustment (MVA) would decrease the value that the policyholder would receive upon lapse when interest rates rise, which will reduce disintermediation risk.
- c. Asset-liability management: To manage the interest rate risk and liquidity risk, BXP should hold assets with earlier and varied maturity dates. This would shorten the asset duration to help match the future liability cash flows.

- (b) You are given the following components of Distributable Earnings:
- (i) Commissions
 - (ii) Overhead expenses
 - (iii) Surrender benefits
 - (iv) Investment income

Describe the impact of a spike in interest rates to each of the above components. Justify your answer.

Commentary on Question:

In order to receive full marks, candidates needed to identify the impact on each component, and provide a thorough explanation.

Most candidates understood the impact on commission, overhead expenses and surrender benefits. However, many candidates incorrectly assumed that the investment income would increase because the BXP would increase crediting rates to remain competitive. Although this is a possibility, this would only occur if BXP explicitly increased crediting rates, and is not the immediate impact if interest rates increased.

- (i) Policyholders would lapse to seek a more competitive product, so commissions would decrease, as commissions usually depend on the account value of the policies. Commissions may eventually increase if BXP decides to increase its credited rates to remain competitive.
- (ii) Overhead expenses are not impacted by the number of policies in force, so there would be no changes to these expenses.
- (iii) Surrender Benefits, especially after the one year surrender charge period, would increase due to a spike in interest rates. Policyholders will lapse their policies in order to obtain better rates elsewhere.

1. Continued

- (iv) The immediate impact will be negative since the company will need to sell fixed income assets at a loss in order to pay policyholders that have lapsed. There will be a realized loss on selling the long duration fixed assets after interest rates rise.

2. Learning Objectives:

1. The candidate will understand the designs and risks of the common life and annuity products and features, as well as the methods and metrics used to design and price these products.
2. The candidate will understand the theory of "Value Creation" for life and annuity products and how to evaluate the patterns of earnings emergence under various regulatory regimes.

Learning Outcomes:

- (1b) Describe and evaluate methods and metrics used to design and price these products, and assess their profitability.
- (1d) Describe and evaluate the impact of VM-20 on pricing.
- (1o) Describe how taxes may be treated in a pricing model and the impact of tax reform on life products profitability.
- (2b) Describe and apply the common profit metrics (IRR, Value of New Business, Embedded Value, ROE) used in pricing insurance products.

Sources:

LPM-155-19: Understanding Profitability in Life Insurance

LPM-148-19: Ch. 9 of Life Insurance Products and Finance, Atkinson and Dallas

LPM-149-19: Ch. 11, pp. 499-502 of Life Insurance Products and Finance, Atkinson and Dallas

Impact of VM-20 on Life Insurance Product Development, SOA Research, Nov 2016, pp. 1-31 (excluding discussion of 20-year term)

LPM-150-19: Tax Reform Impacts on Life Insurance Pricing and Profitability, 2018

LPM-165-19: Life Products and Features, ILA Committee, 2019

Commentary on Question:

Commentary listed underneath question component.

Solution:

- (a) Calculate the after-tax profit margin. Show all work.

2. Continued

Commentary on Question:

Candidates were generally able to solve for the pre-tax solvency earnings correctly. Most candidates had the correct formula for profit margin. However, many candidates incorrectly calculated after-tax solvency earnings. Two errors were common: using the increase in statutory reserve to calculate taxable income (rather than the increase in tax reserve), or deducting tax from taxable income rather than pre-tax solvency income. Another common error was assuming premiums were paid at the beginning of the year; the question clearly stated that all cashflows occurred mid-year. Partial credit was awarded in these cases.

- Product Cash Flows = Premiums – Benefits – Expenses
- Pre-Tax Solvency Earnings = Product Cash Flows + Investment Income – Increase In Solvency Reserve
- Taxable Earnings = Product Cash Flows + Investment Income – Increase in Tax Reserve
- Taxes = Tax Rate * Taxable Earnings
- After-Tax Solvency Earnings = Pre-Tax Solvency Earnings – Tax
- Premium Margin = PV(After-Tax Solvency Earnings)/PV(Premiums)

ProdCashFlow	700	500	200	(100)	(500)
StatResIncr	1,000	1,000	2,000	(2,500)	(1,500)
Inv Income	20	50	80	140	40
Pre-Tax Solvency Earnings	(280)	(450)	(1,720)	2,540	1,040
TaxResIncr	920	920	1,840	(2,300)	(1,380)
Taxable Income	(200)	(370)	(1,560)	2,340	920
Tax	(42)	(77.7)	(328)	491	193
AT Solvency Earnings	(238)	(372)	(1,392)	2,049	847

- $PV(AT\ Solvency\ Earnings) = 705$
- $PV(Premiums) = 9,296$
- **Premium Margin = 7.58%**

- (b) Evaluate term insurance pricing considerations under VM-20 with respect to:
- (i) Product design changes.
 - (ii) Profitability impacts from moving from Regulation XXX.
 - (iii) Profitability impacts of assuming no mortality improvement to future reserve nodes in the deterministic reserve.

2. Continued

Commentary on Question:

In general, candidates performed poorly on this section.

For part (i), most candidates focused on the differences between AG48 and VM20 reserves. The question was asking them to discuss product design.

Most candidates received partial credit on part (ii). To receive full credit on part (ii), candidates had to specify impacts with and without financing under AG48. Very few candidates performed well on part (iii). Partial credit was awarded for recognizing that the deterministic reserve would increase. To receive full credit, candidates had to discuss the resulting tax inefficiency.

(i)

- Level term premiums will still be followed by some sort of annual renewable term (ART) scale. The importance of having very high guaranteed ultimate rates to achieve the desired segmentation may subside somewhat.
- Product design will evolve around encouraging favourable product cash flows and managing risks, rather than focusing on formulaic reserve requirements.

(ii)

- Profitability will increase when moving to VM20 if the AG48 business was not financed. This is driven by lower reserves under VM20.
- Profitability will decrease when moving to VM20 if the AG48 business was financed due to the loss of tax advantages.

(iii)

- Pre-tax profit is unchanged but tax inefficiency is introduced, lowering post-tax profitability and increasing the overall reserve requirement.
- If there is no future mortality improvement, the DR prevails in some early and late durations where the NPR was prevailing previously. This produces a small decline in after-tax profit measures due to tax inefficiency, as when the NPR prevails tax efficiency is maximized.

- (c) Describe the impacts the Tax Cuts and Jobs Act will have on the profit margin for the term insurance products.

Commentary on Question:

Most candidates were able to list the changes, but many struggled to apply those changes to term products. To receive full credit, candidates had to describe the impacts of the Tax Cuts and Jobs Act on both AG48 and VM20 business.

2. Continued

There were four key changes:

1. Tax rate was reduced from 35% to 21%
2. Extension of proxy DAC amortization period from 10 years to 15 year and increase in proxy DAC tax rate from 7.7% to 9.2%
3. Change in the way the tax reserves are calculated via the application of a 92.81% scalar to stat reserves excluding deficiency reserves
4. RBC factors increased by scalar multiple of $(1 - 0.21)/(1-0.35)$. [NAIC may choose to adjust gross factors instead, leaving after-tax factors unchanged].

Tax reform has a small positive impact on VM20 term products, as the increase in profitability due to reduced tax rate outweighs the other impacts.

The tax reform significantly reduces the benefits of financing excess reserves under AG48, significantly reducing the IRR and profit margin.

After tax reform, the profit margins for financed AG48 and VM20 products are much closer together, which may push more companies to adopt VM20 sooner.

3. Learning Objectives:

1. The candidate will understand the designs and risks of the common life and annuity products and features, as well as the methods and metrics used to design and price these products.

Learning Outcomes:

- (1a) Describe the designs of the common life and annuity products and evaluate their associated features and inherent risks.
- (1n) Describe and apply the requirements of applicable ASOPs on Life and Annuity Product Pricing and Assumptions
- (1r) Describe and evaluate the role of Behavioral Economics in understanding and modeling policyholder behavior in the life and annuity context.

Sources:

LPM-166-20:Annuity Product and Features, ILA Committee, 2019

ASOP 54: Pricing of Life and Annuity Products, Jun 2018

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

Commentary on Question:

This question tested candidates' knowledge of pricing, product design, and assumption setting as it relates to variable annuity product features. Overall, candidates displayed good understanding of the variable annuity product and performed well on the question as a whole.

Solution:

- (a) Critique three assumptions in the VA Pricing Model Review report.

Commentary on Question:

Candidates performed well on part (a). Additional answers were possible, such as discussing the annuitization assumption given in the question. Some candidates lost credit because they discussed recommended changes to product features rather than changes to assumptions as the question asked.

Setting the mortality assumption to be equal to the fixed annuity mortality assumption may not be appropriate. Because the variable annuity contains a guaranteed minimum death benefit (GMDB) feature, the company may experience some anti-selective mortality. This indicates that it may be appropriate to set the mortality assumption higher for the variable annuity product compared to the fixed annuity.

3. Continued

It is likely not appropriate to assume that variable annuity expenses will be lower than fixed annuity expenses. In fact, because of the greater regulation associated with variable products as well as the additional expenses associated with tracking unit value calculations, it is likely appropriate to assume that variable annuity expenses are greater than fixed annuity expenses instead.

