# ILA LPM Model Solutions
# Spring 2025

## 1. 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.

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.

**Sources:**
LPM-147-17: Life Insurance: Focusing on the Consumer (excluding Appendices)

Life Insurance for the Digital Age: An End-to-End View , Product Matters, Nov 2017

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

LPM-160-19: Strategic Reinsurance and Insurance: The Increasing Trend of Customized Solutions, pp. 1-4, 14-15 & 18-31

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

**Commentary on Question:**
*This question tests the candidate's knowledge on consumer-focused sales of life insurance and basic reinsurance concepts.*

**Solution:**
(a) Recommend four changes that the company can make to improve customer satisfaction when purchasing term life insurance online.

**Commentary on Question**:
*Most candidates did well on this, there is a broach range of recommendations that could improve customer satisfaction during the purchase process. Some candidates listed items that are not really relevant to the purchase process, such as claim practice, which would not come into play until much later.*

## 1. Continued

Accepted answers include

- Provide a quick tutorial with a concise explanation of benefits
- An individualized needs analysis that provides recommendations for insurance product and face amount.
- A simplified application process (simplified underwriting) with fewer questions.
- Real time insurance quote creation, similar to receiving an auto quote online
- Quote alternatives, with different coverages and premiums for the policyholder to consider.
- Comparison within peer groups, to see what others in the same demographic are purchasing
- Develop products with a cash value in addition to term life to decrease the fear of not receiving any payoff after years of premium payment.
- Develop a suite of simplified and transparent products that makes the decision process easier for buyers.
- Utilize customer surveys to identify ways to become more customer centric in the sales process

Some candidates also mentioned social media engagement in sales process, reward point program as incentive, improving user interface, presenting competitor's quotes – all reasonable answers received full or partial credits

(b) Recommend one strategic/customized reinsurance solution type BAM Life may consider when entering into a coinsurance agreement. Justify your response.

**Commentary on Question**:
*The source material identifies 10 strategic reinsurance solutions but only 5 apply specifically to a growth strategy. One of the five (catastrophic risk solutions) is specific to P&C. The candidate just needs to list 1 of the 4 items below to receive full credit. Most candidates were able to touch on the solutions that support growth plans, and very few went with other solutions listed here. The common mistake for some candidates as they focused on the reinsurance structure e.g. Co-insurance, instead of the strategic solutions.*

- Life in force monetizations that bring forward cash flows and release capital. These solutions bring forward cash flows and release of capital from in-force books. The capital can be used more efficiently in other businesses and improve overall returns. The solutions can also be used in transformational situations, such an exit from discontinued lines or products.

## 1. Continued

- Solutions that support growth plans by providing upfront funding and capital relief. Most reinsurance solutions play a role in supporting an insurer's growth plans including expansion into new markets or the launch of new products. The growth initiatives require upfront funding or capital relief, but the reinsurance solutions package can also involve broader support, for example in managing market and regulatory risk or other expertise.
- Solutions for mutual insurers by increasing their financial flexibility Mutuals face limitations in their ability to access capital. Also, many mutuals have a focused client base and a less diversified portfolio. New regulatory capital standards could put some mutual firms at a competitive disadvantage compared to highly diversified insurers. Reinsurance can provide mutuals with increased financial flexibility to cope with unexpected losses, grow their business and compete with other types of insurers.
- Solutions facilitating mergers and acquisitions by strengthening balance sheets and earnings statements. M&A are transformational situations which entail significant changes to funding and risk transfer needs. There is heightened investor scrutiny of the quality of the acquired portfolio, and there is also execution risk in successfully integrating an acquired entity. Reinsurance solutions can be used to strengthen or relieve pressure on insurers' balance sheets and earnings statements, either as a preparatory step before a sale or in the aftermath of an acquisition.(strengthen stakeholder confidence)

(c)

A whole life policy has been issued by BAM Life. You are given:

| | |
|---|---|
| **Face amount** | 500,000 |
| **Premium rate** | 15 per thousand |
| **Annual policy fee** | 30 |

MNG Re provides the following reinsurance expense allowances:

| **Policy Year** | **Expense Allowance** |
|---|---|
| 1 | 100% |
| 2-10 | 20% |
| 11+ | 10% |

- BAM Life will retain the entire policy fee.
- MNG Re will pay BAM Life an additional allowance of 2.5% of all ceded premiums in lieu of premium tax reimbursement for 10 years.

## 1. Continued

Calculate the coinsurance expense allowance for policy years 1 through 11. Show all work.

**Commentary on Question**:
*Most candidate did well on this question and received full credits, among those who did not receive the full credit, common mistakes include: 1. Including policy fee in the calculation of premium 2. Forgetting the condition stated in the question that the additional allowance is only for 10 years, and including this portion to year 11+. The question did not specify the % of quota share, while most candidates assumed 100%, some had assumed other % - as long as the approach was correct, the candidate would receive full credit*

Premium = 500000/1000 * 15 = 7,500
Premium Tax Allowance = 7,500 * 0.025 = 187.50

Expense Allowance = Premium * Expense Allowance + Premium Tax Allowance
Year 1 = 7500 * 100% + 187.50 = 7687.50
Year 2-10 = 7500 * 20% + 187.50 = 1687.50
Year 11+ = 7500 * 10% + 0 = 750

(d) Critique the following statements.

