

# ILA LPM Model Solutions

## Spring 2024

### 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.

### 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.
- (1n) Describe and evaluate the role of Behavioral Economics in understanding and modeling policyholder behavior in the life and annuity context.

### Sources:

Structured Settlement Annuities, SOA Research Institute, Sklar, 2022

Pension Risk Transfer in Canada and the U.S., SOA Research Institute, Simmons, 2022

Market Trends and Product Designs: Considerations when Interest Rates are Rising, Sun, Moench, Strother, Lee, and Mu, 2021

### Commentary on Question:

*The question was to test the candidate's knowledge of pension risk transfer (PRT) and structured settlement (SS) products. For part (a), Most candidates demonstrated their knowledge about the SS, some candidates lost some points as they mixed the concept between PRT and FA. For part (b), most candidates didn't receive the full marks as they only described the impacts from policyholder behavior under the different interest environments, very few candidates mentioned the pricing strategy and product design under the low/high interest scenarios. For part (c), most candidates made the recommendation with reasonable justifications.*

# 1. Continued

## Solution:

- (a) Compare and contrast the following pricing considerations for retirement annuities and structured settlements.
  - (i) Asset Return/Interest Rates
  - (ii) Longevity/Mortality
  - (iii) Annuitant Behavior
  - (iv) Expenses
  - (v) Liquidity

### Commentary on Question:

*Most candidates were able to provide reasonable considerations for these items, except for Expenses – The candidates were expected to understand the types of different expense items, the difference of how they are determined from pricing between these two, i.e. SS is priced individually, while PRT it is a group contract. Some candidates also lost points on the annuitant behavior as they treated the pensioner as a general holder of fixed annuity ( and even variable annuity from some candidates) instead of retirement-specific products.*

- Assets Return/Interest Rates:

Both types of annuities are long-duration products, so insurers often use illiquid assets in their portfolios.

The inability to match all the projected long duration cash flows with equally long duration assets creates reinvestment risk for both products.

- Longevity/Mortality

The insured populations for retirement annuities and SS is vastly different which creates different types of longevity risk.

For PRT, insurers often use several data points in their underwriting such as ZIP code, job type, and other experience data.

SS insureds tend to be much younger than retirements annuities at issue, and underwriting is a challenge for SS due to physical and medical impairments of many annuitants which impacts the shape of the mortality curve.

# 1. Continued

- Annuitant Behavior

Deferred annuitants are able to choose their retirement date and form of pension. If these options are subsidized (as opposed to being actuarial equivalent) then pricing needs to reflect an assumed retirement date and pension form for each deferred annuitant.

Since SS are used to fund a tort settlement and are not individually purchased by the annuitant, there isn't the type of longevity-related anti-selection or behavior risk that exists with other life annuities.

- Expenses

For SS, expenses such as maintenance, overhead, commission, and other acquisition expenses must be factored into the pricing of the product. Most expenses can be covered by adding a fixed percentage to the premium.

For PRT, similar expense categories apply but at a larger scale. While SS are generally individually priced, PRT's are group annuity contracts that can be thought of as a mini-M&A transaction. The pricing for each quote is highly customizable and expenses are of larger scale and are less fixed than SS.

- Liquidity:

For PRT, deferred annuitants sometimes have the option to commute their pension, so pricing needs to reflect the proportion of annuitants expected to choose a pension versus lump sum commuted value. The asset portfolio should have enough liquid assets to cover these amounts.

For SS, the benefit payments (annuity certain, single life annuity, temp life annuity, lump sum) are fixed and determinable at issue so there is no uncertainty of when benefits will be due, only for how long.

(b) Compare the impact of a sustained low interest rate environment against a rising interest rate environment for each of the following:

- (i) ABC Life's inforce FA block
- (ii) ABC Life's inforce life insurance block
- (iii) Pricing of future PRT deals and structured settlements

# 1. Continued

## **Commentary on Question:**

*Many candidates were unable to cover all the aspects as presented in this model solution, but points were given to answers that had reasonable justification. Many candidates mainly focused on the impacts due to the policyholder behavior under the low/high interest environment, and failed to touch on other aspects. Very few candidates mentioned what the company could do to actively manage the inforce blocks to react to these interest scenarios.*

- **Fixed Annuity:**  
In the sustained low interest rate environment, fixed annuity writers have increased the use of reinsurance to provide surplus relief or to allow for access to a broader range of investment options.  
FA sales growth has occurred during periods of credit spread widening, flow reinsurance mechanics and new capital injection from PE backed companies.
- **Whole Life and UL:**  
The sustained low interest rate environment in recent years followed by increases since late-2020 has been less impactful on WL than UL. WL products are generally more stable in changing interest rate environments, likely due to the simple design of the product.  
In contrast, products that are more interest rate sensitive, including UL products, tend to have lower sales as these products are more expensive for policyholders to keep in force when interest rates are low.  
In the current interest rate environment, insurers must participate in active management on non-guaranteed elements, including raising COI charges on UL products, to ensure profitability. Management also need to maintain a reasonable level of profitability and minimize market value loss on the sale of fixed income by adjusting crediting rate.
- **PRT and SS:**  
PRT and SS are both long duration products. The inability to match all the projected long duration cash flows with equally long duration assets creates “reinvestment risk” for both products.  
As interest rates start to slowly rise, carriers in the long-duration insurance market may be prudent to react given past interest rate trends to be competitive in the annuity market. Leveraging lessons learned during prior periods of rising interest rates can better position carriers for long-term competitiveness and profitability, particularly for PRT cases.

