ILA LP Model Solutions
Fall 2014

1. Learning Objectives:

3. The candidate will understand the relationship between the product features, their inherent risks, and the selection of appropriate pricing assumptions, profit measures and modeling approaches.

Learning Outcomes:

(3c) Analyze results and recommend appropriate action from an array of risk and profit measures such as: Statutory, GAAP, Return on Equity, Market Consistent Pricing, Embedded Value

Sources:

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

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

SOA - Society of Actuaries - Report On Pricing Using Market Consistent Embedded Value (MCEV), incl. Appendix I only

Commentary on Question:

Commentary listed underneath question component.

Solution:

(a) Describe the limitations of using Statutory IRR as the main profit measure for this product.

Commentary on part (a):

In order to obtain full credit, the candidate was expected to describe the limitations or shortcomings of the IRR as a profit measure with additional description provided of how the UL product's features included in the stem of the question would impact the IRR. ***Note: As very few candidates made any reference to the UL product features provided, the rubric was altered to accept a solution where no reference was made to the product.***

The limitations of the IRR are as follows:

- Does not convey absolute dollar amounts
- Does not convey the emergence of profits
- Sensitive to low initial surplus usage
- Not linear – changes in profit can't be related to changes in IRR

1. Continued

(b) The CRO recently has become interested in the Market Consistent Pricing approach and has asked you to develop profitability results using this method.

(i) Explain how the profitability would change under the Market Consistent Pricing approach.

(ii) Recommend product design changes that would increase profitability under Market Consistent Pricing. Justify your answer.

Commentary on part (b):
As per part (a), many candidates did not link their explanation for (i) or (ii) back to the UL product. Furthermore, in order to obtain credit for (i) a candidate was required to relate how the product features of this UL product would impact the profitability (i.e. up, down or unchanged) under the Market Consistent Approach. For part (b) (ii), only a few candidates included recommendations for other UL features - beyond those which were provided - that could have been incorporated.

(i) Two solutions for **part (b) (i)** were accepted.

Solution A:

Under Market Consistent Pricing, profitability would be lower for the following reasons:

- MCVNB captures time value of options and guarantees
- Captures non-hedgeable risks and functional costs - investment expense and taxes
- Uses risk neutral scenarios
- Any other reasonable answer

Solution B:

Under Market Consistent Pricing, profitability given this UL products' features would be impacted as follows:

- Minimum Interest Guarantee is **"in-the-money", which increases the risk** of the product. This would decrease profitability under market consistent pricing.
- **Not having a surrender charge increases the risk** of the product (due to anti-selection), which decreases the profitability under market consistent pricing.

1. Continued

- **Having a front-end expense decreases the risk** of the product (expenses are paid up front, rather than over a period of years). This increases the profitability under market consistent pricing.
- **The optional child rider does not change the risk profile** of the product, and therefore does not impact the profitability under market consistent pricing.

(ii) Recommended UL product design changes include:

- Either removing or lowering the minimum interest rate guarantee
  - Reduces the probability of paying our guarantees and the associated amount of those guarantees
  - Decreases the interest rate risk
- Introduce a surrender charge
  - Reduces anti-selection risk
  - Gives policyholders incentive to keep the product in-force
  - Helps to offset the acquisition expenses in the early years if the policy lapses
- Introduce a non-guaranteed persistency bonus
- Increase the contractually guaranteed maximum Cost of Insurance (COI)
- Reduce front-expense charge and introduce or add a maintenance or on-going expense charge
- Use attained age mortality charges instead of select and ultimate
  - Decreases mortality risk

2. Learning Objectives:

1. The candidate will understand feasibility step of new product and how it drives design.

Learning Outcomes:

(1b) Describe tax regulation and perform calculations to evaluate compliance.

(1e) Recommend ways to close the gaps between design and the internal/external constraints.

(1f) Describe non-forfeiture regulation and perform calculations to evaluate compliance.