Setting surrender charges above the industry average as well as agent commissions below the industry average are both likely to deter sales. Producers will be less motivated to sell the product with lower commissions, and higher surrender charges will decrease the attractiveness of the product. Because of this, it may not be true that these features will improve product profitability once the likely change in sales is factored in to the calculation.

- (b) Describe two governance and controls principles from *ASOP 54: Pricing of Life and Annuity Products* that have been demonstrated in the report.

Commentary on Question:

Part (b) asked candidates to apply the Governance and Controls section of ASOP 54 (Section 3.6) to the pricing report given in the question. Many candidates discussed other elements of ASOP 54, or other general good practices for assumption setting and governance. However, to receive full credit, candidates needed to apply the specific governance and controls elements of ASOP 54 to the variable annuity product.

One governance and controls element discussed in ASOP 54 is that model results should be validated for consistency with independent calculations of such values from outside the model. The Risk Management group independently computing the cost of the death benefit guarantees demonstrates compliance with this principle.

Another governance and controls principle discussed in ASOP 54 is validation that the model reasonably simulates the expected future financial impact of the product. Given that the model's calculated values for death benefits were demonstrated to be consistent with the product design in one of the stochastic scenarios, compliance with this principle was demonstrated.

- (c) Recommend product features and/or assumption changes, based on behavioral economics insights, required to accommodate each of the following policyholder behavior changes:
- (i) A higher percentage allocation to fixed income funds
 - (ii) An increase in annuitization rates

3. Continued

Commentary on Question:

Candidates performed reasonably well on part (c). To receive full credit, candidates needed to both make a recommendation on both parts as well as justify how the recommendation is based on behavioral economics insights.

Some candidates only received partial credit because they only discussed behavioral economics without making a recommendation, or because they made recommendations with no justification.

- (i) The annuity application could include a suggested allocation of 50% equity funds and 50% fixed income funds, or another percentage that is higher compared to the allocations the company currently experiences. This is based on the concept of “anchoring”, where annuitant behavior is very likely to be influenced by numbers that are suggested by the company.
 - (ii) Based on the concept of “reliance on defaults”, the company could set up a default annuitization age that triggers annuitization if no action is taken, but that allows for an “opt out” or resetting the annuitization to occur at a different age. Reliance on defaults refers to the concept that people are unlikely to override set defaults especially as decision complexity increases.
- (d) You are given the following additional information for Policyholder 1 (i.e. Age 40) in the table above:
- An initial premium of 10,000
 - No withdrawals

Calculate the Death Benefit for each of the first five policy years. Show all work.

Commentary on Question:

Candidates were largely successful on part (d). One common mistake was using the modeling assumption for the cost of the return-of-premium benefit and the step-up benefit as well as the per-contract expense assumption as deductions to be taken from the account value. Also, some candidates did not correctly perform the “step-up” calculation, or used incorrect timing assumptions in their calculations. Candidates did receive partial credit for those elements of their calculations that were correct.

3. Continued

<u>Year</u>	<u>Return</u>	<u>Account Value</u>	<u>Step up</u>	<u>5% Rollup</u>	<u>Death Benefit</u>
0		10,000	10,000	10,000	
1	-1%	9,900	10,000	10,500	10,500
2	6%	10,494	10,494	11,025	11,025
3	7%	11,229	11,229	11,576	11,576
4	9%	12,239	12,239	12,155	12,239
5	1%	12,362	12,362	12,763	12,763

4. Learning Objectives:

1. The candidate will understand the designs and risks of the common life and annuity products and features, as well as the methods and metrics used to design and price these products.
2. The candidate will understand the theory of "Value Creation" for life and annuity products and how to evaluate the patterns of earnings emergence under various regulatory regimes.

Learning Outcomes:

- (1a) Describe the designs of the common life and annuity products and evaluate their associated features and inherent risks.
- (1b) Describe and evaluate methods and metrics used to design and price these products, and assess their profitability.
- (1c) Describe and assess insurance and annuity distribution approaches and the impact of emerging technologies.
- (2b) Describe and apply the common profit metrics (IRR, Value of New Business, Embedded Value, ROE) used in pricing insurance products.
- (2e) Describe and evaluate fundamental strategies for enhancing value through active in-force and operational management.

Sources:

Earnings Emergence Insurance Accounting under Multiple Financial Reporting Bases, 2015, pp. 4-6, 10-24 & 45-53

LPM-155-19: Understanding Profitability in Life Insurance

Evolving Strategies to Improve Inforce Post-Level Term Profitability, Product Matters, Feb 2015, pp. 23-29

LPM-149-19: Ch. 11, pp. 499-502 of Life Insurance Products and Finance, Atkinson and Dallas

Relationship of IRR to ROI on a Level Term Life Insurance Policy, Product Matters, Jun 2013, pp. 18-21

Report on Pricing Using Market Consistent Embedded Value (MCEV), Jun 2012 (excluding Appendix 2)

Risk Based Pricing – Risk Management at Point of Sale, Product Matters, Jun 2009

4. Continued

Commentary on Question:

Commentary listed underneath question component.

Solution:

- (a)
- (i) Calculate net income in year 1. Show all work.
 - (ii) Calculate the internal rate of return. Show all work.
 - (iii) Calculate the value of new business. Show all work.
 - (iv) Recommend whether JXR should proceed with the new underwriting program if it will cost 1 million to implement. Justify your answer.

Commentary on Question:

This question requires candidates to apply the common profit metrics (IRR, Value of New Business) and evaluate those metrics in a numerical insurance product example. Most candidates did well in the first 3 parts. In part (iv), very few candidates identified that an after-tax incremental cost should be used, and some candidates used the before/after net income instead of value of new business when deciding the break-even point.

The solution below is based on using 40 as current expense assumption. However, using 109.10 in the current income statement to back solve for the new expense is considered equally valid approach, candidates that did this approach also received full credit. Candidates that got an incorrect value for part (i) were still given full credit for the part (ii), (iii), (iv) as long as the methodology in parts (ii), (iii), and (iv) was correct

(i)
$$\text{Expense} = \text{Acquisition expense per App} \times \text{Applications per policy} + (\text{Acquisition Expense per premium} + \text{Maintenance Expense per premium}) \times \text{average Premium per policy} = (40 - 10) \times 1.5 + (30\% + 5\%) \times 26 = 54.1$$

$$\text{Pretax Net Income} = \text{Premium} + \text{investment income} - \text{claims} - \text{expenses} - \text{increases in reserve} = 26 + (-1.29) - 0.17 - 54.1 - 48.73 = -78.29$$

$$\text{Tax on Income} = \text{Pretax Net Income} \times \text{tax rate} = -78.29 \times 25\% = -19.57$$

$$\text{Net Income} = \text{Pretax Net Income} - \text{Tax on Income} = -78.29 - (-19.57) = -58.72$$

4. Continued

- (ii) IRR definition is "a single interest rate that discounts all policy cash flows back to the issue date of the policy, such that the sum of discounted cash flows equals zero". Those cash flows include income, taxes, required capital, and interest on required capital

Using the IRR() formula to solve r , which can also be verified by checking the NPV at the IRR = 0

	1	2	3	4	5
Net Income	-58.72	21.01	24.28	29.94	35.49
Discount Rate	$(1+r)$	$(1+r)^2$	$(1+r)^3$	$(1+r)^4$	$(1+r)^5$

The proposed program's IRR is 28.01%

- (iii) Value of new business (VNB) Formula
 VNB = Present value of future profits after tax - time value of financial options and guarantees - frictional costs of required capital - cost of non-hedgeable risk

	1	2	3	4	5
Net Income (new)	-58.72	21.01	24.28	29.94	35.49
Discount Rate	$(1+3\%)$	$(1+3\%)^2$	$(1+3\%)^3$	$(1+3\%)^4$	$(1+3\%)^5$

New VNB = NPV @ 3% = 42.23

- (iv) The after-tax cost of the program will be 1 million \times (1 - tax rate) = 750,000.

	1	2	3	4	5
Net Income (current)	-100.83	21.05	24.34	30.01	35.35
Discount Rate	$(1+3\%)$	$(1+3\%)^2$	$(1+3\%)^3$	$(1+3\%)^4$	$(1+3\%)^5$

Original VNB = NPV @ 3% = 1.57

New VNB = 42.23 (from (iii))

Change in VNB = new VNB - old VNB = 42.23 - 1.57 = 40.66

If amortized over one year, the VNB per policy increase of 40.66 means that $\$750,000 \div 40.66 = 18,446$ policies must be sold to break even on the incremental cost.

4. Continued

If the company can sell more than 18,446 policies, then JXR should proceed with the new underwriting program.

- (b) Define the following post level term structures:
 - (i) Traditional approach
 - (ii) Simplified re-underwriting
 - (iii) Graded
 - (iv) Continuing class

Commentary on Question:

This question asks the candidates to describe different design structure under the post-level term for level premium term life. Most candidates did well on this question and clearly understood the difference of each strategy. However, some candidates didn't talk about the definition of the structure, instead focused on describing the pros and cons of each structure and lapse/mortality impacts, which was not the intention of the question.