## 1. Continued

- (c) Recommend one of the following business strategies for ABC Life. Justify your response.

Strategy A: Enter the PRT market

Strategy B: Enter the structured settlement market

Strategy C: Focus on growing the WL business

Strategy D: Focus on growing the FA business

### **Commentary on Question:**

*Most candidates made a recommendation with appropriate justifications. Partial credits were given to candidates who provided reasonable analysis but did not get to enough details. No points were given if the candidate made a recommendation without explaining the reasons, or the reasons given were not correct.*

### Option 1 - Enter the PRT market:

I recommend that the company enter the PRT market.

The PRT market is a massive opportunity for expansion for ABC with PRT transactions often worth premiums of hundreds of millions or even billions of dollars. Additionally, ABC may be average to leverage some of its experience on fixed annuities to developed customized mortality assumptions for each PRT transaction.

In contrast, the SS market is a niche market. Additionally, the complexities of setting unique mortality assumptions, factoring in level of impairment, may be a challenge for ABC since the mortality curve of structured settlements can differ than traditional annuities or retirement annuities.

### Option 2 - Enter the SS market:

I recommend that the company enter the SS market.

Of the two new markets proposed, SS is more appropriate for ABC due to the size of the company. PRTs are generally large deals which can be thought of as mini-M&As. ABC may not have the infrastructure to handle such a financially large block of business.

In contrast, SS is a niche market with annuities used to fund tort settlements. ABC's experience with fixed annuities would be a benefit while entering the SS market.

## 1. Continued

Option 3 - Focus on growth of WL business:

I recommend that the company grow its WL business.

In a period of sustained low interest rates followed by a moderate increase in recent years, ABC should focus on product designs that perform well in rising interest rate environments, such as Whole Life. Historically, WL products have performed well in dramatically changing interest rate environments due to their simple design.

The company should focus on WL over UL because it is less interest sensitive. In the UL line, the company may need to adjust COIs to stay profitable.

Option 4 - Focus on growth of FA business:

I recommend that the company grow its FA business.

As a small company, ABC may not have the appropriate infrastructure to expand its product offerings; however, in the current period of heightened mortality, the company may be able to see profits on their annuity business.

While expanding its FA business, ABC should increase the use of reinsurance to aid profitability, provide reserve relief, and to use offshore reinsurance transactions utilized to better recognize asset-liability-management and allow for access to a broader range of investment options.

## 2. 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.
- (4c) Describe risk transfer considerations, and evaluate their impact on reinsurance agreement provisions.
- (4d) Describe and evaluate nonproportional reinsurance arrangements and their use.
- (4e) Describe and evaluate how strategic/customized reinsurance solutions may enhance insurer prospects.

### Sources:

Life, Health & Annuity Reinsurance, Tiller, John E. and Tiller, Denise, 4th Edition, 2015 - Ch. 5-7, 9, 17

### Commentary on Question:

*The question tested the candidate's understanding of a variety of types of reinsurance transactions, how to prepare financial statement entries, and the NAIC's model regulations on acceptable risk transfer. Overall, candidates did reasonably well on this question. Candidates performed the best on part a.*

### Solution:

- (a) Recommend a method of reinsurance for each of the following. Justify your answers.
  - (i) Company A is looking to free up surplus for the issuance of a new line of universal life (UL) products. Company A would like to run off its old whole life (WL) block and is looking to reduce the size of its balance sheet immediately.
  - (ii) Company B is looking to mitigate its lapse risk on the fixed annuity business by transferring 30% of its lapse risk exposure using reinsurance without reducing its total invested assets or reserves. Company B also prefers to have frequent cash flow settlements.

## 2. Continued

- (iii) Company C would like to reduce 90% of its mortality risk on its UL business while retaining all other risk. Company C is looking for a fast and efficient solution.
- (iv) Company D discovered if the surrender rate on their whole life block were to exceed 35% in any given year, the company may not have sufficient cash on hand to pay out the surrender benefits. The block has profitable experience with surrender rates around 3%, and Company D does not seek to give up much profit generated from the mortality and investment experience.
- (v) Company E's investment yield ranks among the highest in the industry due to its aggressive investment strategy and utilization of alternative assets, but its mortality and lapse experience has been undesirable on its WL, term, and UL business. Company E would like to transfer 40% of its underwriting risk using reinsurance without altering its investment portfolio.