*A.* *To simplify the reinsurance transaction, the participating whole life block will be reinsured without dividend participation. Excluding dividend participation from the contract will reduce risk for BAM Life as they will not have to work with MNG Re to manage future dividend scale changes.*

*B.* *For policies going on nonforfeiture status, MNG Re will not be responsible for death benefit payments given that MNG will not receive any future premium payments for these policies.*

*C.* *The coinsurance agreement with MNG Re will increase BAM Life's credit risk. However, the increase in credit risk is less than if BAM and MNG had engaged in a funds withheld coinsurance agreement.*

**Commentary on Question**:
*Most candidates recognize the issue in part B regarding MNG being responsible for mortality risk on nonforfeiture policies; and for part C, most candidates also correctly pointed out the credit risk exposure being reduced with a FWH arrangement, but many candidates struggled with Part A, where the key issue is conflict between underlying assets vs. investment benefits, and instead many candidates focused on whether this arrangement simplifies the transaction*

## 1. Continued

A. This statement is false. If a large portion of a block of participating policies is ceded without reinsurer dividend participation, the ceding company may have a problem because it is not holding the assets underlying the reserves and therefore is not receiving the investment benefits.

B. This statement is false. MNG is still responsible for the mortality risk on nonforfeiture policies. If the insured elects the reduced paid up insurance option, the amount of reinsurance is adjusted proportionately to reflect the reduced amount, and no further premiums are received. If the extended term option is elected, the reinsurer will provide extended term insurance for the appropriate duration, again, with no further premiums.

C. This statement is false. Coinsurance subjects the ceding company to a significant additional credit risk because the cedant may be unable to obtain full reimbursement for benefits or full amount of policy reserves if the reinsurer becomes insolvent. The use of funds withheld coinsurance lessens the ceding company's exposure should the reinsurer become insolvent as the ceding company retaining the assets backing the reserves is likely in a better position than it might be under a regular coinsurance arrangement.

## 2. Learning Objectives:

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:**

(2a) Describe, evaluate and apply the economic value creation framework.

(2b) Describe and apply the common profit metrics (IRR, Value of New Business, Embedded Value, ROE) used in pricing insurance products.

(2c) Describe and evaluate fundamental strategies for enhancing value through active in-force and operational management.

**Sources:**

LPM-113-09: Economics of Insurance: How Insurers Create Value for Shareholders

**Commentary on Question:**

*Commentary listed underneath question component.*

**Solution:**

(a) Calculate the time 0 expense that would be needed for the total economic profit at time 0 to equal 30. Show all work.

**Commentary on Question**:

*Candidates generally did well on this question. Some candidates incorrectly included the risk capital as a cashflow, assumed the risk capital charge was paid at the beginning of the year, or miscalculated the revised time 0 expense. If a candidate made a mistake in an earlier step, but applied correct logic and formulas in later steps, full credit was given for the later steps.*

See Excel file.

(b) LJA Life has decided to attribute performance using transfer pricing.

Identify which components of the LJA's economic balance sheet will reside on the balance sheet of each of the following functions:

(i) Treasury function

(ii) Underwriting function

(iii) Investment function

## 2. Continued

**Commentary on Question**:
*This question required candidates to map each component of LJA Life's balance sheet into the specified underlying functions. Candidates generally struggled to appropriately split the balance sheet items into the corresponding areas. Candidates who identified income statement components received partial credit.*

LJA Life's equity will reside on the Treasury function's balance sheet.

LJA Life's liabilities will reside on the Underwriting function's balance sheet.

LJA Life's assets will reside on the Investment function's balance sheet.

(c) LJA Life has an incentive bonus structure based solely on economic profit generated.

Explain how this may create misaligned incentives between the company and the following types of employees:

(i) Senior executives

(ii) Non-management employees

**Commentary on Question**:
*This question required the candidates to retrieve from the source reading. Many candidates did well in part (i) but struggled with part (ii). In part (i), many candidates were able to identify that the performance is measured "ex post basis" and structured like a free put option. In part (ii), many candidates offered an alternative compensation structure but did not discuss the misaligned incentives of the proposed structure. No credit was awarded without identifying the misalignment.*

(i) Since the performance is measured on an ex-post basis (after risks are realized) rather than ex-ante basis (before risks are realized), there is a free put option as bonuses cannot go negative. Senior executives can maximize the value of this option by maximizing the amount of risk taken and putting the solvency of the firm at risk.

(ii) For non-management employees, incentives based on economic profit generated are less effective as the impact of their performance on group economic profit is diluted. With a bonus that is not strongly correlated to their own performance, the overall incentive is weakened.

## 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.

(1b) Describe and evaluate methods and metrics used to design and price these products, and assess their profitability.

(1d) Describe considerations and practices related to "Lapse-Supported" insurance.

(1e) Describe methodologies and considerations used in the regulation of nonforfeiture practices.

(1h) Describe what is meant by Life Settlements and assess their impact on insurance product pricing/management.

(1m) Describe and evaluate the types of assumptions commonly used in actuarial pricing and product development.

**Sources:**

The Response of Life Insurance Pricing to Life Settlements, Product Matters, Sep 2006

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

LPM-165-20: Life Products and Features

Life Insurance for the Digital Age: An End-to-End View, Product Matters, Nov 2017

LPM-152-19: Lapse Supported Insurance Analysis

**Commentary on Question:**

*This was a challenging question for candidates if they did not understand the concept of life settlements and the policy characteristics that would make a good target from the perspective of a potential investor. Many candidates struggled to draft their responses in the context of each scenario and how that might change an investors outlook.*
*Many candidates did not explicitly state their position on whether the scenario was feasible or provided statements and left it up to their audience to infer or assume what their position was. In cases where candidates did state their position, some provided limited or no valid evidence for their conclusion.*

## 3. Continued

**Solution:**

(a) LFB expects that future mortality will be worse than mortality used by life insurers in the pricing of the following products.