Sources:

2008 Supplement to Life Insurance and Modified Endowments Under IRC §7702 and §7702A, Pages 3-33, 40-56, 71-81, Appendices A-C

LP-122-13: NAIC Standard Non-forfeiture Law for Life Insurances: Sections 1-4 Computation of CSVs and Paid-up NF Benefits

Life Insurance and Modified Endowments Under IRC §7702 and §7702A, Chapter 3 Computing Limitations (Interest, Mortality and Expense Assumptions)

Commentary on Question:

Commentary listed underneath question component.

Solution:

(a) Evaluate assumptions for calculating IRC Section 7702 limits and predict the impact on the GLP.

Commentary on Question:

The question was testing the candidate's knowledge of IRC Section 7702 and how to apply those limits when dealing with secondary guarantees. The question also was testing the candidate's ability to predict what would happened to the GLP when changing the insurance product.

Many candidates just evaluated the assumptions of the UL product and did not regard the switch to the FPUL and the secondary guarantee. As a result, few candidates addressed the concept of a switch in assumptions in year 16 due to the secondary guarantee.

According to footnote 53, the 7702 limits must be calculated in each year using the guaranteed elements that produce a higher cash value in that year when dealing with secondary guarantees.

2. Continued

Therefore, the base guaranteed elements should be used for testing in years 1-15, and the tabular elements should be used starting at the cross-over point in year 16. This means the base guaranteed interest of 4% is used in the first 15 years and the tabular interest rate of 4.5% is used in year 16 and later.

The mortality assumption of 2001 CSO is compliant for all years.

The base guaranteed expense charge of $60 is used for years 1-15, in years 16 – 40, the tabular CV expense charge should be the Fixed Level Premium of $2,500 minus the SNFL adjusted net premium of $2,190.50 = $309.50.

Since the assumptions are established to replicate the fixed level premium, I predict the GLP will equal $2,500 in consideration of the secondary guarantee.

(b) Assume the statutory valuation interest rate is changing from 3.5% to 3.0%.

(i) Describe the NAIC nonforfeiture implications.

(ii) Describe the IRC Section 7702 implications assuming the FPUL contract follows CVAT.

Commentary on Question:
The question was asking candidates to assess the implication to nonforfeiture law when the statutory interest rate drops. Candidates needed to know how to apply the regulation to valuation interest rates and then predict what will happen to nonforfeiture values.

In part (ii), candidates were asked to describe how this new product will be affected by IRC Section 7702 under CVAT and the new statutory interest rate.

Largely, candidates were able to apply the Nonforfeiture rule of calculating stat. interest rates in part (i) and could predict what would happen to NF values.

However, most candidates did not think this change would impact CVAT and hence answered "no impact". Very few candidates got credit in section (ii).

(i) The nonforfeiture value must be equal to the adjusted premiums accumulated at 125% of the statutory valuation interest rate, rounded to the nearest quarter percent. Therefore, the accumulation rate is decreasing from 4.5% to 3.75%. This lower interest contributes to higher net level premiums and higher AV's and SNFL's. To remain compliant, the tabular guaranteed rate should be lowered to 3.75%.

2. Continued

A CVAT contract of 3.75% would not be compliant. Here is why:

Section 101(f) provides that interest rates used in computing the NSP under the CVAT test are the greater of an annual effective rate of 4% or the guaranteed rates at issue.

Section 101(f) requires a minimum of 6% for GSP and 4% for GLP. These rates do not limit the actual contract guarantees directly, but could have an indirect limitation. This is true for traditional contracts that qualify under CVAT (and such as the tabular CV)

The NSP is calculated at 4% under Section 101(f), and the CVAT must be met under the terms of the contract. Since now the tabular CV rate is 3.75%, this lower interest rate for the CVAT test would not remain in compliance.

As a result, the death benefit should be increased to stay in compliance.

(ii) Since the state SNFL requirement has dropped below the federal tax requirement, 3.75% versus 4%, this difference could create a compliance issue with CVAT, causing it to fail.

- I would recommend increasing the death benefit
- Another option would be to switch from CVAT to the premium/cash value corridor test

3. Learning Objectives:

1. The candidate will understand feasibility step of new product and how it drives design.

3. The candidate will understand the relationship between the product features, their inherent risks, and the selection of appropriate pricing assumptions, profit measures and modeling approaches.