### **Commentary on Question:**

*Candidates performed well on this question. Candidates who selected the appropriate method of reinsurance and described why the method was the best choice received full credit. Credit was also given for other methods of reinsurance that were appropriately justified. Many candidates did not recognize that part (iv) was a non-proportional reinsurance structure.*

(i) Recommend coinsurance. Coinsurance will reduce the balance sheet and free up surplus. It is also efficient and quick to administer. Assumption reinsurance is not appropriate in this scenario because Company A wishes to reduce the size of the balance sheet immediately.

(ii) Recommend modified coinsurance. Modified coinsurance allows Company B to mitigate its lapse risk without reducing its total invested assets or reserves, as opposed to coinsurance. Company B also prefers to have frequent cash flow settlements, which would happen with modified coinsurance, but not with funds withheld modified coinsurance.

(iii) Recommend YRT. This will allow the ceding company to reduce their exposure to mortality risk. YRT is also a fast and efficient solution and is low cost.

(iv) Recommend stop loss reinsurance. Company D seeks to reduce excess risk, which is best handled by stop loss reinsurance. This type of reinsurance will also be low cost, which will allow Company D to retain profit generated from mortality and investment experience.



## 2. Continued

(v) Recommend modified coinsurance. Modified coinsurance will not alter the asset positions of the ceding company and thus not affect the portfolio. Although a funds withheld could also aim to achieve this, the alternative assets may cause additional regulatory scrutiny under this structure. Thus, modified coinsurance is the best choice.

- (b) Calculate the following for each of the three quotes above:
- (i) Initial reinsurance premium
  - (ii) Initial amount due from UWU Life to the reinsurer
  - (iii) UWU Life's net reserve as of the reinsurance effective date
  - (iv) UWU Life's invested assets as of the reinsurance effective date

### Commentary on Question:

*Candidates needed to be able to demonstrate their understanding of how reinsurance of in-force business is calculated. Full credit was awarded for a correct response to each part, including work shown. Candidates received partial credit for each result they correctly calculated for a particular quote.*

(i) The initial premium is based on a pro-rata share of the reserve backing the policies to be reinsured.

Initial Premium = quota share \* reserve inforce

Quote #	Initial Premium
Quote 1	=80% * 2,200,000,000 = 1,760,000,000
Quote 2	=75% * 2,200,000,000 = 1,650,000,000
Quote 3	=75% * 2,200,000,000 = 1,650,000,000

(ii) For Quote 1, the initial amount is equal to the ceded premium less allowance less the modco reserve adjustment. Thus,

initial amount due = initial premium - initial allowance – modco reserve adjustment

$$\begin{aligned} \text{initial amount due} &= 1,760,000,000 - 1,760,000,000 * 9\% - 1,760,000,000 \\ &= -158,400,000 \end{aligned}$$

## 2. Continued

For Quote 2, the initial amount is equal to the ceded premium less allowance.

Thus,

initial amount due = initial premium - initial allowance

$$= 1,650,000,000 - 1,650,000,000 * 10\%$$

$$= 1,485,000,000$$

For Quote 3, the initial amount due is 0 because it is a funds withheld basis where the new position is reflected via payable / receivable. Thus,

initial amount due = 0

(iii) On a Coinsurance or Funds Withheld Coinsurance basis, the net reserve is simply the pro-rata share of the gross reserve (i.e., 25% of 2,200,000,000), while on a Modified Coinsurance basis, all assets are retained by the ceding company and therefore the net reserve is equal to the gross reserve. Thus,

Quote #	Net reserve at reinsurance effective date
Quote 1	= 2,200,000,000
Quote 2	= 2,200,000,000 * 25% = 550,000,000
Quote 3	= 2,200,000,000 * 25% = 550,000,000

(iv) In general, the invested assets are equal to the surplus and reserve, plus the initial gain (allowance) from the reinsurer. However, on a Funds Withheld Coinsurance basis, a paper liability (accounts payable) results in the invested assets remaining the same since no funds physically change hands.

First, the surplus = total invested asset – reserve inforce = 200,000,000

Quote #	Net reserve at reinsurance effective date
Quote 1	Invested assets = surplus + reserve from (iii) + allowance = 200,000,000 + 2,200,000,000 + 1,760,000,000 * 9% = 2,558,400,000
Quote 2	Invested assets = surplus + reserve from (iii) + allowance = 200,000,000 + 550,000,000 + 1,650,000,000 * 10% = 915,000,000
Quote 3	invested assets = original total invested assets = 2,400,000,000

## 2. Continued

- (c) XYZ is considering reinsurance to improve capital efficiency on their long term care block. XYZ is evaluating the use of the following reinsurance structure which combines modified coinsurance and coinsurance:

	<b>Modified Coinsurance Component</b>	<b>Coinsurance Component</b>
<b>Initial Quota Share</b>	90%	10%
<b>Initial Allowance</b>	10%	10%