Assess the feasibility of the following life settlement opportunities for LFB. Justify your response.

(i) A 250,000 simplified issue term policy issued five years ago to an applicant whose health has been stable

(ii) A 5 million survivorship universal life policy issued four years ago to a married couple, one of whom was assessed by the insurance company as a substandard risk

(iii) A 2 million indexed universal life policy issued two years ago to an applicant who qualified for accelerated underwriting, with an index floor of 0%

**Commentary on Question (i)**:
*This question tested the candidates Term product knowledge and an understanding of simplified issue underwriting. Many candidates did not account for the temporary nature of this type of policy and the unlikely payoff prior to the end of the term period to a potential investor. The simplified method of underwriting was likely priced into the product offered, resulting in higher mortality baked into pricing which would reduce any potential mortality gain an a life settlement company would typically try to exploit.*

This policy presents a limited opportunity for LFB Capital and should be considered not feasible for several reasons:

- Modest Face Amount: The $250,000 benefit is relatively small for a life settlement transaction, limiting the potential return after acquisition and servicing costs are considered.
- Higher Mortality Risk from Simplified Issue: Simplified underwriting typically results in higher expected mortality due to reduced medical screening. While LFB expects mortality to be worse than originally priced, the limited underwriting already reflects elevated risk. This reduces the mortality "gain" LFB can achieve through adverse selection.
- Time-Dependent Exposure: The policy was issued five years ago. If it is a 10-year term, only five years of level premiums remain. After that, premiums are likely to increase sharply, reducing the economic viability of holding the policy. There's also a risk that the insured could outlive the term period, in which case the policy would lapse unless expensive premiums are paid, potentially yielding no return.

## 3. Continued

**Commentary on Question (ii)**:
*This question tested the candidates survivorship product knowledge and an understanding of why these types of products are purchased. Many candidates did not make the connection to estate planning and how that would play into the desire of a policyholder to maintain their policy rather than surrender for a cash value benefit. Given many owners of survivorship contracts are more affluent, these individuals value the ability to pass down a legacy in a tax efficient manner. Though candidates recognized the large face amount of $5 million and the attractiveness of this to a life settlement company, they neglected to comment on whether a policyholder would be enticed.*

This policy presents a more feasible opportunity for LFB Capital, however; with several factors to consider:

- High Face Amount: The $5 million face amount makes this a potentially attractive transaction from a return-on-investment perspective, as larger policies can better absorb acquisition and maintenance costs while providing a more meaningful payout.
- Estate Planning Purpose: Survivorship (second-to-die) policies are commonly used for estate planning purposes. Policyholders often prioritize leaving a legacy or covering estate taxes rather than accessing liquidity during life. As such, financial hardship—which often drives interest in life settlements—may not apply. The insureds may have little incentive to accept a settlement offer, especially if they do not need immediate cash.
- Mortality Complexity and Lapse Support: Survivorship UL policies involve joint mortality assumptions, and underwriting one substandard life adds further complexity. While this could suggest pricing inefficiencies, these products are typically lapse-supported—premiums are set assuming many policies will not persist to claim. This increases the risk to a life settlement investor like LFB, who would plan to hold the policy to payout. If assumptions such as "broken heart" syndrome or mortality contamination are not well understood or misestimated, the investment could perform worse than expected.

**Commentary on Question (iii)**:
*This question tested the candidates indexed universal life product knowledge and an understanding of accelerated underwriting. Though many candidates recognized the attractiveness of the relative large face policy, they did not comment on the unique index crediting aspect of IUL contracts or considerations of accelerated underwriting as compared to traditional underwriting.*

## 3. Continued

This policy presents a promising and feasible opportunity for LFB for several reasons:

- High Face Amount: The $2 million face makes this case financially attractive, providing potential for a meaningful return if appropriately priced and managed.
- Mortality Slippage Due to Accelerated Underwriting: The use of accelerated underwriting may result in under-assessment of the insured's true health risks. If LFB expects future mortality to be worse than that assumed by carriers using limited underwriting, this could result in mispricing that LFB can capitalize on.
- Interest-Sensitive Design with Flexibility: IUL policies offer flexible premium funding, allowing LFB to fund the policy at minimally necessary levels while still preserving coverage. With an index floor of 0%, there is downside protection against negative market returns. If the underlying index performs well, cash value growth could improve policy sustainability and internal rate of return metrics.

(b) Explain how the lack of a minimum nonforfeiture law in Canada results in more varied opportunities for life settlements compared to the US.

**Commentary on Question**:
*Many candidates were able to demonstrate their understanding of nonforfeiture law and make the connection to the potential opportunity the lack of it presents for life settlement companies. Despite how well most candidates performed on this question, many did not mention how the lack of nonforfeiture laws in Canada permits the design of products like Term to 100 (T100), a permanent product with zero cash value.*

In the U.S., minimum nonforfeiture laws require life insurance policies to provide policyholders with a guaranteed minimum value if they choose to stop paying premiums. This value can be accessed through options such as surrender for cash, reduced paid-up insurance, or extended term insurance. These built-in protections ensure that policyholders retain some value even if they choose to walk away from the policy.