Learning Outcomes:

(1a) Explain considerations for prudent and practical decision making.

(3c) Analyze results and recommend appropriate action from an array of risk and profit measures such as: Statutory, GAAP, Return on Equity, Market Consistent Pricing, Embedded Value

(3e) Describe when a stochastic model should be used, its advantages and disadvantages, how to build it and how to analyze its results

Sources:

Atkinson & Dallas, Life Ins. Products and Finance Chapter 2 Product Development

LP-120-11: Session PD-5: Pricing Best Practices

Atkinson & Dallas, Life Insurance Products and Finance, Chapter 11 Profit Measurement and Analysis

Commentary on Question:

The question tested the candidate's ability to retrieve, comprehend and utilize information from pricing best practices and metrics. Candidates generally did well on the retrieval and comprehension questions but did poorly on the knowledge utilization section.

Solution:

(a) Critique this pricing work and recommend any changes.

Commentary on Question:

Overall, candidates did poorly on this section. The majority of candidates critiqued the product design (or marketing strategy) instead of the pricing work. Several candidates failed to recommend changes. However, the majority of candidates did well in recognizing the issue within the persistency and mortality assumptions.

Majority of candidates recommended a change to commission levels, however several recommend an increase in commission rates thus failing to recognize the difficulty in recovering this expense over a shorter period.

3. Continued

Most candidates failed to analyze the cash flow illustration thus failing to identify pricing methodology mistakes.

Assumptions:

- It is not adequate to use the same persistency and mortality assumptions from current experience. Current target market is high-income market which would experience higher persistency and lower mortality. Recommend decreasing persistency (increase lapse) and increasing mortality rate.
- From the annual premium pattern, we identify that a flat lapse rate of roughly 3% is used for the entire projection. A lapse rate of 3% might be too low for a heavy first year commission (with respect to later years). Recommend increasing first year lapse rate, followed by lower lapse rate in later years.
- Commissions should not be at the same level as a Term 10 or Term 20 as a Term 5 product may not be able to recoup the expenses over 5 years. Recommend lowering the commission rate.

Pricing Methodology:

- Not accurately reflecting the effect of accounting guidelines which would impact the timing of profits. Recommendation: tax reserves and required capital should be included.
- Not accurately reflecting timing of cash flows. E.g. death benefit is assumed to be paid at end of year. Recommend distributed evenly as this will change the investment income in the model
- Once profits have been earned, they should be distributed and removed from the model. Recommend that interest on past profits not included as part of current profits.
- Pricing is done using terminal reserves which ignores conservatism. Recommend using mean reserves
- Recommend incorporating the change in target surplus as part of distributable earnings

(b) Demonstrate that the Generalized ROI equals 12.6% using net income. Show all work.

Commentary on Question:
Many candidates used the ROI formula instead of the Generalized ROI method. Some candidates recognized the shortfall of the ROI method (i.e. more than 1 answer) when future profits are negative in later years but did not show adequate understanding of the generalized ROI method.

Partial credit was given to candidates who wrote down the generalized ROI formula even if they did not recognize that the borrowing rate (net earned rate) was given.

3. Continued

Generalized ROI formula:
For t = 5, 4, 3, 2, 1:
If PVFP (t) >0, then
PVFP(t-1) = PVFP(t)/(1 + generalized ROI) + Adjusted Net Income (t-1)
else,
PVFP(t-1) = PVFP(t)/(1 + net earned rate) + Adjusted Net Income (t-1)

Proof that Generalized ROI = 12.6%
Net earned Rate = 2%

PVFP (end of year 4) = (-555)/1.02 + 2281 = 1737
PVFP (end of year 3) = 1737/1.126 + 1133 = 2676
PVFP (end of year 2) = 2676/1.126 + 595 = 2971
PVFP (end of year 1) = 2971/1.126 -2639 = 0

(c) Identify common mistakes made in entering new markets and pricing products.

Commentary on Question:
Majority of candidates did well on this part.