Critique the following characteristics of the proposed reinsurance structure with respect to the NAIC's model regulations on acceptable risk transfer:

- (i) *Based on recent asset performance, XYZ will use a constant modified coinsurance interest rate of 5%.*
- (ii) *XYZ will use assumption reinsurance to maximize the value of the transaction but seeks the option to recapture the business in 5 to 10 years if experience improves.*
- (iii) *XYZ is looking to receive an experience refund at the end of every month, settled on a cash basis.*
- (iv) *XYZ will adjust the quota shares of modified coinsurance and coinsurance to minimize the size of periodic cash settlements.*

### **Commentary on Question:**

*To receive full credit, candidates needed to not only say if they agreed or disagreed with the statement, but needed to explain why the statement was correct or incorrect. For statements that could violate model regulations, alternative options were required for full credit. Credit was also given for other reasonable responses.*

- (i) The constant modified coinsurance interest rate is inappropriate. XYZ should use a rate that references actual asset performance, otherwise risk transfer will not be met.
- (ii) Assumption reinsurance transfers policy obligations directly to the assuming insurer, and therefore would not permit recapture. Indemnity reinsurance should be used if recapture is a requirement.
- (iii) There is nothing wrong with the structure in settlement frequency as it is more frequent than quarterly. The experience refund is also acceptable since it appears that the risk to the reinsurer is not eliminated (e.g., by requiring the ceding company to subsidize losses)

## 2. Continued

(iv) This structure is also known as partially modified coinsurance. An increase in quota share when reserves increase may not be appropriate as some states may not allow it, thereby losing any reserve/surplus credit. It would be preferable to choose a reinsurance method with clearer risk transfer that requires the reinsurer to pay for its share of cash losses, such as traditional modified coinsurance.

### 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.
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:

- (1h) Describe what is meant by Life Settlements and assess their impact on insurance product pricing/management.
- (1j) Describe and apply the requirements of applicable ASOPs on Life and Annuity Product Pricing and Assumptions
- (2c) Describe and evaluate fundamental strategies for enhancing value through active in-force and operational management.

#### Sources:

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

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

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

#### Commentary on Question:

*Commentary listed underneath question component.*

#### Solution:

- (a) Critique each of the following statements with respect to ASOP 24: Compliance with the NAIC Life Illustrations Model Regulation.
  - A. *The illustration actuary can assume expense improvement into the future if the improvement is proved to be significant and ongoing.*
  - B. *Any experience factor needs to be based on actual experience, either the company's own experience or a combination of industry experience and the company experience, and changes to the company's business practice may not be considered.*

### 3. Continued

- C. *The requirement for the self-support test is that, at every illustrated point in time starting at a policy anniversary specified by the NAIC Life Illustrations Model Regulation, the accumulated value of all policy cash flows, when using experience assumptions underlying the currently payable scale, should be equal to or greater than the illustrated policyholder value.*
- D. *Policy forms that can never develop nonforfeiture values are exempt from both the self-support test and the lapse-support test.*

**Commentary on Question:**

*This question required that candidates understand all aspects of the statement and how it related to ASOP 24. In many of the statements, some of the information was correct, but each of the four statements had a component that was not correct. To receive full credit, candidates needed to identify the component of the statement which was not correct, and provide a correction to the statement.*

*Candidates generally received full credit for statements A. and B. On statement C., many candidates focused on defining the requirements of the self-support test, but were not able to identify the incorrect wording of using assumptions underlying the disciplined current scale, rather than the currently payable scale. On statement D., many candidates failed to acknowledge that the policy forms are exempt from the lapse-support test but still need to pass the self-support requirement.*

- A. This statement is false. It is not acceptable to assume future experience improvements beyond the effective date of the disciplined current scale underlying the illustration.
- B. This statement is false. Significant changes to the company's business practice may be reflected in the experience factors underlying the disciplined current scale. The change in business practice should have already been made, not planned in the future.
- C. This statement is false. The experience assumptions must be underlying the disciplined current scale, not the currently payable scale.
- D. This statement is false. These policy forms are exempt from the lapse-support test but still need to pass the self-support requirement.

### 3. Continued

- (b) Describe three specific actions PQR could take to improve profitability of the inforce UL block.