In contrast, Canada does not have minimum nonforfeiture requirements, which means policies — particularly those like Term-to-100 (T100) or similar permanent plans — may offer no cash surrender value at all. As a result, Canadian policyholders who no longer need or want coverage have fewer internal policy options to access value. This creates a more favorable environment for the life settlement market, where third parties may offer to purchase the policy for an upfront payment, often higher than the zero or minimal surrender value offered by the insurer.

## 3. Continued

Therefore, compared to the U.S., Canada's lack of nonforfeiture protections results in more varied and compelling life settlement opportunities, since policyholders may be more willing to consider external settlement offers when there is little or no value available within the policy itself.

## 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.

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.

**Learning Outcomes:**

(1m) Describe and evaluate the types of assumptions commonly used in actuarial pricing and product development.

(3a) Recommend and justify changes to policyholder dividends.

**Sources:**

Overview of Non-guaranteed Elements (NGEs), SOA Research Institute, Cook, Koon, Motiwalla, and Rudolph, 2022

Mechanics of Dividends, SOA Research Institute, Dale Hagstrom, Mar 2022

**Commentary on Question:**

*This question tested the candidates' understanding of the process of revising nonguaranteed elements and dividends. Overall, candidates demonstrated a moderate understanding on part (a) and a poor understanding on part (b).*

**Solution:**

(a) Critique the following statements:

*A. To reduce the shock to policyholders, the change should be implemented gradually over several years, but management should still expect shifts in policyholder behavior in the months following the change announcement.*

*B. Once the new dividend policy is finalized, both the new sales illustration and actuarial models must be updated to reflect the changes.*

*C. Determination of divisible surplus is at the sole discretion of the board of directors, who tries to balance being cost competitive against the future needs for surplus.*

*D. If NGE scales need to be revised, key issues that should be addressed in the revision calculations are recouping past losses and/or distributing past gains.*

## 4. Continued

*E. Using the Contribution Method to determine policyholder dividends, the three-factor formula that is used to calculate major sources of gain includes mortality, investment income and predicted lapsation.*

**Commentary on Question**:
*Statements A and B were poorly answered by candidates. To receive full credit, candidates had to link the statements with the situation and recognize that the change to divisible surplus was small and not necessarily unfavorable to policyholders. Partial credit was given even if the magnitude of the change was not taken into consideration, but the explanation provided needed to be valid. Therefore, dividend scale smoothing or updating the sales illustration may not be required. In general, statement C was well answered and most candidates earned full credit for statements D and E.*

**A.** Since it is a relatively small impact, it may be better to reflect the impact immediately. However, you could also spread out the impact to stabilize earnings. Regardless, this should not have a noticeable impact on policyholder behavior.

**B.** Since the impact is small, the new sales illustrations don't necessarily need to be updated. For accuracy, it would be beneficial to update the actuarial models, but immateriality could be argued.

**C.** True

**D.** False
NGE scale revisions should be a prospective exercise focusing solely on future profitability levels.

**E.** False
The three factors that are used to calculate gain include mortality, investment earning and expense.

(b) Compare and contrast the considerations in adjusting dividends for a participating whole life block of business against adjusting nonguaranteed elements in a universal life block.

**Commentary on Question**:
*Candidates were expected to describe both similarities and differences to consider between adjusting the dividends and NGEs for the two blocks. Fewer candidates were able to provide similarities. Most candidates only listed product feature differences between WL and UL blocks and not considerations for adjusting dividends versus NGEs, which received only partial credit.*

## 4. Continued

*The most common difference identified by candidates was related to NGEs, which should reflect expected future experience, while dividends are based on past performance.*

**Similarities**
- Both adjustments can reflect similar items such as investment experience, expense levels, and mortality.
- Changes will impact future policy values.
- To be illustrated, they must be supportable.

**Differences**
- Items in a UL policy generally have a guaranteed floor while dividends are not floored.
- UL has experienced much more litigation, especially in relation to COIs.
- NGEs should reflect expected future experience; dividends can be paid based on past performance.
- With UL generally unbundling NGE components from the death protection, it is clearer to identify the change (e.g., changes in mortality to COI, investment performance to credited interest).

## 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.

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.

**Learning Outcomes:**

(1i) Describe how predictive analytics can be used in life and annuity pricing applications.

(3f) Describe how alternative data might be used to supplement mortality rate estimates.

(3j) Describe methodologies, approaches, considerations and tools related to the Underwriting function.

(3k) Describe and assess insurance and annuity distribution approaches and the impact of emerging technologies.

**Sources:**

Predictive Modeling for Life Insurance: Ways Life Insurers Can Participate in the Business Analytics Revolution, Product Matters, Jun 2018

Life Insurance for the Digital Age: An End-to-End View , Product Matters, Nov 2017

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

**Commentary on Question:**

*The question test the candidates knowledge of the use of predictive analytics.*

**Solution:**

(a) Explain three ways the fully automated end-to-end approach to underwriting may negatively impact the customer experience.

**Commentary on Question**:

*Candidates generally performed well on part a). Many candidates were able to identify scenarios in which clients with good risk profiles were declined under fully automated underwriting processes. Some candidates received no credit due to a fundamental misinterpretation for attributing adverse customer experiences exclusively to the full end-to-end underwriting approach. Traditional underwriting methods can also lead to similar outcomes, including application declines.*

## 5. Continued

The fully automated end to end underwriting solution will decline the applications without a referral to the traditional underwriting. There are a few plausible scenarios that will result in a poor customer experience or increased chance of poor mortality:

- Nonsmokers who the smoker propensity model conservatively predicted to be a smoker will reduce the placement rate of potentially good risk
- Smokers who have either self-declared or have been classified as such by the smoker propensity model have no opportunity to be assessed for smoker rates
- Applicants who have generated limited data within the sources used by the risk classifier may receive a score of 0 and therefore not have an opportunity to be underwritten
- Lab test data may not provide a complete picture of the applicant's health. In the case where a test was performed, but the test result was ultimately negative, or if the medical condition has stabilized or reversed; this may screen out otherwise acceptable risks.