- Companies base their prices on their costs, not the customer's perception of values
- Companies attempt to achieve same profit margin across different product lines
- Companies fail to segment their customers in terms of age, sex and smoking status
- Companies hold prices at the same level for too long ignoring changes in cost, competitive environment and customer's preferences
- Companies incent agents based on units sold or revenue generated rather than profits
- Change prices without forecasting competitor's reactions
- Insufficient resources managing their pricing resources
- Fail to establish internal procedures to optimize prices
- Spend most of the time serving least profitable customers
- Developing assumptions based on educated guesses rather than experience
- Not accounting for rational buyer or seller behavior
- Offering product with first year commission plus first year cash value greater than premium
- High subsidization across pricing cells
- Not clearly understanding the cost of options of product features.
- Assuming tax advantages for Policyholders are never taken away

4. Learning Objectives:

1. The candidate will understand feasibility step of new product and how it drives design.

2. The candidate will understand the design and purpose of various product types, benefits and features.

Learning Outcomes:

(1b) Describe tax regulation and perform calculations to evaluate compliance.

(2a) Describe in detail product types, benefits and features.

Sources:

Marino and Grobe, Canadian Taxation of Life Insurance, 5th Edition, Chapter 1 The History of Life Insurance Policy Taxation

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

Commentary on Question:

Commentary listed underneath question

Solution:

(a) Determine whether this policy is tax-exempt throughout the first three policy years. Show all work.

Commentary on Question:

Most candidates knew the calculation part. When the test is not passed in all three years, candidates need to clearly state the policy is not tax-exempt. Also, surrender charges should not be used for the tax-exempt test.

Policy Year	Portfolio Return	Policy Expense Charges	CIA 1969 – 1975 Select Mortality Rates	ETP AF	AF
1	7.5%	600	0.700	2,875	2,556
2	4.5%	125	0.800	5,750	5,621
3	3.5%	125	0.900	8,625	8,751
Assumptions:					
Face Amount	250,000				
Premium	5,000				
COI	2,000				
Minimum credited rate:	3%				

Must determine if Policy's AF < ETP AF for each policy year

AF(t) = (Premium(t) – COI(t) – Expense(t) + AF(t-1)) * (1+Credited Rate(t))

4. Continued

credited rate = max(portfolio return, minimum guaranteed credited rate)
Conclusion: The policy does NOT stay tax-exempt for all years
In order to pass the test, the policy must pass each year.

(b) Evaluate the policyholder taxation impact of each of the following proposed changes to the exempt test:

(i) Based on an 8-pay endowment at age 90

(ii) Use 3.5% interest rate and CIA 86-92 mortality table

(iii) Use the UL cash surrender value as the tax accumulating fund

Commentary on Question:
Candidate is expected to note the difference in the proposed tax rules compared to current.
Part (i) – Candidates often can point out the current is based on 20-pay endowment at age 85, but fail to understand the two changes (20-pay to 8-pay and age 85 to age 90) have opposite impact to the test.
Part (ii) – Most candidates do not point out the current interest rate and mortality charges are based on the assumption used by insurer in designing the actual policy.
Part (iii) – Most candidates understand using the surrender value as the tax accumulating fund will decrease the value use in test but fail to note this approach is not permitted in current standard.

(i) Current ETP is based on endowment at age 85 with a 20 year premium payment period. Increasing this to age 90 should decrease the overall deposits permitted in the policy; decreases the exempt test policy accumulating fund value. Shortening the pay period of the benchmark policy to 8 years from 20 years, will increase the savings component on the benchmark policy, hence increasing the maximum deposit permitted in the early years.

(ii) Current ETP's AF is based on interest rates and mortality charges used by insurer in designing the actual policy. Prescribing the mortality and interest rate used to calculate to ETP's AF will have a different impact, depending on if the prescribed mortality is higher or lower than CIA8692 table or if the assumed interest rate is higher/lower than 3.5%

(iii) Current cash surrender value cannot be used when calculating the accumulation fund value. By allowing use of the surrender value will decrease the value used in the test, therefore increasing maximum deposits permitted in the early years.

5. Learning Objectives:

1. The candidate will understand feasibility step of new product and how it drives design.

3. The candidate will understand the relationship between the product features, their inherent risks, and the selection of appropriate pricing assumptions, profit measures and modeling approaches.