Traditional approach: initial term is fixed level premium, followed by a YRT rate schedule thereafter; in most cases, all risks are aggregated post-renewal, i.e. all risks pay the same rate based on their attained age, sex, and smoker status

Simplified re-underwriting: ahead of the post-level term period, the carrier offers the insured the option to answer a simplified underwriting questionnaire; the result would then classify the insured into a few categories (may be fewer risk classes than the original preferred structure), including a default guaranteed scale for those who decline to respond to the questionnaire

Graded: moderate the increase in post-level term rates by having rates increase less for the first few years, followed by a jump later (e.g. 5 years post-renewal)

Continuing class structure - maintain parallel distinction between YRT scales for each risk class at issue rather than aggregate all risks into one YRT scale per the traditional approach

- (c) Explain how adding a post level term renewal feature with simplified re-underwriting to the non-renewable product would impact product design and profitability.

4. Continued

Commentary on Question:

This question asks candidates to evaluate one specific post level term strategy of level term premium product– simplified re-underwriting and assess its necessary assumptions and the impact on its probability.

Full credit was awarded to candidates who commented on both product design and profitability, as well as provided three valid explanations. Other answers with suitable justification not listed below were also awarded full credit. One common mistake was that candidates were comparing the product design and profitability of a traditional renewable term vs a simplified re-underwriting term instead of a non-renewable term vs a simplified re-underwriting term

- Need to estimate a lapse rate at renewal, where the jump in premium will influence the number of lapses - by maintaining multiple post-renewal risk classes, the insurer may be able to limit the increase in premium and therefore lapse rates because re-underwriting offers some degree of protective value.
- How to estimate anti-selection for each risk class including the guaranteed class: with a simplified re-underwriting structure, the incentive to lapse is somewhat reduced depending on the attractiveness of the offer; only the very best risks may have an incentive to be fully re-underwritten and to the extent this is a small proportion of the cohort, the level of anti-selection may be relatively minimal compared to a typical PLT structure
- Whether to adjust the initial level premium rates to be more competitive ("race to bottom"): the carrier may elect to reduce the initial level term premiums if simplified re-underwriting becomes an option; there is more flexibility over the choice of the break-even year past the initial term period at the cost of lapse risk; Lapse in the level term period would also be affected: most likely reduced when renewal option is added. If initial premium could be reduced, then lapse would be almost certain to reduce as well
- For a US product, ensure that cash values will not be required under standard nonforfeiture law: the addition of renewable premiums may necessitate offering cash values which must be tested for. Only certain PLT structures such as high renewal premiums or limiting issue or attained ages will permit offering no cash values

5. Learning Objectives:

1. The candidate will understand the designs and risks of the common life and annuity products and features, as well as the methods and metrics used to design and price these products.
2. The candidate will understand the theory of "Value Creation" for life and annuity products and how to evaluate the patterns of earnings emergence under various regulatory regimes.

Learning Outcomes:

- (1) Describe and apply the principles of "Risk-Based Pricing" and "Market Consistent Embedded Value".
- (2b) Describe and apply the common profit metrics (IRR, Value of New Business, Embedded Value, ROE) used in pricing insurance products.
- (2e) Describe and evaluate fundamental strategies for enhancing value through active in-force and operational management.

Sources:

LPM-153-19: Life in-force Management: Improving Consumer Value and Long-Term Profitability

LPM-155-19: Understanding Profitability in Life Insurance

Report on Pricing Using Market Consistent Embedded Value (MCEV), Jun 2012 (excluding Appendix 2)

Commentary on Question:

This question tested candidates understanding of MCEV and capital. Successful candidates were able to demonstrate their understanding of MCEV construction and its purpose in strategic planning and risk assessment.

Solution:

- (a) Describe why the capital held by KXW may differ from the regulatory capital requirement.

Commentary on Question:

Most candidates were able to correctly identify that regulatory capital represents a floor to the amount of capital held by the company. However, many candidates were not able to correctly identify and describe why the capital might be higher than the floor.

5. Continued

The required capital must be at least equal to that determined by following local regulatory capital requirements, but may also include any amounts required to meet other objectives (i.e. internal risk objectives and/or allocations, as well it may incorporate rating agency outlook)

- (b) Calculate the Market Consistent Embedded Value (MCEV) of KXW. Show all work.

Commentary on Question:

Full credit was awarded to candidates who were able to correctly calculate the MCEV of KXW. Partial credit was awarded where candidates were able to correctly articulate the formulas and subcomponents of MCEV. While the ultimate MCEV value needed to reflect both the life and annuity lines of business equivalent credit was awarded to candidates to performed the calculations independently and combined at the end and to candidates who combined the life and annuity values in their first step.

In general, candidates struggled to earn full credit on this question. Many candidates failed to correctly account for the Adjusted Net Worth contribution to MCEV, either by setting $MCEV = VIF$ or by incorrectly calculating the required capital as it contributes to MCEV. Additionally, many candidates failed to provide transparency into the subcomponents of the calculation – making it difficult to award partial credit.

- (c) The following sensitivity tests on the MCEV of KXW’s life and annuity block are available:

Set #	Sensitivity	% change in MCEV
1	Risk-free rates decrease 100bps	-8.0%
	Risk-free rates increase 100bps	+2.5%
2	Mortality improvement of 5% for life business	+3.0%
	Mortality improvement of 5% for annuity business	-1.2%

- (i) Describe the purpose of MCEV sensitivity testing.
- (ii) Explain possible reasons for the relative asymmetric magnitude of each set of sensitivities.
- (iii) Recommend two methods of risk transfer that KXW can use to manage the overall level of risk and amount of required capital. Justify your response using the sensitivity tests provided above.

5. Continued

Commentary on Question:

- (i) *Full credit was given to candidates who were able to describe the purpose of MCEV sensitivity testing specifically. Most candidates were able to articulate the purpose of sensitivity testing, but many struggled to provide the relevance of sensitivity testing within the context of MCEV*
- (ii) *Full credit was awarded to candidates who provided at least two possible reasons for the asymmetry of the sensitivity results referenced in the table. In general candidates performed well on this question, but some candidates failed to provide more than one reason for the asymmetry while other candidates failed to address the specific asymmetries represented in the results they were asked to evaluate.*
- (iii) *Full credit was awarded to candidates who were able to propose and justify **two** distinct methods of risk transfer for KXW that were directly tied to the sensitivity results presented. While in general candidates did well on this question, many candidates lost points by proposing two reinsurance structures (e.g., coinsurance and modified coinsurance) instead of two distinct methods of risk transfer. On the whole candidates did very well at both identifying and justifying their recommendations.*

- (i) The purpose of MCEV sensitivity testing is to provide management and investors with a means to better understand how changes to assumptions or the broader market environment impact the economic value of the company
- (ii) Risk Free Rate - The company is less sensitive to an increase in interest rates of the same magnitude because in general many insurers only partially participate in investment income above guarantees but have to bear the full downside risk.

Mortality Improvement – Mortality improvement has a bigger and opposite impact on total MCEV for the life business than it has for the annuity business because KXW writes more death protection business than longevity business.

- (iii) Method 1: Use derivatives to hedge the portfolio against interest rate risk. When the asset-liability match of a business is adversely impacted by a sharp interest rate movement, derivatives can be used to manage the asset risk on the business – transferring risk to investors in the market.

Method 2: Transfer risk to reinsurers. Using reinsurance will allow KXW to directly transfer all or some of their risk exposures to reinsurance partners, depending on the selected structure.

6. Learning Objectives:

4. The candidate will understand the various forms of traditional reinsurance, will be able to assess how and when they are effectively used, and will be able to perform the associated accounting (from both ceding and assuming perspectives) for basic reinsurance transactions.

Learning Outcomes:

- (4a) Evaluate and analyze traditional and advanced reinsurance transactions, and prepare related financial statement entries.
- (4b) Describe and evaluate indemnity reinsurance and evaluate its use, forms, and requirements.

Sources:

Life, Health & Annuity Reinsurance, Tiller, John E. and Tiller, Denise, 4th Edition, 2015
- Ch. 4: Basic Methods of Reinsurance

Life, Health & Annuity Reinsurance, Tiller, John E. and Tiller, Denise, 4th Edition, 2015
- Ch. 7: Reinsurance of Inforce Risks

Life, Health & Annuity Reinsurance, Tiller, John E. and Tiller, Denise, 4th Edition, 2015
- Ch. 9: Risk Transfer Considerations

Commentary on Question:

The purpose of this question was to test the candidate's knowledge of reinsurance arrangements and their impact on company financial statements.

Solution:

- (a) Calculate the following for ABC and XYZ:
 - (i) Gains from Operation Sheet for Year 1. Show all work.
 - (ii) Balance Sheet for Year 1. Show all work.
 - (iii) Gains from Operation Sheet for Year 2. Show all work.

Commentary on Question:

Candidates generally performed well on this question.

Full credit was given if candidates created the financial statements and correctly calculated the corresponding values. Note the solution provided here assumes the annual policy fee is not included in the ceded premium, but is included in commissions and premium taxes for ABC Life. Since the question did not state how the annual policy fee should be handled, values were adjusted based on the assumption by the candidate.

6. Continued

The most common mistake was the calculation of the reinsurance allowance. This is equal to a percentage of the ceded premium plus the reinsurer's share of the premium tax. Other common mistakes were including the policy fee in expenses rather than revenue and calculating the initial surplus plus gain from operations as the assets rather than the surplus.