(b) Describe the four data preparation steps that should be followed for building a smoker propensity model.

**Commentary on Question**:
*The majority of candidates did well on this question. Some candidates errored by focusing on solely on data items. However, developing and analyzing the variables are necessary components of the steps. Partial credit was awarded where appropriate. To receive credit, candidates must have described the steps, not just provide a simple list.*

1. Variable generation
   - Create variables from raw data and enter into the system.

2. Exploratory data analysis
   - Analyze the distributional properties of each variable using descriptive statistics (e.g. min, max, mean, etc.)

3. Variable transformation
   - Address data issues identified during exploratory data analysis (e.g. replacing missing values)

4. Partitioning model set for model build
   - Divide the data set into approximately three equal parts: train, validation, and test sets

## 5. Continued

(c) Critique each of the following statements regarding the proposed accelerated underwriting process:

*A. Underwriting cost savings should allow accelerated underwriting to scale to higher face amounts.*

*B. Setting a maximum risk score of 1.0 for accepting applicants should result in mortality consistent with SLT's fully underwritten experience, since it has been calibrated to millions of records.*

*C. As more 3rd party data sources become available and usable, they should be added to the automated underwriting process to improve the accuracy of underwriting decisions and reduce prices for standard or preferred risk customers.*

**Commentary on Question**:
*Most candidates could formulate some good points that showed general knowledge of the topic. But few gave solid complete answers to all parts that critiqued the actual statements.*

A. This statement is not correct. While accelerated underwriting can lead to cost savings its benefit lies in its ability to use data to perform predictive analytics. Mortality costs are usually proportionate to the risk and can grow faster with higher face amount than the underwriting cost savings. Improvements in analytics may allow accelerated underwriting to scale to higher face amounts, but this would be because of model improvement, not specifically be because of cost savings in underwriting.

B. This is not a correct statement. Firstly, setting a maximum risk score of 1 would eliminate many applicants who would otherwise be considered under traditional underwriting; thus they would be comparing different samples. Secondly, just because the model has been calibrated to millions of records does not mean it will be consistent with SLT's data. SLT may have demographics or markets specific to its underwriting that may not be consistent with the average of the sample used for calibration.

C. Third party data sources can be useful in improving the accuracy of underwriting decisions assuming they are relevant. However, these data sources typically come with costs attached to them to acquire the data. Thus the cost of the data must be weighed against its usefulness. There is no guarantee using more 3rd party data will reduce prices.

## 6. 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.

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:**

(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.

(1g) Describe the operation of Life Acceleration Riders and their role in meeting market needs.

(1m) Describe and evaluate the types of assumptions commonly used in actuarial pricing and product development.

(3f) Describe how alternative data might be used to supplement mortality rate estimates.

(4c) Describe risk transfer considerations, and evaluate their impact on reinsurance agreement provisions.

**Sources:**

Life Insurance Acceleration Riders, SOA Reinsurance News, 2013

What if Mortality Stops Improving? Introducing a Product Idea that Shares the Risks and Benefits of Changes in Mortality Rates, Product Matters, Aug 2023

**Commentary on Question:**

*Overall, candidates demonstrated a general understanding of accelerated life insurance riders and the impact of COVID-19 on mortality assumptions. However, many candidates struggled to evaluate product design challenges and did not adequately address key considerations from a reinsurer's perspective.*

## 6. Continued

**Solution:**

(a) SV Life's CEO released the following statement: *"In light of the COVID-19 pandemic, it is clear that our assumptions around mortality improvement for life insurance need to be dramatically reduced."*

(i) Critique the CEO's statement with consideration of drivers of mortality improvement.

(ii) Recommend a product design that could reduce the risk associated with mortality improvement on life insurance products.

(iii) Describe three possible challenges with the proposed product design.

**Commentary on Question**:
*For part (i), most candidates correctly identified that the CEO's statement was inaccurate and acknowledged the uncertainty surrounding future mortality improvement. Partial credit was awarded for recognizing the inaccuracy of the statement, while full credit required citing at least two drivers of mortality improvement and two drivers of mortality deterioration.*

*For parts (ii) and (iii), most candidates selected the mortality-indexed design as the most appropriate option and were able to explain its mechanics. However, many candidates did not reference design challenges directly from the source material, which resulted in only partial credit.*

(i) Future mortality improvement is uncertain following the COVID-19 pandemic.

- Historically, mortality has improved due to advancements in medical technology, improved public health measures, and other socio-economic factors.
- However, factors such as long COVID, substance abuse, climate change, and squaring of the curve may lead to deterioration.

Given these opposing forces, the CEO's statement that mortality improvement must be dramatically reduced is speculative and not well-supported.

## 6. Continued

(ii) A mortality-indexed design could support better management of mortality improvement risk.

- Under this design, future premiums are linked to a pre-defined mortality index. As mortality improves, premiums decrease; as mortality deteriorates, premiums increase.
- This dynamic pricing mechanism helps maintain the long-term profitability of the product by aligning premiums with emerging mortality experience.