**Commentary on Question:**

*This question tested candidates' understanding of the inforce management of UL product. To receive full credit, candidates had to demonstrate knowledge of specific actions to improve profitability on an inforce UL block. Candidates who provided at least three specific actions, of which there were more than three possibilities, with justification received full credit. Candidates who provided specific actions without extensive justification received partial credit.*

*Candidates generally performed well on this question, as they were able to identify and justify three specific actions. However, some candidates did not receive credit because their responses focused on actions that could be taken to improve the profitability of new business, not of the inforce block.*

- PQR could improve persistency, as low persistency from healthy policyholders can lead to a higher mortality rate from the remaining unhealthy policyholders. By increasing customer engagement, offering premium holidays or discounts when necessary, PQR will be able to improve persistency.
  - PQR could increase its operational efficiency, as expenses often represent a significant cost for a life insurance company. By overhauling its IT core systems, improving process automation, or by outsourcing business to lower-cost providers, operational efficiency can be improved, which will reduce expenses and thus increase profitability.
  - PQR could improve its capital position, which can be done by reinsuring the block of business. They could consider reinsuring mortality and lapse risk through these reinsurance agreements, as reinsuring a block of business can optimize the capital allocation, and thus improve returns.
- (c) PQR found that some inforce policies have been sold to life settlement companies. Describe two reasons such sales could negatively impact PQR's profitability.

**Commentary on Question:**

*The question tested the candidates' knowledge of life insurance pricing to product settlements and how they impact a life insurance company's profitability. This question was generally well done, as many candidates were able to identify and explain the reasons that life settlements negatively affect the PQR's profitability.*

*Some candidates did not receive the full credit because they provided a downstream impact of the inforce policies being sold but did not adequately explain how profitability would be impacted.*

### **3. Continued**

- These policies will exhibit higher than assumed persistency, which will be particularly noticeable at older attained ages. With the increase in persistency, there will be higher than assumed mortality at these older ages, which will lead to more claims being paid out than originally anticipated, hurting profitability.
- The life settlement companies will often decide to pay the minimum amount of premiums needed to keep the policies in force, since the focus is now on the death benefit rather than the accumulation value. There will be less inflow of premiums, which makes it more challenging to cover expenses and death benefits, and will reduce profitability.



#### 4. 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.

#### Learning Outcomes:

- (3e) Describe how experience studies are designed and used for evaluating past experience, and for setting assumptions.

#### Sources:

Experience Study Calculations, Oct 2016, sections 2-4, 11, 12 15, 17 & 18 (excluding 18.2, 18.8 & 18.9)

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

#### Commentary on Question:

*This question tested the candidates' knowledge of how experience studies are used for evaluating past experience and for setting assumptions. It also tests the candidates' knowledge about how an accelerated underwriting (AUW) program helps to achieve mortality at a level closer to a fully underwritten process compared to nonmedical underwriting. Most candidates did well on part a). Candidates did not perform as well on part b).*

#### Solution:

- (a) DEF Life sells income payout annuities and term life insurance. DEF Life would like to leverage the mortality experience from their immediate annuity business to price structured settlements.

Evaluate this approach.

#### Commentary on Question:

*For part a), candidates were expected to comment on the source of business differences between immediate annuities and structured settlements – age and significant impairment of structured settlement lives would be required for full credit.*

*Most candidates did well on this part. This included stating the approach was not appropriate and providing justification including younger age of structured settlement demographics or injury/impairment creating higher mortality risk relative to demographics purchasing an immediate annuity. The candidates were expected to mention specifically higher mortality from structured settlements instead of simply different mortality compared to immediate annuities.*

## 4. Continued

Immediate annuities often attract buyers who are healthier than average and at risk of outliving their savings:

As with life insurance products, larger amounts are often associated with lower mortality. In the case of immediate annuities, the best amount to study is the monthly income amount.

Immediate annuity studies are needed to help quantify historical mortality improvement. This can be difficult because so many variables need to stay constant to develop accurate comparisons. For example, how immediate annuities are sold or bought and what competing options are available can vary over time and consequently affect the expected mortality of new buyers.

Structured settlements often arise from injury lawsuits. Their terms are sometimes decreed by a court of law but are more often the result of negotiated settlements.

Typically, the structure of the payments is not a single monthly amount payable for life. Instead, there may be one or more lump sums and some payments that increase over time, with a goal of providing for the injured person or, in some cases, the surviving dependents of the plaintiff.

Mortality levels for structured settlements would normally be higher than those for immediate annuities. The most severely injured payees would be expected to live shorter lives and may thus qualify for substandard underwriting, which would provide greater annuity benefits

When studying mortality by the amount of a structured settlement, reserves are not a perfect choice for the amount but are often a better choice than a monthly income amount that varies. The premium paid to purchase the structured settlement might be a better choice of amount, but most companies don't store the premium in their administration system.

- (b) Explain how each of the following components of an accelerated underwriting (AUW) program helps to achieve mortality at a level closer to a fully underwritten process versus nonmedical underwriting:
- Smoker propensity model
  - Risk score model
  - Prescription (Rx) data
  - Medical records
  - Triage rules

## 4. Continued

### **Commentary on Question:**

*For part b), candidates were expected to explain how each component helps to achieve mortality at a level closer to a fully underwritten process.*

*Candidates had mixed performance on this question, but most had a fundamental understanding of these AUW components. Points were most frequently missed by not adequately explaining how these AUW components can help get mortality closer to that of fully underwritten business. This includes not only stating that smoker propensity model identifies smoking status, but also an accurate model should lower the cost of misclassifying smokers as non-smokers as smoking status is highly correlated with mortality. In terms of triaging rules, to receive full credits, candidates were expected to expand on the desire to reduce mortality slippage to get AUW mortality closer to FUW.*

Smoker propensity models – these lower the cost of misclassifying smokers, whose mortality is frequently 3 times as high as nonsmokers. Without such a model, non-medical underwriting is prone to greater misclassification with the loss of ability to detect cotinine in urine or blood.