	Gain from Operations			
	Year 1		Year 2	
	ABC Life	XYZ Re	ABC Life	XYZ Re
Revenue				
Premiums				
Gross	7,550	3,750	7,550	3,750
Ceded	3,750	0	3,750	0
Net	3,800	3,750	3,800	3,750
Investment Income				
Surplus	100	100	68	75
Reserves	0	0	25	25
Total	100	100	93	100
Reinsurance Allowance	3,825	0	825	0
TOTAL REVENUE	7,725	3,850	4,718	3,850
Benefits				
Claims	0	0	0	0
Surrenders	0	0	0	0
Reserve Increase				
Gross	500	250	3,000	1,500
Ceded	250	0	1,500	0
Net	250	250	1,500	1,500
TOTAL BENEFITS	250	250	1,500	1,500
Expenses				
Commissions	7,173	3,750	604	750
Acquisition	455	20	0	0
Maintenance	20	10	20	10
Premium Tax	151	75	151	75
TOTAL EXPENSES	7,799	3,855	775	835
GAIN FROM OPERATIONS	(324)	(255)	2,443	1,515

6. Continued

	Balance Sheet	
	Year 1	
	ABC Life	XYZ Re
Assets		
Invested Assets	926	995
TOTAL ASSETS	926	995
Liabilities & Capital		
Policy Reserves		
Gross	500	250
Ceded	250	0
Net	250	250
TOTAL LIABILITIES	250	250
Surplus	676	745
TOTAL CAPITAL	676	745
TOTAL LIABILITIES & CAPITAL	926	995

- (b) Calculate the differences between the Balance Sheet for the above coinsurance arrangements and each of the following:
- (i) Funds Withheld Coinsurance arrangement. Show all work.
 - (ii) Modified Coinsurance arrangement. Show all work.

Commentary on Question:

Candidates generally performed poorly on this question.

For part (i), full credit was given if the balance sheet still showed a ceded reserve, set up an accounts receivable and accounts payable for the ceded reserve, and left surplus unchanged. Note the solution provided here assumes the receivable/payable is equal to the ceded reserve. However, credit was given for alternate assumptions.

For part (ii), full credit was given if the balance sheet showed no ceded reserve and the corresponding impact on surplus. Although a mod-co adjustment would be calculated for this type of reinsurance, it was not necessary for this question.

6. Continued

	Funds Withheld Coins		Modified Coins	
	Year 1		Year 1	
	ABC Life	XYZ Re	ABC Life	XYZ Re
Assets				
Invested Assets	1,176	745	1,176	745
Accounts Receivable	0	250	0	0
TOTAL ASSETS	1,176	995	1,176	745
Liabilities & Capital				
Policy Reserves				
Gross	500	250	500	0
Ceded	250	0	0	0
Net	250	250	500	0
Accounts Payable	250	0	0	0
TOTAL LIABILITIES	500	250	500	0
Surplus	676	745	676	745
TOTAL CAPITAL	676	745	676	745
TOTAL LIABILITIES & CAPITAL	1,176	995	1,176	745

- (c) With respect to coinsurance:
- (i) Assess ABC's ability to claim the reserve credit under each of the terms proposed.
 - (ii) For each treaty term, if appropriate, propose changes to make them acceptable for the credit reserve.

Commentary on Question:

Full credit was given if the candidate answered correctly whether each of the give treaty terms would allow or prohibit the company from claiming a reserve credit and provided reasonable changes to make the problematic treaty terms acceptable.

Most candidates were able to correctly identify the 1st and 5th treaty terms would prohibit ABC Life from claiming a reserve credit. For the other treaty terms, candidate performance was mixed.

6. Continued

Note the solution for the 2nd and 4th treaty terms provided below assumes a modified coinsurance arrangement. However, since the question was not specific, credit was given for correct responses assuming a coinsurance arrangement.

Similarly, the solution for the 5th treaty term provided below assumes the cedent, ABC Life, is required to guarantee future performance. However, credit was given to candidates that assumed the reinsurer, XYZ Re, is providing the guarantee.

1. XYZ Re is required to terminate the reinsurance agreement after 10 years.

Assessment: This treaty term would prohibit ABC Life from claiming a reinsurance reserve credit. Requiring mandatory termination after a specific date means the risks beyond that date were never reinsured and thus cannot be included in the reserve credit.

Proposal: This treaty term could be removed entirely. Alternatively, ABC Life can have the ability, but not the obligation, to recapture the business.

2. ABC Life will retain the assets for investment purposes while still obtaining the surplus relief.

Assessment: This treaty term would allow ABC Life to claim a reinsurance reserve credit. This is a normal requirement of modified coinsurance.

Proposal: No changes needed.

3. ABC Life will be insulated from selling at a loss when surrenders or policy loans increase while asset values are low.

Assessment: This treaty term would prohibit ABC Life from claiming a reinsurance reserve credit. Insulating from selling at a loss means there is no disintermediation risk transfer, which is a significant risk for this product.

Proposal: This treaty term could be removed entirely or altered such that disintermediation risk is reintroduced.

4. XYZ Re will be responsible for funding any increases to the reserve, less a credit for the investment income.

Assessment: This treaty term would allow ABC Life to claim a reinsurance reserve credit. This is a normal requirement of modified coinsurance.

6. Continued

Proposal: No changes needed.

5. XYZ Re is required to guarantee the future performance of the reinsured business.

Assessment: This treaty term would prohibit ABC Life from claiming a reinsurance reserve credit. If the ceding company guarantees the performance, the reinsurer will be reimbursed for any shortfalls. Thus, the reinsurer has not assumed any risk and there has not been a significant risk transfer.

Proposal: This treaty term could be removed entirely or altered such that there is a significant transfer of risk. For example, an experience refund could be included.

7. Learning Objectives:

1. The candidate will understand the designs and risks of the common life and annuity products and features, as well as the methods and metrics used to design and price these products.
5. The candidate will understand the role of the Investment Actuary and the Portfolio Management Process in the Life Insurance company context, as well as the common forms of Fixed income securities and their uses, and the methods and processes used for evaluating portfolio performance and asset allocation.

Learning Outcomes:

- (1a) Describe the designs of the common life and annuity products and evaluate their associated features and inherent risks.
- (5d) Describe and assess Fixed Asset Portfolio management methods, and immunization (including derivatives) and cash matching strategies, including:
 - Considerations such as managing funds against a bond market index, the classification of possible strategies, the impact of risk factors and tracking risk, and the use of indexing and active strategies
 - Considerations such as managing funds against liabilities, the use of dedication strategies and immunization strategies, the assessment of risk minimization for immunized portfolios, and the use of cash flow matching and combo strategies
 - The use of derivative enabled strategies, and the use of futures, swaps, and options

Sources:

Managing Investment Portfolios, Magnin and Tuttle, Ch. 6 - Fixed-Income Portfolio Management, 6.1-5

The Handbook of Fixed Income Securities, Fabozzi, 8th Ed., Ch. 62 - Interest-Rate Swaps and Swaptions

Life and Annuity Products and Features

Commentary on Question:

This question was testing the candidates' understanding of dedication strategies, interest rate hedging instruments, and the fundamentals of swaps.

Solution:

- (a) Critique the following statements in relation to creating an asset portfolio to back the above liabilities:
 - A. *The classical immunization can be used to duration match the asset portfolio with the duration of the liability.*

7. Continued

- B. *An alternative strategy is to use the cash-flow matching to eliminate all risks.*
- C. *An interest-rate swap can be used to provide a better match between assets and liabilities.*

Commentary on Question:

This question required candidates to have a strong understanding of the dedication strategies to be able to critique the statements appropriately. To receive full credit, the candidate needed to provide justification for their critique and relate their response to the product description.

For statement A, most candidates did poorly. Candidates who knew the criteria for classical immunization did well. For statement B most candidates did well. However, many candidates failed to recognize that cash-flow matching will not eliminate all risks or did not describe the risks that remain. For statement C, candidates generally did well.

- A. This statement is partially correct. It is correct that the main condition for immunization is duration matching, however that is only the minimal condition. An additional assumption is that the immunizing portfolio has the same present value as the liability being immunized.

The classical immunization strategy can be used on this product. However, because of the unknown nature of the liability payments in the future it will be required to rebalance the portfolio which is also due to the fact that the duration of both the liability and assets will change in the future.

- B. This statement is false as cash-flow matching will not eliminate all risks. Cash flow matching will protect against interest rate risk only, which is the largest risk that a portfolio manager will face. However, the portfolio will still be exposed to other types of risk including default, credit spread and downgrade risk.

Cash flow matching could only be fully used in the first three years where there is a fixed known liability payment. It cannot be fully implemented when the liability cash flow is unknown so there still remains reinvestment and interest rate risk.

- C. This statement is correct. An interest rate swap can be used to alter the cash-flow characteristics of an institutions assets or liabilities. This is accomplished by changing cash flows from fixed to floating or floating to fixed.

7. Continued

The best way to minimize interest rate risk for this product is to enter in to a swap and exchange the floating payments for a fixed payment. By exchanging the variable for a fixed liability payment it will be easier to match the asset cash flow. Swaps can also be used to change the duration of the portfolio.

- (b) HLC decides to use an immunization strategy to manage the assets backing the annuity block.

Analyze the impact to the immunization strategy for each of the following events:

- (i) Annuitant mortality has increased
- (ii) Interest rates rise
- (iii) Short-term bonds used in the immunization portfolio become unavailable for reinvestment

Commentary on Question:

For event (i), about half of the candidates did well. For event (ii), candidates did poorly. For events (i) and (ii), this question required the candidate to analyze the impact of the events on the innovative product, and then the impact on the immunization strategy. Some candidates failed to recognize the impact on this particular product and thus only received partial credit.