(iii) Key challenges associated with a mortality-indexed product design include the following:

- Life expectancy at birth may not accurately reflect changes across all ages, particularly those most relevant to the insured population.
- Mortality improvement differs by gender and smoking status, which may not be captured accurately in general population indices.
- General population mortality data is more readily available and objective but may not reflect the typically healthier and more affluent insured population.
- The insurer must determine which index to use, balancing transparency, stability, and relevance.
- A stable and predictable index is needed, with contingency plans in place if the index becomes unavailable or unsuitable.
- Adverse mortality periods could trigger premium increases, leading to anti-selective lapsation.
- Frequent premium changes may be confusing to customers who may prefer the predictability of traditional level premium products.
- Tying premiums to an external index increases pricing and administrative complexity, potentially raising operational costs.

(b) SV Life is exploring the addition of life insurance acceleration riders to their product offerings with the objective of better serving customers in a post-pandemic environment.

(i) Define three types of life insurance acceleration riders prevalent in the market.

(ii) Recommend one life insurance acceleration rider that would meet the company's objective. Justify your response.

(iii) Describe three ways the company can mitigate the risk from selling life insurance acceleration riders.

## 6. Continued

(iv) Describe two reasons a reinsurer could be concerned with adding a life insurance acceleration rider to products covered under an existing reinsurance treaty.

**Commentary on Question**:
*For part (i), most candidates were able to correctly identify and define the three types of acceleration riders. Partial credit was awarded to those who listed the riders without providing definitions.*

*For part (ii), some candidates correctly identified the chronic illness rider as the most appropriate choice to align with the company's objective and provided adequate justification. Partial credit was given for recommending a rider without sufficient justification.*

*For part (iii), many candidates did not reference the appropriate risk mitigation techniques for acceleration riders as outlined in the source material, which resulted in partial credit. The model solution includes more examples than was required for full credit.*

*For part (iv), most candidates did not sufficiently address key concerns from a reinsurer's perspective, resulting in weaker responses on this portion of the question. The model solution includes more examples than was required for full credit.*

(i) Three types of life insurance acceleration riders prevalent in the market:
- Terminal Illness Rider: Allows policyholders to accelerate a portion of the death benefit if they are diagnosed with a terminal illness and have a life expectancy of less than two years.
- Chronic Illness Rider: Allows acceleration if the insured is unable to perform two or more Activities of Daily Living (ADLs) without assistance.
- Critical Illness Rider: Allows acceleration upon diagnosis of a covered critical illness, such as cancer, heart attack, or stroke, as defined in the policy.

(ii) SV Life should offer a chronic illness rider, which aligns with the company's objective and may be especially appealing to individuals experiencing the effects of long-COVID. This rider enables policyholders to access a portion of the death benefit while still living, providing financial support for caregiving, medical expenses, or lost income associated with the inability to perform ADLs.

## 6. Continued

(iii) Risk mitigation techniques for acceleration riders include:

- Requiring supplemental underwriting for rider eligibility.
- Limiting issue ages or requiring cognitive testing at older ages.
- Structuring benefits as a lien on the death benefit with interest, or providing a discounted acceleration amount.
- Capping the annual and lifetime acceleration amounts.
- Requiring certification from a licensed healthcare provider to trigger benefits (especially for chronic illness riders).
- Defining qualifying ADL impairments as expected to be permanent.
- Including exclusions such as mental/nervous disorders, substance abuse, suicide, or acts of war.
- Limiting rider availability to certain underwriting classes (e.g., excluding substandard risks or applying maximum ratings). Capping the accelerated benefit at less than 100% of the policy's face amount.

(iv) Key reinsurer concerns regarding acceleration riders include:

- Determining whether the reinsurer's share of the rider benefit should match their participation in the base policy.
- For permanent products, claims are highly likely once acceleration triggers are met, leading to near-zero lapse rates. Reinsurers must assess whether discounted payouts appropriately reflect expected mortality, lost premium, and interest.
- Reinsurers must evaluate and be comfortable with the ceding company's risk mitigation measures related to the rider to ensure it is being administered responsibly.
- Some reinsurers may prefer lump-sum payments over benefit streams and may limit participation based on payment format, resulting in acceleration costs being borne by the ceding company.
- Riders added to term products may pose higher risk and pricing uncertainty compared to permanent products.
- Reinsurers need clarity on how they are compensated if the direct writer charges for the rider, especially if the reinsurer lacks expertise in the pricing of living benefits.
- Under yearly renewable term (YRT) arrangements, it must be clear whether the reinsurer pays only at death. Scenarios where a policy accelerates benefits and later lapses present complications in settlement mechanics.

## 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.

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.

**Learning Outcomes:**

(1j) Describe and apply the requirements of applicable ASOPs on Life and Annuity Product Pricing and Assumptions

(3i) Describe standards for illustrations in both the United States and Canada

**Sources:**

Actuarial Guideline XLIX (AG49): Past, Present and Future, Product Matters, Jun 2023

ASOP 24: Compliance with the NAIC Life Illustrations Model Regulation, December 2016

**Commentary on Question:**

*This question attempted to test the candidate's knowledge of illustration standards. Overall, many candidates seemed to struggle with this question. Partial credit was given as described in each section.*

**Solution:**

(a) Calculate the following under the AG49-A "quick-fix" rules. Show all work.