Learning Outcomes:

(1a) Explain considerations for prudent and practical decision making.

(1c) Describe how investment policy and policy loans can impact design.

(3c) Analyze results and recommend appropriate action from an array of risk and profit measures such as: Statutory, GAAP, Return on Equity, Market Consistent Pricing, Embedded Value

Sources:

Atkinson & Dallas, Life Ins. Products and Finance Chapter 2 Product Development

Hardy, Investment Guarantees, Chapter 6 Modelling the Guarantee Liability

Atkinson & Dallas, Life Insurance Products and Finance, Chapter 13 Annuity and Investment Products

Commentary on Question:

Commentary listed underneath question component.

Solution:

(a) List the core competencies, as suggested by Atkinson and Dallas, which the new product should build upon.

Commentary on Question:

Overall, candidates answered Part A relatively well. Most papers mentioned the low cost of capital; financial strength, operational efficiency; distribution and home office staff abilities and investment management. Fewer papers mentioned the underwriting expertise and the high persistency. Very few papers mentioned speed, flexibility and adaptability.

Low cost of capital
Financial strength (high ratings, high capital ratios, strong earnings)

Operational efficiency (low acquisition and maintenance costs)

Underwriting expertise and discipline
High persistency (high customer value, quality sales and service efforts)

5. Continued

Investment management (superior returns, low investment expenses)

Speed, flexibility, adaptability
Quality of distribution
Control of distribution
Low-cost distribution
Sophisticated distribution (able to sell complex products)
Sophisticated home office staff (able to develop and support complex products)

(b) Determine whether the GMDB is profitable in this deterministic scenario using the actuarial approach.

Commentary on Question:
Overall, candidates were able to answer with at least a few key correct responses. However, many did not show their work, only including their answer. Please note that it is always a good idea to show the work. Most candidates got the formula and numerical values for the guarantee and the margin offset correct. A large number of candidates knew to use e to the exponent .05xt as the discount factor, but many incorrectly used 1.05. Only a few got the correct final answer of 3.66.

A number of papers did not come to any conclusion in terms of stating whether the result for GMDB indicated a profitable or unprofitable venture. Please note that it is always a good idea to respond qualitatively as well as quantitatively to each specific point in the question. Please consider rereading the question when finished writing the answer, to be sure the answer hits all that was asked in the question.

In the formula, Value of Fund before expenses, a number of candidates did not use F_0, or did not take (1-m) to the power t; or incorrectly divided by S_t-1 or used 2.5% as m instead of 2 %.

*In the formula, Liability Cash Flow, a number of papers did not have the negative sign in front of the tpx*Mt; some papers did not include the floor of zero or mixed up the terms in the formula.*

5. Continued

Formulas
Value of Fund before expenses = F_t = F_0- *(S_t *(1-m))^t / S_0
Margin Offset Income = M_t = F_t * mc
Liability Cash Flow = C_t = -tPxMt + t-1|qxd * (G - Ft)
Guarantee = Gt = 1000 * 90% * (1 + 3%) ^ t
Discount rate = dt = e^(-0.05t)

Calculations

Single Premium	1000		
Risk free rate	5%		
GMDB Payoff	90%	accumulated at	3%
Margin Offset	0.50%		
Management Charge	2%		

t	S_t	${}_tp_x^{\tau}$	${}_{t-1}\|q_x^{d}$	Fund Value (t)	Margin Offset Income (t)	Guarantee (t)	CF_t	Discount Rate	Discounted CF
0	1	1		1,000.00	5.00		(5.00)	1.00	(5.00)
1	1.075	0.9198	0.0802	1,053.50	5.27	927.00	(4.85)	0.95	(4.61)
2	0.98	0.8433	0.0765	941.19	4.71	954.81	(2.93)	0.90	(2.65)
3	0.8	0.7703	0.073	752.95	3.76	983.45	13.93	0.86	11.99
4	0.975	0.7003	0.07	899.31	4.50	1,012.96	4.81	0.82	3.94
								PV CF	**3.66**

Total Discounted Liability is 3.66
A positive number for discounted liability cash flows implies an unprofitable scenario