Risk score model – risk scores are frequently used to classify risk in much the same way an underwriter would. A better risk scoring model will result in more distinct relative A/E ratios, while a poor model will fail to adequately distinguish relative risk.

Prescription / Rx data – Rx data is frequently an input into a risk scoring model that helps identify potential impairments requiring drugs to treat that could explain or predict higher mortality associated with that impairment.

Medical records / Dx data – Dx data, similarly to Rx data, may be used by a rules engine or as an input into a risk scoring model to predict relative mortality in relation to health insurance claims and other data embedded in medical records.

Triage rules – these rules help determine the optimal amount of screening for a given applicant. It can fast track good risks, but arguably more importantly, has criteria determining which applicants must be referred to an underwriter for a more traditional underwriting experience. For applicants whose predicted mortality is more uncertain or more likely to be higher than can be tolerated, this helps reduce mortality slippage in an AUW program.

## 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.

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

### Sources:

Pension Risk Transfer in Canada and the U.S., SOA Research Institute, Simmons, 2022

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

Long-Term Care Insurance: The SOA Pricing Project, 2016

Understanding the Volatility Experience and Pricing Assumptions in Long-Term Care Insurance, 2014, pp. 4-46

### Commentary on Question:

*Candidates were generally able to list much of the appropriate content and showed knowledge of the concepts making the question reasonably well done overall. Few were able to demonstrate a complete depth of understanding which was needed to get full marks.*

### Solution:

- (a) List four reasons that the group annuity proposal could be advantageous to DNS.

### Commentary on Question:

*Many were able to list 2 or 3 solid reasons. Often candidates repeated the same item twice but in different words or gave a reason quite similar to one they had already given which was not sufficient for full marks.*

## 5. Continued

- It would transfer investment and longevity risk from DNS to ONA which are significant components in the cost of a benefit plan. ONA has more experience managing these type of risks.
- If a buy-out transaction was used this would also transfer a lot of administrative and operational work to ONA allowing DNS to focus on their specialty of legal work.
- Life insurers are well-regulated and the plan members generally have increased confidence in their benefit payments being made when pensions are transferred to insurers. So a plus for the DNS plan members.
- Insurers have access to their interest and industry experience data which may allow ONA to offer a more competitive quote.

(b) Critique each of the following statements from the proposal to DNS:

- (i) *ONA Life plans to use individual annuity experience to price the group annuity.*
- (ii) *The best way to mitigate longevity risk is to fully reinsure the business.*
- (iii) *Since this is an established block of business for ONA Life, a deterministic model with a single set of assumptions would be sufficient.*

### **Commentary on Question:**

*Candidates typically showed understanding of the concepts and could respond to the statements. A proper critique or opinion was required for full markets. Listing some relevant content but leaving the response too open ended only earned partial credit. For part (iii) some candidates simply stated stochastic models as the better approach but without giving some context or justification.*

- (i) This is not an appropriate plan. Individual and Group annuity experience are often different due to the nature of who uses each product. Individual annuities are selected by individual customers where group contracts are generally based on the customers type of employment. This can cause differences in data. ONA would be better to look at internal group data and supplement it with relevant industry data for group products.
- (ii) This is not the case. For a well established life insurer typically the best way is to naturally hedge longevity risk with products containing mortality risk like permanent life insurance or term insurance. It does not appear ONA has mortality risk products based on their specialties listed, but this is the first suggestion. Reinsurance can still be a tool but not the best way to mitigate longevity risk.

## 5. Continued

- (iii) A deterministic model with a single set of assumptions is not sufficient. Experience can vary and it is unlikely that one model will have every assumption precisely accurate. Sensitivity testing a variety of assumptions in a deterministic model can work to assess the range and magnitude of possible risks. Depending on the size of risk and length of contract a stochastic model for interest rates or mortality may also be appropriate. But either way a deterministic model with one set of assumptions will not suffice to assess the potential risks.
- (c) DNS is interested in providing long term care insurance for their employees, but is concerned about recent premium increases.
  - (i) Describe four challenges that the long term care insurance industry has faced that has led to premium rate increases.
  - (ii) Propose a strategy to address one of the challenges.