For event (iii), candidates did well if they identified the reinvestment risk and analyzed the impact to the immunization strategy. About half of the candidates did well.

- (i) An increase in annuitant mortality will result in annuity payouts being lower than expected after the guarantee period, since payouts are no longer made once the annuitant dies.

Therefore, the duration of the expected liability payouts as well as the present value of future cash flows will be reduced, and the immunized portfolio may have a duration that is too long.

- (ii) An increase in interest rates will result in higher payouts based on the structure of the product.

If the portfolio is invested in fixed interest securities then the resulting asset cash flows will be too low. However, this would be mitigated by using swaps.

7. Continued

(iii) Immunization requires offsetting price risk with reinvestment risk, and increased reinvestment risk means increased immunization risk.

If securities that are assumed to be available for reinvestment become unavailable, the duration matching in the immunization portfolio will no longer be accurate. Therefore, a change in investment strategy will be required.

(c) HLC Life also enters into an interest rate swap with the following specifications:

- The floating-rate payments are made annually at year end.
- The term of the swap is 3 years
- The notional amount is 100 Million
- Current yield curve:

Year	Spot Rate
1	3.00%
2	3.50%
3	3.20%

Calculate the implied swap rate. Show all work.

Commentary on Question:

Candidates overall did poorly on this question. Candidates who understood the difference between spot rates and forward rates did well on this question. Being able to understand the difference between forward rates and spot rates impacted both the floating payments and the discounting rates used. Partial credit was given if forward rates were calculated incorrectly, but the candidate showed their work. Full credit was given if units other than 365 were used and resulted in a similar answer.

Calculate forward rates. Forward rates are derived from the spot rates.

$$\text{Forward Rate}_t = (1 + \text{Spot Rate}_t)^t / (1 + \text{Spot Rate}_{t-1})^{t-1} - 1$$

Year 1: same as 1yr spot rate of 3%

$$\text{Year 2: } (1.035)^2 / (1.03) - 1 = 4.002\%$$

$$\text{Year 3: } (1.032)^3 / (1.035)^2 - 1 = 2.603\%$$

Calculate the floating payments.

$$\text{Floating payment}_t = \text{nominal amount} * \text{Forward Rate}_t * (\text{actual} / 360 \text{ days})$$

$$\text{Floating payment}_1 = 100\text{M} * 3\% * 365/360 = 3,041,667$$

$$\text{Floating payment}_2 = 100\text{M} * 4.002\% * 365/360 = 4,058,016$$

$$\text{Floating payment}_3 = 100\text{M} * 2.603\% * 365/360 = 2,638,753$$

7. Continued

$$\begin{aligned} &\text{Calculate PV of floating payments} \\ &= 3,041,667/(1.03) + 4,058,016/(1.035^2) + 2,638,753/(1.032^3) \\ &= 9,142,097 \end{aligned}$$

Calculate the swap rate such that:
PV of floating payments = PV of fixed rate payments

PV of fixed rate payments = Sum of (Notional Amount * Swap Rate * days / 360 * discount factor)

$$\begin{aligned} \text{Swap Rate} &= \text{PV of floating payments} / (\text{Sum of (Notional Amount * days / 360 * discount factor)}) \\ &= 9,142,097 / (100,000,000 * 365/360 * (1/1.03 + 1/1.035^2 + 1/1.032^3)) \end{aligned}$$

$$\text{Swap Rate} = 3.204\%$$

- (d) Propose two product changes that can mitigate interest rate risk. Justify your answer.

Commentary on Question:

Candidates performed well on this question. To earn full credit, candidates needed to provide justification for their answer. Partial credit was given if candidates provided a valid annuity product change with no justification. Product changes with justification that are not listed below but would mitigate interest rate risk were also given full credit. Candidates who listed hedging or other investment strategies to reduce interest rate risk did not receive credit as these are not product changes.

Possible answers include:

- 1) Change the product to a period-certain only product (or increase the period certain). Then, changes in mortality can no longer affect the timing and duration of the liability cash flows.
- 2) Change the payouts to be fixed amounts, instead of being based on the market interest rate. Then, the exact amounts of the liability cash flows will be known and not subject to interest rate risk.
- 3) A Market Value Adjustment (MVA) feature could be added to the product, so that payouts would reflect changes in current interest rate levels since the beginning of the guarantee period.
- 4) Add a cap to the market interest rate used to determine the payment. This mitigates interest rate risk as it reduces the risk of volatile interest rates impacting the payment, thus providing a limit to the loss due to rising interest rates.

8. Learning Objectives:

5. The candidate will understand the role of the Investment Actuary and the Portfolio Management Process in the Life Insurance company context, as well as the common forms of Fixed income securities and their uses, and the methods and processes used for evaluating portfolio performance and asset allocation.

Learning Outcomes:

- (5c) Describe and assess the role of and significant considerations related to the design and function of asset allocation strategies.
- (5d) Describe and assess Fixed Asset Portfolio management methods, and immunization (including derivatives) and cash matching strategies, including:
- Considerations such as managing funds against a bond market index, the classification of possible strategies, the impact of risk factors and tracking risk, and the use of indexing and active strategies
 - Considerations such as managing funds against liabilities, the use of dedication strategies and immunization strategies, the assessment of risk minimization for immunized portfolios, and the use of cash flow matching and combo strategies
 - The use of derivative enabled strategies, and the use of futures, swaps, and options
- (5e) Describe and assess Alternative Investment Portfolios (including real estate) in the context of an insurance company portfolio.
- (5g) Describe the principles of Liquidity Risk Management in an insurance company portfolio management context.
- (5h) Describe and apply conventional yield metrics used in bond performance evaluation.
- (5i) Describe the attributes of US Treasuries, Agency Debt Securities, Municipal bonds, Corporate bonds, Private Money Market securities, Floating Rate Agreements, Agency Mortgage Backed securities, Agency Collateralized Mortgage securities, Interest Rate Swaps and Swaptions, Credit Derivatives and High Yield Bonds, and the markets they are traded in.

Sources:

Managing Investment Portfolios, Maginn, John L. and Tuttle, Donald L., 3rd Edition, 2007 - Ch. 8: Alternative Investments Portfolio Management (section 3)

Managing Investment Portfolios, Maginn, John L. and Tuttle, Donald L., 3rd Edition, 2007 - Ch. 5: Asset Allocation (sections 2-4)

Managing Investment Portfolios, Maginn, John L. and Tuttle, Donald L., 3rd Edition, 2007 - Ch.12: Evaluating Portfolio Performance (section 4)

8. Continued

Handbook of Fixed Income Securities, Fabozzi, Frank J., 8th Edition, 2012 - Ch. 6: Bond Pricing, Yield Measures and Total Return (pp. 102-120)

LPM-162-19: Liquidity Risk Management: Best Risk Management Practices

Handbook of Fixed Income Securities, Fabozzi, Frank J., 8th Edition, 2012 - Ch. 11: Municipal Bonds (pp. 225-230 & 234-246)

LPM-161-19: High-Yield Bond Market Primer

Handbook of Fixed Income Securities, Fabozzi, Frank J., 8th Edition, 2012 - Ch. 16: Private Money Market Instruments (pp. 337-340 & 345-351)

Commentary on Question:

This question asks candidates to address various investment concepts as it relates to the Investment Actuary role. A secondary focus is on testing candidates' knowledge of asset allocation strategies. Candidates did not do well overall and especially with part (c). See separate comments below.

Solution:

- (a) Assess the appropriateness of the above assets for:
 - (i) The current product portfolio
 - (ii) The addition of Long Term Care insurance to the current product portfolio

Commentary on Question:

The candidates received points when they listed out the characteristics of the assets. Candidates generally performed well on the first part of the question, although some candidates only indicated whether the asset was suitable for the product without explaining the characteristics of the asset. The second part was done less well. Most candidates answered similarly to the first part, without making the connection to the LTC product. Some candidates were able to recognize that commercial paper is the most liquid asset and real estate is the least liquid asset. Some candidates misunderstood the question to assess the product portfolio, instead of the assets. Partial credit was given when candidates provided valid explanation and consideration for various assets.

8. Continued

(i) Municipal bonds:

- Generally tax exempt but may offer lower returns compared to other investments
- Have been considered second in safety to US treasuries, but there have been more recent concerns about their credit risk
- Offer investment flexibility, since insurance companies typically adjust their holdings of municipal bonds according to profitability, and the relative value they offer compared with taxable bonds

High Yield Bonds:

- May earn higher rates of return than their investment-grade counterparts, but generally carry below investment grade ratings
- Good for companies looking for growth (e.g. M&A activity), working capital or other cash flow purposes; however, referred to as speculative and junk bonds which give a negative connotation and attract higher required capital

Commercial Paper:

- Provide quick liquidity with maturity less than 45 days
- Can be used for short-term funding and can be issued by non-US corporations
- Disadvantages are that it is short term, and risk that the investor faces is that the borrower will not be able to issue new paper at maturity (roll-over risk); also, they are unsecured promissory notes

Real Estate:

- Advantages:
 - To the extent that the law allows mortgage interest, property taxes, and other expenses to be tax deductible, taxable owners of real estate may benefit from favorable tax treatment
 - Mortgage loans permit most real estate borrowers to use more financial leverage than is available in most securities investing
 - Real estate investors have direct control over their property and can increase the market value of the property
- Disadvantages
 - Less flexibility, as most real estate parcels are not easy to divide into smaller pieces; cost of getting information is high as each piece of real estate is unique
 - Expenses – real estate brokers charge high commissions; real estate involves substantial operating and maintenance costs; risk of neighborhood deterioration
 - Income tax deductions can be discontinued and therefore subject to political risk

8. Continued

(ii) LTC products become financially stressed when interest rates are lower than anticipated. This leads to carriers with LTC products to become more cautious on their investment strategy.