Detailed Calcs
Year 0: Margin Offset Income = 0.005 * 1,000 = 5
CF0 = -5
Year 1: F_1 = F_0- (S_1*(1-m))/S_0 = 1,000 * (1.075 * (1 - 0.02) / 1.000) = 1,053.50
Year 1: tPxMt = 0.9198 * 1,053.50 * 0.005 = 4.85
Year 1: DB1 = 0.0802 * (927 - 1,053.50)+ = 0
Year 1: CF1 = 0 - 4.85 = -4.85
Year 4: F_4 = 752.95 * ((975)*(1-0.02) / 0.8) = 899.30
Year 4: tPxMt = 0.7003 * 899.30 * 0.005 = 3.15
Year 4: DB4: (0.07 * (1,012.96 -899.30)+ = 7.96, CF4 = 7.96 - 3.15 = 4.81
Discount Rates: e^(-0.05t) = [1.0000, 0.9512, 0.9048, 0.8607, 0.8187]
Discount CFs: [-5, -4.61, -2.65, 11.99, 3.94] = 3.67
Discount Rates: e^(-0.05t) = [1.0000, 0.9512, 0.9048, 0.8607, 0.8187]

(c) Propose changes to the GMDB and/or base product to increase profitability.

Commentary on Question:
The question is for the student to demonstrate knowledge of product features and how they affect profitability. In general the students did fairly well in this part.

Part C was answered relatively well. Most papers mentioned lowering the credited interest rate and lowering the percent of initial premium; revisiting the management charge and margin offset assumptions were also often listed. Fewer papers mentioned adding an exclusion period or selling to healthier lives to improve mortality. On this last point, please consider not necessarily listing the exact words of the text, but instead using that knowledge logically to respond to the specific situation in the question. For example, consider what would improve profitability. One logical response is not paying out as often or as soon. A logical response to the question of what would help in delaying deaths is to sell to healthier people (or having an exclusion period).

5. Continued

Decrease the % credited interest rate
Decrease the % initial premium
Add an exclusion period where GMDB is not effective (this should decrease anti-selection)
Educating advisors on selling to healthier lives, therefore improving mortality experience

Check to see if assumed mortality is not overly conservative (check vs. industry/intelligence analysis)
Revisit the management charge assumption
Revisit margin offset income assumption
Build on the core competency of investment management (superior returns imply higher cash values and lower net amount at risk.)

6. Learning Objectives:

2. The candidate will understand the design and purpose of various product types, benefits and features.

Learning Outcomes:

(2a) Describe in detail product types, benefits and features.

(2b) Construct and recommend a design that is consistent with the market needs identified in the idea generation.

(2c) Evaluate the feasibility of the recommended design.

Sources:

Designing & Pricing LTCI Combination Insurance Products, Long Term Care News, December (13) 2004

LP-127-13: Product Design of Critical Illness Insurance in Canada

LP-126-13: Pricing Critical Illness Insurance in Canada, Mooney

Quantification of the Natural Hedge Characteristics of Combination Life or Annuity Products Linked to Long-Term Care Insurance, March 2012

Annuity/LTCi Combinations , Product Matters, October, 2009

Commentary on Question:

Candidate must understand how LTC, CI and combo products work, be able to identify the risk within each product feature and understand sensitivity to actuarial assumptions.

Solution:

(a) Determine product features that would reduce costs for:

(i) A Standalone Long Term Care (LTC) product

(ii) A Standalone Critical Illness (CI) product

Commentary on Question:

This question tested candidate's comprehension of the LTC and CI product features. In general, candidates did well on this part of the question. Candidates who did not do well gave more answers related to the pricing of the product, such as limiting ADLs, stricter underwriting, etc, or were too brief in their answers.

6. Continued

(i)

- Reduce or eliminate the inflation protection options
- Lengthen the elimination period
- Limit the daily/monthly/etc payment amount
- Benefit payment set at time of purchase instead of time of acceleration to prevent increases in coverage

(ii)

- Limit covered illnesses (potentially only cover Big 4)
- Reduce or eliminate the inflation protection options
- Limit or remove partial payments for non-life threatening illnesses
- Limit/remove/charge extra for Return of Premium features
- Remove guaranteed premium options
- Require longer survival/elimination time

(b)

(i) Construct a process for developing the CI incidence rates within your company.