### **Commentary on Question:**

*Many candidates could list 3 or 4 key challenges but often missed some points in not truly describing them and why they caused premium rate increases. Part (ii) was not well done. Many candidates listed a solution but did not connect it to what challenge it was trying to address or give sufficient detail to support why their proposed strategy would be beneficial.*

- (i)
  1. Lapse rates were much lower than expected. Because there was no benefit from surrendering policyholders developed a ‘use it or lose it’ mentality and held onto the policies longer than expected or even incentivized them to go on claim resulting in higher likelihood of claims payout.
  2. Mortality improvement was higher than expected and mortality lower than expected. People living longer led to longer time when on claim, and less terminations due to death, and thus higher amount of benefits being paid
  3. Interest rates turned out to be much lower than originally forecasted when the products were initially priced. The investment return was a large component of the product as the product is a longer duration product. The expectation was investment returns would support the pricing but low interest rates led to low investment returns.
  4. Inflation and long-term care costs were higher than expected. The cost of LTC increased substantially between when the products were initially priced and when the majority of people started making claims. There was no mitigation for inflation in the premiums.

## **5. Continued**

(ii)

To address that lapse rates were much lower than expected and that policyholders developed a ‘use it or lose it mentality’ the company could add a return of premium or non-forfeiture benefit. The price of the benefit would need to be included in the overall price meaning customers would still have higher premiums, but a return of premium or other non-forfeiture benefit can encourage the policyholder to consider lapsing the policy if they haven’t made a claim by a certain time period and thus reduce the risk of policies staying on longer than expected. Encouraging some lapsation shortens the overall duration of the product.

## 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.

### Learning Outcomes:

- (1l) Describe and apply methods for pricing term conversions.
- (1m) Describe and evaluate the types of assumptions commonly used in actuarial pricing and product development.
- (1n) Describe and evaluate the role of Behavioral Economics in understanding and modeling policyholder behavior in the life and annuity context.

### Sources:

Term Conversions: Pricing and Reserving, Product Matters, Mar 2017

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

Predictive Models on Conversion Studies for the Level Term Premium Plans, Society of Actuaries, March 2022

### Commentary on Question:

*This question tested candidates' knowledge on various aspects of term conversions. Candidates were also required to understand the impact on mortality assumptions for converted policies. Overall, candidates performed better on the first part of the question compared to the second part.*

### Solution:

- (a) Critique the following statements on term conversions:
  - A. *The converted policy is perfectly priced if, at conversion, the slope of the expected mortality is less than the gross premium for a permanent policy.*
  - B. *For a convertible term policy, the costs associated with the conversion are unrelated to the issue age.*
  - C. *When conversion privileges are shortened, the premium for the convertible term product is expected to increase.*
  - D. *There is no need to charge for a conversion option as part of the term premium, because the premium for the permanent products will already reflect the additional mortality experience due to conversions.*



## 6. Continued

### **Commentary on Question:**

*Candidates generally did well on this part. For Statement A, full marks were given for stating either 'True' or 'False' given reasonable justification. A common error for Statement D, was describing the different ways the conversion cost charge could be distributed. Some candidates did not indicate if they agreed or disagreed with the statement so full credit wasn't given when this happened.*

Statement A – This statement is partially true.

Although this situation is ideal in theory, based on the nature of mortality selection on converted policies, the rate scales would likely need to be separate from other permanent products and create administrative complexity that may be difficult to manage.

Statement B – This statement is false.

Generally speaking, the older the issue age, the higher the excess mortality. Therefore, policies issued to older people who convert at a later stage of the level term period tend to have higher claims costs.

Statement C – This statement is false.

When conversion privileges are shortened, it would be reasonable to expect policyholders to accelerate their conversion decisions while they still have the option. The earlier the conversion, the younger the policyholder, the lower the claim costs, the lower the premium.

Statement D – This statement is false.

It is more appropriate to separate converted policies' mortality experience from the permanent products due to the following reasons:

- Converted permanent products generally have higher mortality experience than permanent policies bought outright.
- Experience could vary significantly by the motivation of the policyholders who exercise the conversion option. For example, for a 10-year term life product, the first 9 years of experience would likely see very low conversion rates and impact on the permanent policies' experience will be minimal while year 10 could see a jump in conversion rates and cause the mortality of permanent products suddenly spike, if blending the two for experience study.

(b)

(iv) Describe two approaches for developing the mortality assumption for converted policies.

(ii) List an advantage and a disadvantage of each of the above approaches.

## 6. Continued

### **Commentary on Question:**

*Many candidates did not do well on this part of the question as they were unable to identify the approaches for developing mortality assumptions for converted policies. Some candidates described options as to where to add the additional premium for the conversion option rather than describe methods to develop the mortality assumption for converted policies. Many candidates also erroneously referenced Dukes-McDonald or Becker-Kitsos. Although there are three distinct approaches, full marks were given to candidates for identifying and explaining any two approaches.*

**First Approach** - Estimate the mortality rate on converted policies by making an assumption of the degree of anti-selection using the principle of “conservation of deaths”.

Advantage – It more accurately reflected the characteristics and risks associated with the converted policies.