LTC products are typically guaranteed renewable (cannot cancel the business but can adjust premium rates for classes of business) and projections of claims and premiums extend for 50 years or more. Long term Investment strategy is critical to LTC.

Since insurance companies typically adjust their holdings of municipal bonds according to profitability, and the relative value they offer compared to taxable bonds, this feature makes municipal bonds appropriate for any product offering, including LTC. Municipal bonds are safe and secure which is important for LTC, given the need for long term security.

High yield bonds have lower investment grade ratings and can be speculative and would not be a safe investment for LTC, although the higher rates of return are attractive.

The disadvantage of commercial paper is that it is largely a short-term funding vehicle, and potentially not as secure over the long term as LTC issues may prefer.

The tax-deductibility and the financial leverage of real estate is attractive to LTC companies as is the diversification features and the low volatility of returns, but the expense of acquiring and maintaining real estate are risks to consider.

- (b) Describe liquidity stress tests which may be performed for the Long Term Care insurance product to address liquidity risk.

Commentary on Question:

Candidates were expected to link the scenario to the LTC product in order to receive full points. Most candidates received credit for indicating the catastrophic claims scenario. When discuss disintermediation and customer panic scenario, some candidates answered more relative to general scenario, which is different for LTC. The combination of liquidity test is rarely answered.

Some candidates did not indicate that a decrease in interest rates as LTC carries could become financially stressed.

The following are examples of liquidity stress tests, although it is the combination of liquidity stress events that are key.

8. Continued

Disintermediation scenario

For interest sensitive products, this scenario examines the amount and timing of increased withdrawals due to an increase in interest rates. However, for LTC, an increase in lapse rates could increase profitability. For LTC products, it might be appropriate to examine a decrease in interest rates, particularly for existing in-force, as LTC carriers could become financially stressed, depending on their interest rate assumptions.

Catastrophic Claims Scenario

This scenario for LTC could be a large increase in nursing home and home care claims such as during a pandemic

Customer Panic Scenario

This scenario could consider the added effect of a material company downgrade due to a sharp deterioration in its financial condition; for LTC, this would primarily impact new business, depending on the extent to which factors such as product availability, underwriting, and price determine if in force business lapses or not.

Impaired Markets Scenario

This scenario addresses the possibility that the company cannot sell assets to raise cash; liquidity may be assumed to be frozen for a period of time (e.g. 3 months), which may impact the LTC company in terms of paying claims or covering acquisition expenses

Impaired Markets/Panic Withdrawal Scenario

This scenario examines "run on the book" level of withdrawal and limited or no sales when capital market liquidity has vanished; for LTC, the withdrawals may not impact the LTC company as much as one with interest sensitive products depending on the degree of lapse support, but the point is to run multiple stress scenarios at once to determine the impact of potentially compounding risk.

Ability for Company to get needed rate increases

Customers and regulators have not been happy with the wave of LTC rate increases, but the company needs them to remain financially solvent.

Other possible scenarios include loss of a key distribution channel and/or a sudden termination of a reinsurance contract, both of which could impact LTC sales or the company's financial health negatively. The loss of sales may limit future liquidity as a smaller stream of future premiums must support the in force business, and if terminated reinsurance contracts are the ones most likely to positively support the ceding company, the loss of such a contract may require additional reserves and required capital for which the reinsurance provided relief.

8. Continued

- (c) You are proposing the use of an asset liability approach for SXR.
- (i) Propose a specific approach to asset allocation strategy that meets the demands of the growth strategy that SXR Life would like to pursue.
 - (ii) Explain the advantages for using the asset liability approach instead of the asset only management approach.

Commentary on Question:

This question tested candidates' "knowledge of asset allocation strategies". Full points were awarded when candidate demonstrated their understanding of asset liability management. Candidates' performance on the first part was weak. Most candidates came up with a very specific asset mix approach for the company to invest but didn't propose what ALM strategy should be used. For the second part, most candidate understood that ALM ensures asset and liability matched but could not list out all the benefit of ALM and when it is appropriate. Most candidates understood the relationship between liabilities and assets and the impact changes in the asset strategy would have on the portfolio. Some candidates mentioned the mechanics of immunization theory (e.g., duration matching). A few candidates received full credit by explaining why the Asset-Liability Management (ALM) approach is more appropriate than the Asset-Only approach.

- (i) An asset liability management approach would be preferred for management since it involves explicitly modeling liabilities and adopting the optimal asset allocation to funding liabilities.

Controlling the risk related to funding future liabilities is a key investment objective for ALM; in contrast to ALM, an asset-only (AO) approach does not explicitly involve modeling liabilities. In an AO approach, any impact of the investor's liabilities on policy portfolio selection is indirect, e.g., through the return requirement.

The following is an example of a recommendation supporting Cash Flow Matching:

- Cash flow matching structures investments in bonds to match (offset) future liabilities
- Cash flow matching minimizes risk with respect to funding liabilities because cash flows are matched
- One potential limitation is that cash flow matching may not be effective if there are no assets which exist to match very long duration liability cash flows

8. Continued

The following is an example of a recommendation supporting Immunization:

- Immunization structures investments in bonds to match (offset) the weighted average duration of liabilities
 - To improve risk-control characteristics of an immunization approach relative to shifts in the yield curve, convexity may be matched as well
 - One potential limitation is that duration is a first order approximation of interest rate risk, whose ability to mitigate interest rate risk becomes less effective as interest rates fluctuate across a wider range
- (ii) The following are some advantages of an asset liability approach over an asset-only strategy:
- The asset-only approach affords much less precision in managing risk related to funding of liabilities, which is needed for SXR, and which asset liability management provides
 - Asset liability management offers more flexibility for SXR, as the strategy can range from minimizing risk with respect to net worth or surplus (assets less liabilities) to deliberately bearing surplus risk or mismatch risk to earn potentially higher returns
 - Asset liability management may produce a higher allocation of fixed-income instruments which SXR Life is already invested in
 - If SXR Life has below-average risk tolerance because of their product offering, asset liability management is likely to be more effective in helping stay within their risk tolerance than an asset-only approach.
 - The asset-only approach may have a severe financial cost if it results in liabilities not being able to be met.
 - The market value of liabilities are interest rate sensitive, which emphasizes the benefit of asset liability management over an asset-only approach.

9. Learning Objectives:

1. The candidate will understand the designs and risks of the common life and annuity products and features, as well as the methods and metrics used to design and price these products.
5. The candidate will understand the role of the Investment Actuary and the Portfolio Management Process in the Life Insurance company context, as well as the common forms of Fixed income securities and their uses, and the methods and processes used for evaluating portfolio performance and asset allocation.

Learning Outcomes:

- (1d) Describe and evaluate the impact of VM-20 on pricing.
- (5b) Describe and evaluate how a company's objectives, needs and constraints affect investment strategy and portfolio construction (including capital, funding objectives, risk appetite and risk return tradeoff, tax and accounting, accounting considerations, and constraints such as regulation, rating agency ratings and liquidity).
- (5f) Describe and apply methods and processes for evaluating portfolio performance, including performance attribution, sources of earnings analysis on investment income, benchmarks, metrics, and risk adjusted performance appraisals (including total return vs reported earnings).
- (5i) Describe the attributes of US Treasuries, Agency Debt Securities, Municipal bonds, Corporate bonds, Private Money Market securities, Floating Rate Agreements, Agency Mortgage Backed securities, Agency Collateralized Mortgage securities, Interest Rate Swaps and Swaptions, Credit Derivatives and High Yield Bonds, and the markets they are traded in.

Sources:

Handbook of Fixed Income Securities, Fabozzi, Frank J., 8th Edition, 2012 - Ch. 12: Corporate Bonds (pp. 259-287, excluding exhibits 12-1 & 12-2)

Handbook of Fixed Income Securities, Fabozzi, Frank J., 8th Edition, 2012 - Ch. 25: Agency Mortgage-Backed Securities

Managing Investment Portfolios, Maginn, John L. and Tuttle, Donald L., 3rd Edition, 2007 - Ch.12: Evaluating Portfolio Performance (section 4)

Managing Investment Portfolios, Maginn, John L. and Tuttle, Donald L., 3rd Edition, 2007 - Ch. 3: Managing Institutional Investor Portfolios (section 4.1)

9. Continued

Commentary on Question:

Candidates did not perform well on this question. Part (a) of this question tested the candidates' knowledge of MWR and TWR. Many candidates struggled with the right formula for each metric. Others failed to assess either metric. Part (b) required the candidates to understand and compare features of MBS (Mortgage-Based Securities) and Term Life product. Most candidates listed two advantages but failed to justify their response.

Solution:

- (a) Assess how well the 5-year approximation of TWR compares to the true TWR at the end of 2025. Justify your answer and show all work.