(i) Maximum illustrated rate for a Benchmark Indexed Account

(ii) Maximum assumed earned rate

(iii) Illustrated rate

**Commentary on Question**:

*Many candidates struggled with this section, providing incorrect or incomplete calculations. Partial credit was given for recalling part of the equations.*

(i) AG49 defines a maximum illustrated index credited rate based on a benchmark indexed account, based on S&P 500, 1-year point-to-point, 100% participation rate with a 0% floor. This was provided in the question and is 7.61%.

## 7. Continued

(ii) The maximum assumed earned rate is limited to 145% of the net investment income rate. Net investment income rate can either be defined as net of default cost or net of both defaults and investment expenses. The investment return factors may be net of investment expenses or investment expenses may be treated separately as part of expenses.
Max Earned Rate = NII * 145%
NII = Gross Portfolio Investment Yield – Investment Expenses – Default Assumption
Max Earned Rate = (5.50% - 0.25% - 0.25%) * 145% = 7.25%

(iii) The illustrated rate is the minimum of the BIA from part (i), the max earned rate from part (ii), and the option budget * 145% + any fixed bonus
Illustrated Rate = min(7.61%, 7.25%, 3.50% * 145% + 1.75%)
Illustrated Rate = 6.825%

(b) Critique the following elements of ASOP 24, "Compliance with the NAIC Life Insurance Illustrations Model Regulation," with respect to the new product:

(i) Expenses

(ii) Crediting rates

(iii) Changes in business practice

(iv) Lapse-support test

(v) Self-support test

**Commentary on Question**:
*The candidates generally fared better in this section, though some responses were limited to rote memorization. Partial credit was awarded for general actuarial knowledge, but higher-scoring responses applied that knowledge to the specifics of the case study and provided relevant insights.*

## 7. Continued

(i) As described in the NAIC Life Insurance Illustrations Model Regulation, the actuary should consider whether the minimum expense to be used in the calculation of the disciplined current scale (DCS) for all policy forms during the certification year are based on fully allocated, marginal, or GRET (Generally Recognized Expense Table). Marginal expenses are only appropriate if the GRET, an industry table, is available and marginal expenses are greater than GRET. Nonrecurring costs may be spread over a reasonable number of years. Therefore, the amortization of underwriting is appropriate. The same unit expense basis should be used for all policy forms tested. Since DCS was based on fully allocated expenses, marginal should not be used.

(ii) For policies with interest credits linked to an external index or indices, the interest credited rate for the illustrated scale for each indexed account shall be limited in accordance with AG49. Specifically, limited to 6.825% as calculated in a(iii). The experience factor should be based on recent actual investment experience less default costs. The actuary should reflect actual practice for realized and unrealized capital gains and losses, investment hedges, policy loans, and other investment items. Policy loan interest is limited to 5%: 4.5% (based on Moody's Corporate Bond Index) + 50 basis points (limited by AG49 QF).

(iii) Changes in business practice should be reflected as soon as they are enacted (but not before), even if experience has not yet been impacted. Here, the new accelerated underwriting program should be reflected in the illustration.

(iv) Failing the lapse support test prohibits the illustration of non-guaranteed elements. The lapse support test is similar to the self-support test, changing only the persistency assumption: use DCS persistency for the first 5 years, then 100% thereafter. The case study did not mention any results of a lapse support test. The noted profit margin improvement under increased lapses suggests this product would fail the lapse support test.

(v) The NAIC Life Insurance Illustrations Model Regulation requires every policy form, for policies inforce for less than 1 year, illustrated by an insurer to be self-supporting according to the assumptions underlying the insurer's disciplined current scale. Starting at the $15^{th}$ policy anniversary, and for every illustrated point thereafter, the value of the cash flows must be greater than or equal to the cash surrender value. While the case study reports this test was passed, the product should be retested with updated mortality assumptions accounting for impacts from the new accelerated underwriting program and pandemic deterioration residual.

## 8. 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.

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:**

(1a) Describe the designs of the common life and annuity products and evaluate their associated features and inherent risks.

(1m) Describe and evaluate the types of assumptions commonly used in actuarial pricing and product development.

(1p) Describe how product designs are impacted in a rising interest rate environment.

(3b) Describe and evaluate the challenges insurers face in a low and potentially rising interest rate environment.

**Sources:**

LPM-166-20 Annuity Products and Features (Chapter 1)

Life, Health, & Annuity Reinsurance, Tiller & Tiller Chapter 4

**Commentary on Question:**

*Question 8 was generally well-responded to by candidates. Most demonstrated a basic understanding of interest rate risk in annuities, reinsurance characteristics, and how experience gain / losses are shaped by the presence of reinsurance.*

**Solution:**

(a)

(i) Define C-3 risk.

(ii) Explain why products similar to TTPD's current FDA design may be susceptible to C-3 risk.

(iii) Recommend one change to TTPD's FDA product design that could be used to mitigate C-3 risk for the FDA block. Justify your response.