Disadvantage – An assumption about the degree of anti-selection is required. Anti-selection refers to those insured whose health has deteriorated are more likely to convert in order to maintain their insurance coverage since they cannot qualify for newly underwritten term insurance and the current term insurance may expire or have rapidly rising premiums.

**Second Approach** – Blend the experience of the permanent product and the converted policies and conduct a combined experience study for the two.

Advantage – More data will increase credibility; lead to assumption more tailored for the company’s experience.

Disadvantage – Since converted permanent products generally have higher mortality experience than permanent policies bought outright, blending the experience of the two might make overall mortality for a given product appear artificially high. The premium for permanent products would reflect the excess death experience due to conversions.

**Third Approach** – Conduct a separate mortality study for converted policies, if there is adequate data.

Advantage – More accurately reflected the characteristics and risks associated with the converted policies.

Disadvantage – If there is inadequate data, will need to determine the credibility.

## 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.
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.
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:

- (1d) Describe considerations and practices related to "Lapse-Supported" insurance.
- (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.
- (4a) Evaluate and analyze traditional and advanced reinsurance transactions, and prepare related financial statement entries.

### Sources:

LPM-155-19: Understanding Profitability in Life Insurance;  
LPM-153-19: Life in-force Management: Improving Consumer Value and Long-Term Profitability;  
LPM-152-19: Lapse Supported Insurance Analysis; LPM-107-07: Experience Assumptions for Individual Life Insurance and Annuities; Life, Health & Annuity Reinsurance, Tiller, John E. and Tiller, Denise, 4th Edition, 2015 - Ch. 4: Basic Methods of Reinsurance

### Commentary on Question:

*The candidates did an average job answering this question. In section (a) and (c), most answers relied on overall actuarial knowledge, which was duly rewarded. However, considering the intent of these exams, the better answers drew upon the readings from the syllabus. Section (b) was a bit surprising due to the difficulty a fair number of candidates had in identifying the MCEV formula, a key concept.*

### Solution:

- (a) Evaluate the advantages and disadvantages of an Embedded Value (EV) approach to measuring profitability versus accounting-based metrics.

## 7. Continued

### Commentary on Question:

*Partial credit was given if the answer was actuarially sound but did not appear in the solution. Optimal answers discussed both advantages and disadvantages. At times the key aspects of MCEV vs accounting based metrics were switched.*

#### Advantages:

- MCEV recognizes the relative riskiness of different business lines better than accounting based metrics.
- MCEV better addresses the long-term nature of the life insurance business.
- MCEV values assets and liabilities on a market-consistent basis to capture their value at the time of valuation.
- MCEV provides a common methodology for comparison that is missing due to the differences in rules and practices between statutory, local GAAP, and IFRS accounting.

#### Disadvantages:

- Accounting based metrics provide more transparent profit indicators.
- Accounting-based metrics are straightforward and easy to access.
- MCEV has lost some steam after the financial crisis as investors concentrate less on long term cash flows and become more concerned with current cash generating power.

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

### Commentary on Question:

*Straightforward calculation question that required the candidate to properly use Market Consistent Economic Value (MCEV) and Value In Force (VIF) equations. Partial credit given if the correct equation was listed and the numerical answer was not correct. A common error was that candidates confused required capital and frictional costs of required capital in the equations.*

	VIF=Present Value of Future Profits-Time value of financial options and guarantees-Cost of residual non-hedgeable financial and insurance risks-Frictional costs of required capital	MCEV=VIF + Required Capital + Free surplus
Whole Life	=3000-100-250-50-40=2560	=2560+900+200=3660
Term Life	=1500-2000-200-500-20=-1220	=-1220+500+500=-220
Universal Life	=2000-120-150-50-30=1650	=1650+700+300=2650

## 7. Continued

- (c) Critique each of the following proposals to improve profitability of the inforce products:
- (i) Increase persistency on the universal life block by sending annual reminders about all the benefits of holding a policy
  - (ii) Up-sell term life policyholders by providing annual reminders that they may convert to a permanent policy which will have higher premiums
  - (iii) Recapture whole life policies following a series of YRT reinsurance rate increases which have made the reinsurance more expensive than the benefit provided.

### **Commentary on Question:**

*Partial credit was once again given for actuarial sound analysis with the better answers using insight directly from the syllabus.*

- (i) While improving customer service may improve customer persistency, it is important to realize that if this is a lapse supported product, it would harm profitability. Answers that mentioned the generally superior profitability of a Universal/Whole Life product compared to Term Life products, also received some credit.
- (ii) Anti-selection should be a key concern when upselling policyholders to a permanent policy due to high risk policyholders oversubscribing to this conversion. Additional underwriting or data analytics may diminish this risk. Reputational risk may also be an issue if a policyholder denied the option to convert was to find out about the missed opportunity.
- (iii) Before recapturing a reinsurance block of business, it is important to understand the implications of any recapture fees. It is also important that the ceding company understands the causes of the higher mortality found in the reinsurance agreement. The reinsurer may have additional insight into the block of business the ceding company does not have.