Commentary on Question:

Candidates did not do well on this part. Many used incorrect formulas for either MWR or TWR. Some candidate commonly mistook the timing of the deposit of \$400,000. No credit was given for incorrect timing. Some candidates failed to address appropriateness of the approximation

Step1. CFs = Semi-Coupon payment = Par Value * Coupon Rate/2, projecting till maturity date. *Partial credit was awarded for correct formula but incorrect projection period.*

Bond 1: $14,000 = 700,000 * 4\% / 2$, projection from Q2 2021 to Q4 2024

Bond 2: $10,000 = 400,000 * 4\% / 2$, projection from Q2 2023 to Q4 2024

Deposit: Deposit made at BOY, immediately invested into a Bond 2

Q/Y	t	CF _t	Deposit	MV _t
Jan, 2021	0	-	-	1,400,000
Q2 2021	0.5	14,000	-	889,000
Q4 2021	1	14,000	-	912,450
Q2 2022	1.5	14,000	-	926,450
Q4 2022	2	14,000	-	951,773
Q2 2023	2.5	24,000	400,000	1,400,950
Q4 2023	3	24,000	-	1,455,045
Q2 2024	3.5	14,000	-	1,484,146
Q4 2024	4	14,000	-	1,537,353
Q2 2025	4.5	-	-	1,552,726
Q4 2025	5	-	-	1,568,254

9. Continued

Step 2. MWR – Money Weighted Rate of Return

LIRR Method: Chain-linking annual MWR is the approximation of TWR (as given in the question).

Additional credit was awarded for properly reflecting the deposit of 400,000.

Step 2.1 – Find MWR $\text{\textcircled{R}}$ for each (annual) time period.

$$MV_t = (MV_{t-1} + \text{Deposit}_t) * (1+R)^2 + CF_{t-0.5}(1+R) + CF_t$$

Where t increments semi-annually;

R = return for each semi-annual period

r = return for each annual time period = $(1+R)^2 - 1$

Here are calculation details for certain period as an example:

T=1 (Q4 2021): $R_1 = -20.39\%$ $\Rightarrow r = (1-20.39\%)^2$, where

$$MV_1 = 912,450 = MV_0 * (1+R_1)^2 + CF_{0.5} * (1+R_1) + CF_1$$

$$= (951,773 + 400,000) * (1+R_1)^2 + 14,000 * (1+R_1) + 14,000, \text{ solve for } R_1$$

T=3 (Q4 2023): $R_3 = 2.01\%$ $\Rightarrow r = (1+2.01\%)^2$, where

$$MV_3 = 1,455,045 = MV_2 * (1+R_3)^2 + CF_{2.5} * (1+R_3) + CF_3$$

$$= (951,773 + 400,000) * (1+R_3)^2 + 24,000 * (1+R_3) + 24,000, \text{ solve for } R_3$$

Q/Y	t	CFs	Deposit	MV _t	R _t (semi-annual)	r _t (annual)
Jan, 2021	0	-	-	1,400,000	-	-
Q2 2021	0.5	14,000	-	889,000		
Q4 2021	1	14,000	-	912,450	-20.39%	0.6338
Q2 2022	1.5	14,000	-	926,450		
Q4 2022	2	14,000	-	951,773	0.61%	1.0123
Q2 2023	2.5	24,000	400,000	1,400,950		
Q4 2023	3	24,000	-	1,455,045	2.01%	1.0405
Q2 2024	3.5	14,000	-	1,484,146		
Q4 2024	4	14,000	-	1,537,353	1.84%	1.0371
Q2 2025	4.5	-	-	1,552,726		
Q4 2025	5	-	-	1,568,254	1.00%	1.0201

Step 2.2 – Chain link annual returns (r_t): MWR = Product of r_t -1

$$= 0.6338 * 1.0123 * 1.0405 * 1.0371 * 1.0201 - 1 = \text{29.37\%}$$

9. Continued

Step 3. True TWR – Time Weighted Rate of Return

Additional credit was awarded for properly reflecting the deposit at time 2.5

Step 3.1 – determine the return at each period $R_t = (MV_t - CF_t) / (MV_{t-0.5} + \text{Deposit}_{t-0.5}) - 1$, where t increments semi-annually

$$t=0.5, \text{TWR}_{0.5} = (889,000 - 14,000) / 1,400,000 - 1 = -27.50\%$$

$$t=2.5 \text{TWR}_{2.5} = (1,400,950 - 24,000) / (951,773 + 400,000) - 1 = 1.86\%$$

Q/Y	t	CFs	Deposit	MV _t	R _t (semi-annual)
Jan, 2021	0	-	-	1,400,000	-
Q2 2021	0.5	14,000	-	889,000	-37.50%
Q4 2021	1	14,000	-	912,450	1.06%
Q2 2022	1.5	14,000	-	926,450	0.00%
Q4 2022	2	14,000	-	951,773	1.22%
Q2 2023	2.5	24,000	400,000	1,400,950	1.86%
Q4 2023	3	24,000	-	1,455,045	2.15%
Q2 2024	3.5	14,000	-	1,484,146	1.04%
Q4 2024	4	14,000	-	1,537,353	2.64%
Q2 2025	4.5	-	-	1,552,726	1.00%
Q4 2025	5	-	-	1,568,254	1.00%

Step 3.2 – Chain link R_t to get TWR: TWR = product of (1+R_t)-1

$$= (1 - 37.50\%) * (1 + 1.06\%) * (1 + 0.00\%) * (1 + 1.22\%) * (1 + 1.86\%) * (1 + 2.15\%)$$

$$* (1 + 1.04\%) * (1 + 2.64\%) * (1 + 1.00\%) * (1 + 1.00\%) - 1 = \mathbf{-29.60\%}$$

Step 4. Evaluating the 5-year approximation of TWR (MWR) to true TWR:

Some candidates did not complete this step. Partial credit was awarded to candidates who made reasonable conclusions based on incorrect calculated numbers above.

MWR (-29.37%) is not a bad approximation to the true TWR (-29.26%). Annual frequency for MWR is a reasonable frequency and is a positive contributor to being a good approximation. However, the volatile swings in sub-period equity returns contributed to approximation differences.

- (b) Assume investment income is the primary source of liquidity and liquidity risk should be minimized.

Describe two disadvantages of modeling mortgage-backed securities (MBS) as the only investment based on the projected liability cashflow. Justify your answers.

Commentary on Question:

Most Candidates identified two disadvantages but some struggled to provide justifications. Amongst those who did describe disadvantages, many candidates tended to focus on MBS only and didn't properly address features of the Term Life Products. Partial credit was given to candidates who only listed disadvantages. Full credit was awarded to candidates who described any two of the three disadvantages below

9. Continued

The given liability has both positive and negative CFs based on the premium pattern. If investment income is the primary source of liquidity, liquidity risk is minimized when investment income is enough for the liability cash outflow. This is the basis for what's considered relevant.

Disadvantage #1 – Terms & CF pattern mismatch: MBS are typically longer term (15 -30 years), which expects somewhat level interest and principal payment in early years. However, liability CFs has 4-5 years cycles.

Disadvantage #2 – Interest rate sensitivity: since income generated from MBS consists of interest, principle and prepayment the amounts often vary and depend greatly on the prepayment assumption. Prepayment assumption poses heavy dependency on interest environment. However, Term Life insurance is not very sensitive to interest rate environment. Therefore, MBS prepayment introduces more volatility

Disadvantage #3 – Complicated modeling: given all underlying assumptions (i.e. prepayment assumption), it is more complex to model MBS products.

10. Learning Objectives:

1. The candidate will understand the designs and risks of the common life and annuity products and features, as well as the methods and metrics used to design and price these products.
5. The candidate will understand the role of the Investment Actuary and the Portfolio Management Process in the Life Insurance company context, as well as the common forms of Fixed income securities and their uses, and the methods and processes used for evaluating portfolio performance and asset allocation.

Learning Outcomes:

- (1d) Describe and evaluate the impact of VM-20 on pricing.
- (5b) Describe and evaluate how a company's objectives, needs and constraints affect investment strategy and portfolio construction (including capital, funding objectives, risk appetite and risk return tradeoff, tax and accounting, accounting considerations, and constraints such as regulation, rating agency ratings and liquidity).
- (5f) Describe and apply methods and processes for evaluating portfolio performance, including performance attribution, sources of earnings analysis on investment income, benchmarks, metrics, and risk adjusted performance appraisals (including total return vs reported earnings).
- (5i) Describe the attributes of US Treasuries, Agency Debt Securities, Municipal bonds, Corporate bonds, Private Money Market securities, Floating Rate Agreements, Agency Mortgage Backed securities, Agency Collateralized Mortgage securities, Interest Rate Swaps and Swaptions, Credit Derivatives and High Yield Bonds, and the markets they are traded in.

Sources:

Managing Investment Portfolios, Maginn, John L. and Tuttle, Donald L., 3rd Edition, 2007 - Ch. 3: Managing Institutional Investor Portfolios (section 4.1)

Impact of VM-20 on Life Insurance Product Development, SOA Research, Nov 2016, pp. 1-31 (excluding discussion of 20-year term)

Commentary on Question:

The question asked candidates to describe potential impacts to the investment yield in part a) and then in part b) to identify expected impact to the discount rate for the VM-20 DR calculation. Both part a) and b) required justification of the response. A simple answer of increase or decrease was not sufficient without explanation to support the assertion.