## 8. Continued

**Commentary on Question**:
*This question had a range of responses.*

*For 8a) i):*

*Most candidates recognized C3 risk as interest rate risk or interest rate mismatch risk. Partial credit was given if candidate only identified C3 as interest rate risk but did not elaborate on further details. Some candidates did not identify C3 risk as interest rate risk, but instead mentioned asset risks, investment risks, asset default, or non-economic risks, were not given credit as candidate did not demonstrate clarity of C3 risk being exclusive to interest rate risk. Candidates were given credit for disintermediation risk.*

*For 8a) ii):*

*Not all candidates commented on FDA's susceptibility to disintermediation risk, which is key to getting full credit for this question. If they comment on the surrender charge schedule (and how it's low and declining), but does not link this feature to disintermediation risk, only partial credit was given.*

*For 8a) iii):*

*The range of responses for this is quite wide. Some candidates directly addressed increase in surrender charges and market value adjustments as effective ways to mitigate C3 risk. Ones who linked these two product designs as discouraging lapsation and removing need to sell assets at a loss are given full credit.*

*Others suggested shortening the guarantee period so we can increase guarantee rates to keep up with competitors. While this may increase persistency, we now have to earn more yield on our existing asset base to fund the higher guarantee, which can decrease our profitability and subject us to more interest rate risk later.*

*Others suggested switching to an Index Annuity, but this will not mitigate C3 risk in the existing FDA product. This was not given full credit.*

*Some candidates suggested lowering the guaranteed rate, but this was deemed an ineffective lever as policyholder is not incentivized to stay with the product if interest rates are rising and they can get more competitive rates elsewhere. Candidates who suggested using reinsurance to mitigate C3 risk were not given credit as it is not deemed a product design feature that can be tweaked specifically to mitigate C3 risk.*

## 8. Continued

(i) C3 risk is interest rate risk. It is the risk of interest rate fluctuations (or changes in interest rate environment) having adverse impacts to profitability. Specifically for fixed deferred annuities, it is subject to disintermediation risk, a subset of interest rate risk, which is the risk of selling assets at a loss to fund policyholder lapses in a rising interest rate environment for fixed deferred annuities.

(ii) TTPD's current FDA design has low surrender charges. In a rising interest rate environment, policyholders may be incentivized to lapse the policy and reinvest their money into policies with higher guaranteed rates. This causes TTPD to sell assets at a loss to fund the lapsation due to bond values decreasing in a rising interest rate environment.

(iii) TTPD can increase the surrender charge or add a market value adjustment to help discourage lapses and improve persistency in a rising interest rate environment. This will reduce the risk of having to sell assets at a loss to fund policyholder lapsation, decreasing our interest rate risk.

(b) Recommend one form of reinsurance for each block that will satisfy each company's priorities. Justify your response.

**Commentary on Question**:
*Most candidates were able to clearly identify the two appropriate reinsurance structures for each block. Some did not explicitly rule out funds withheld as a viable option or did not address the need for cash settlements. Candidates who selected incorrect reinsurance structures may have gotten partial credit if demonstrated understanding of link between reinsurance characteristic and underlying needs of stakeholders.*

Recommend Block A (IUL) to use coinsurance:
(i) Coinsurance allows for the transfer of assets and investment risk, and gives reinsurer autonomy over asset holdings and investment decisions
(ii) Coinsurance allows for the transfer of other non-economic risks, such as mortality risk

Recommend Block B (LTC) to use modified coinsurance.
(i) Modified coinsurance will allow TTPD to retain the assets.
(ii) Modified coinsurance allows cash settlement, which rules out funds withheld.

## 8. Continued

(c) Analyze how each of the following scenarios would impact the after-tax profits of TTPD and its reinsurer, inclusive of an assumed 100% coinsurance reinsurance agreement. Justify your response.

(i) Mortality emerges at 80% of expected on the IUL block

(ii) Default rate on assets held by the reinsurer is 100% higher than expected

(iii) Morbidity on LTC is 250% of expected, and the reinsurer becomes insolvent

**Commentary on Question**:

*There were some common misconceptions on this question to highlight:*

- *Some candidates missed the 100% coinsurance agreement, which means TTPD is not on the hook for experience gains / losses, as long as the reinsurer stays solvent.*
- *Credit was given if candidates mention impact to TTPD via experience refunds.*
- *If the candidate mentions an impact to TTPD, but does not specify it is from experience refunds, this was not given credit.*
- *Some candidates did not differentiate between the impact on direct insurer vs. reinsurer.*
- *Others assumed the impact on direct insurer and reinsurer were the same.*
- *Candidates who identified the impact in the opposite direction did not receive credit.*
- *Candidates who identified the movement in the correct direction, but no justifications or incorrect justification, received only partial credit.*

*For 8c) i) specifically:*

- *For the mortality A/E ratio < 100%, some candidates interpreted this as an experience loss, whereas an actual mortality experience being less than expected is considered an experience gain and good for profits.*

*For 8c) ii) specifically:*

- *Most candidates recognized an increase in asset defaults decreases profits.*

## 8. Continued

*For 8c) iii) specifically:*

- *Some candidates mention the reinsurer is insolvent, but did not explicitly comment on reinsurer after-tax profits decreasing, becoming zero, or possibly negative due to the insolvency. This direct link was necessary for full credit.*
- *Some candidates reemphasized no impact on direct insurer and did not demonstrate understanding that reinsurance insolvency has a spillover effect on direct insurer.*

(i) No impact to TTPD (or increase in profits for TTPD via experience refunds), as block is 100% coinsured. Reinsurer after-tax profits increase due to experience gain from actual mortality claims experience being lower than expected.

(ii) No impact to TTPD (or decrease in profits for TTPD via experience refunds), as block is 100% coinsured. Reinsurer after-tax profits decrease due to higher asset default rates.

(iii) Reinsurer after-tax profits decrease (or possibly be zero or go negative) due to the insolvency and experience loss. Reinsurer counterparty insolvency will leave TTPD on the hook for any shortfalls in covering the morbidity claims experience loss, as actual morbidity claims is higher than expected, decreasing after-tax profits for TTPD.