10. Continued

The Question provided cashflow information with an increase and a decrease in the lapse as compared to a base assumption. Very few candidates used this information to answer either part of this question. Many candidates provided a generic response to both parts of the questions based on the impacts that would occur for various products with term products, annuities, whole life with cash values being most common.

Solution:

- (a) Describe three potential impacts on the expected total investment yield if lapses increase. Justify your answer.

Commentary on Question:

Many candidates responded with expected impacts to the investment yield with good explanation. Very few used the cashflow information provided in the question to help justify the expected impacts. Most candidates missed that the sensitivity results tested the year 5 lapse assumption. The resulting impact to the cashflows in years 6 through 12 result from the change in assumption the 5 year lapse assumption. Instead many candidates provided generalized comments about the impacts of increases in lapses without specifically mentioning the specific example in the question. Both approaches were given full credit.

Some candidates proposed an overall change in the investment rates in the market as a reason for the increase in lapses and others suggested high lapses would drive mortality anti-selection that would hurt future mortality experience. With these projected items the candidates explained potential impacts. This was unnecessary as there was sufficient information to fully answer the question without requiring these additional assumptions.

Candidates that answered the question by referring to the change in cashflows followed by explanations of the expected impacts to the investment yield scored well on this part of the question. Some candidates referred to the expected impact to profits rather than the investment yield as requested in the question.

As illustrated by TXL's sensitivity to the 5 year lapse assumption, an increase in lapses generates a reduction in the cashflows for duration 6 through 10 and duration 12. There is a slight improvement in the cashflow in duration 11. This change in cashflows will drive an expected reduction in the investment yield from overall lower total assets due to faster runoff of reserves. The investment yield will be lower if the investment cashflows are not sufficient to cover the liability cash outflow and there is a need to borrow. The increased need for shorter duration assets and increased liquidity will also be expected to reduce the investment yield.

10. Continued

- (b) Describe the expected impact on the discount rate for the VM-20 DR calculation if lapses decrease. Justify your answer.

Commentary on Question:

Very few candidates referred to the specific situation for decreased lapse in year 5 as provided in the question and referred in general to the impact of decreased lapses for various types of products. The wording in the question asked about the impact if lapses decrease. An answer using the specific change in the year 5 lapse rate or lapses in general would receive full credit.

Some candidates provided an estimate of the expected impact without including a justification.

A number of candidates incorrectly felt there would be no change in the discount rate for the VM-20 DR calculation. Some candidates proposed there would be a decrease in the discount rate while the majority of the candidates stated they expected an increase in the discount rate.

Full credit for the question required a good description that could be aided by the information provided in the question along with properly explained justification. and explained, others thought there would be a decrease and

The discount rate for the VM-20 DR calculation would be expected to increase if lapses decrease.

The VM-20 DR discount rate is based on the investment yield provided by the assets that are modeled based on existing assets and reinvestments under VM-20 assumptions to fully satisfy the company's obligations over the lifetime of the modeled policies under the DR scenario.

The decrease in lapses for TXL's product changes the expected number of policies that will be in force. More policies will be in force for longer periods and the assets would be different than expected leading to different asset investment timing and different amounts. The reinvestment strategy would need to be reviewed to reflect the different amounts of assets and the different timing. The yield curve would affect the price and would contribute to the increased discount rate.

11. Learning Objectives:

3. The candidate will understand common issues and practices related to In Force and New Business Product Management, and how experience studies are designed and used for evaluating past experience and for setting assumptions.

Sources:

LPM-133-16: Testing for Adverse Selection in Life Settlements: The Secondary Market for Life Insurance Policies, pp. 2-18

LPM-167-20: TransUnion's TrueRisk Life Creation and Validation of the Industry's Leading Credit-Based Insurance Score, RGA, 2019

LPM-168-20: LexisNexis® Risk Classifier – Stratifying Mortality Risk Using Alternative Data Sources

Commentary on Question:

The question considers the mortality impact of life settlements on an inforce block, including the use of predictive analytics designed for risk selection. In general, candidates were able to provide general information about life settlements and the impact to the inforce block, but not many candidates provided all the details required for a high score on this question.

Solution:

- (a) Critique each of the following statements:
 - A. *Viatical settlements are the same as life settlements.*
 - B. *Policyholders are better off selling their policies through a life settlement because the policyholder will get the market value of the policy which is always more than the cash value of the policy.*
 - C. *The price of life insurance products will increase if the life settlement business succeeds.*
 - D. *It is better for a policyholder considering a life settlement to have multiple medical underwriters assess their life expectancy.*

Commentary on Question:

To receive a high score, the candidate was expected to identify if each statement was true, false, partially true or false, and then support their answer. Most candidates were able to correctly assess some, but not all, of the statements.

- A. This statement is partially true. Viatical settlements and life settlements are similar, but not identical. Viaticals were focused on HIV cases with limited life expectancy of less than 2 years while life settlements are focused on older ages, larger face amounts and longer life expectancies. The tax treatment of the proceeds from both viatical and life settlements is the same.

11. Continued

- B. This statement is true for policyholders that are unhealthy, as the shortened life expectancy will generate a better payout, typically as much as four times the cash value. It is unclear for healthy policyholders as the settlement amount may be less than the current cash value.
 - C. This statement is true. A policy sold to a settlement company will not lapse as the investors will continue to pay premiums until the death of the insured. This will increase persistency on the insureds in poor health, and subsequent death claim payments. This will increase the cost of providing life insurance and the required premiums.
 - D. This statement typically is true. Investors and policyholders will be better served with a consensus from multiple underwriters. However, the policyholder could benefit from a single underwriter that provides an assessment of very short life expectancy.
- (b) Outline four categories of credit attributes that quantify behavioral risk for the TrueRisk Life Score including two attributes for each category.

Commentary on Question:

In general, candidates did not score well on this part of the question. To receive full credit candidates needed to provide all four of the categories used in the Transunion model, and provide an example of at least one attribute for each category.

1. Credit Seeking Activity: how recently and how frequently have credit inquiries been made
 2. Credit Tenure: What is the length of credit history, how many active trade accounts are there, how many months since oldest trade
 3. Severity and Frequency of Derogatory Credit Information: Have there been any bankruptcies, delinquent accounts or collections
 4. Credit Usage: What percentage of the available line of credit has been utilized. What are usage patterns and how recently accessed.
- (c) Explain the influence of ‘conscientiousness’ in segmenting mortality outcomes.

Commentary on Question:

Candidates generally understood how conscientious behavior is associated with lower mortality. Few candidates provided information on the studies that support this view.

Few candidates provided information on how conscientiousness could be used to segment mortality outcomes.

11. Continued

Conscientious people tend to live longer, as they choose healthier environments, maintain healthier friendships, are better educated, and have more successful careers and higher incomes. A study of over 6,000 adults completed in 2013 showed that those with the lowest level of conscientiousness had around 3.2 times the mortality risk of those with the highest level of conscientiousness. Even when researchers controlled for age, sex, education, marital status, and indicators of health-related behaviors such as smoking, alcohol use and waist circumference the difference in risk was still 1.6 times higher for lower conscientiousness people.

In order to use factors from conscientiousness in setting mortality assumptions, specific information about the policyholder's behavior will be required. Conscientiousness could be treated as a new segmentation of mortality, much like when like when smoking status was added to mortality assumptions.

- (d) Explain the advantages and disadvantages for the investors in using these scores to target older age policyholders.

Commentary on Question:

To receive full credit, a candidate needed to provide three advantages and three disadvantages when using TRL and Risk Classifier mortality scores to select appropriate UL policies for life settlements. Most candidates were able to provide only one or two advantages/disadvantages.

Advantages could include:

- This is a non-intrusive approach to underwriting
- Risk Classifier utilizes public records such as consumer credit history and motor vehicle history to stratify mortality
- The scores are easier and faster than traditional underwriting
- The scores help to identify the worst mortality risks
- Higher TRL scores over age 70 have 2.6 times the mortality of the lowest scores
- The selection value of the scores holds across durations
- Risk Classifier is consistent for varying durations, age bands and genders
- May be less expensive for investors than traditional underwriting

Disadvantages could include:

- The scores are not precise on their own, and age and current health conditions could have a larger influence on determining expected mortality
- Scoring results are insurance company specific and are not likely to apply uniformly across the market

11. Continued

- The scoring tools were developed to assist in initial underwriting and not investors of life settlements
 - Investors are unlikely to have sufficient data to complete an experience study to use the scoring at a specific company
 - Retrospective studies are recommended before implementation of the scoring tools (both Risk Classifier and TRL)
 - Ages above 70 were not included in TRL scoring, but would be in the target market for life settlements
 - TRL scores above 90 and Risk Classifier scores below 200 represent the worst risks, and significantly narrows the prospective policyholders for settlement
- (e) Describe the potential impacts to BLX's mortality and lapse experience if the investors proceed with using the TrueRisk Life and Risk Classifier scoring tools to target older age UL policyholders for life settlements.

Commentary on Question:

Many candidates indicated lapse rates would decrease and mortality would increase. To receive full credit, the candidate also needed to explain what would cause this to happen.

The scoring tools would help investors select the policies with the worst mortality risk (TRL over 90, Risk Classifier under 200.)

Lapses on life settlements would be expected to drop to zero, as the investor will continue to pay the premiums until a death claim is made.

Overall persistency of the block would improve, but the improvement would come for the settlement policies which are the worst risks.

With lower lapses on the worst mortality risks, BLX would see worse overall mortality experience on the UL block.