(ii) Explain why CI incidence rates vary by country.

Commentary on Question:
The first part was a retrieval question and candidates who knew this process did very well. For the second part, candidates who did well provided at least four or more examples from the list below.

(i)

- Start with general population incidence rates, obtained from government sources and or research organizations
- Adjust these rates to fit the company's condition definitions
- Take account of any trends over time
- Adjust incidence rates from the general population to the insured population
- Segment aggregate incidence rates into smoker/non-smoker rates
- Create select and ultimate incidence rates
- Compare the rates to any available rates in other countries and adjust as necessary

(ii)

- Type and quality of the healthcare system
- Region specifics and/or lifestyle (Diet, fitness, smoking, climate)
- Underwriting practices

6. Continued

- Genetic characteristics of the population
- Buyer mix and reason for the insurance
- Product type/features

(c) Explain the advantages and disadvantages to the policyholder of a Life/LTC combination product.

Commentary on Question:
This was comprehension question. Candidates that did well provided more examples and explained their answers well. Candidates who did not do well on this question were too brief in their response and/or did not provide disadvantages.

Advantages:

- Combo products are more affordable than buy the standalone products separately
- Alleviates the concern of "Use it or lose it" on the standalone LTC product
- Customers that do not qualify for standalone LTC might be able to qualify for the combo product

Disadvantages:

- Use of the LTC portion on the combo product decreases the life portion of the benefit payable when the need for life insurance could be higher
- The complexity of combo products make it hard to understand

(d) Describe a typical Life/LTC combination benefit payout design.

Commentary on Question:
This was a Knowledge Utilization question. Many candidates did well on this question, some described an Annuity/LTC combo product and lost some marks.

- A typical payout structure is accelerated benefit (AB)
- LTC payment reduces the life insurance face amount dollar for dollar
- Alternative is to use the lien approach where benefits are accumulated with interest and deducted at death

6. Continued

(e) Evaluate how the Life/LTC combination product creates a natural hedge in each of the following situations:

(i) Mortality rates increase for all active lives (i.e. those insureds not on claim for LTC)

(ii) Incidence rates for LTC increase in all policy years

(iii) Periodic claim termination rates are reduced

(iv) Lapse rates decrease for both benefits

Commentary on Question:
This was a Knowledge Utilization question. Candidates who did well on this question described the impact to both the LTC and Life products separately, as well as how the two sides of the combo product interacted to create the natural hedge. Candidates that only described how it affected each product received partial credit.

(i) Mortality Increase
- Decreases life profitability because death benefits are paid earlier
- Increases standalone LTC profitability because less lives remain to claim the LTC benefit
- In a combo product, the loss from the Death Benefit is partially offset by the gain on LTC, which creates a natural hedge

(ii) Incidence Rates Increase
- Decreases standalone LTC profitability because utilization of LTC benefit is higher
- Life impact, on its own, is not affected by the increase in incidence rates
- In a combo product, the LTC benefit decreases the Death Benefit, resulting in lower Death Benefit payments, which creates the natural hedge.

(iii) Claim Termination Rates Decrease
- Decreases standalone LTC profitability because LTC benefits are paid for a longer period of time
- Life impact, on its own, is not affected by the decrease in claim termination rates
- In a combo product, the LTC benefit decreases the Death Benefit, resulting in lower Death Benefit payments, which creates the natural hedge.

6. Continued

(iv) Lapse Rates Decrease

- Decreases standalone LTC profitability because it is a lapse-supported product
- Increases life profitability because more premiums are received and acquisition costs are spread out over a longer period of time
- In a combo product, the impact in opposite direction create a natural hedge that varies by age

7. Learning Objectives:

2. The candidate will understand the design and purpose of various product types, benefits and features.

3. The candidate will understand the relationship between the product features, their inherent risks, and the selection of appropriate pricing assumptions, profit measures and modeling approaches.

Learning Outcomes:

(2a) Describe in detail product types, benefits and features.

(3c) Analyze results and recommend appropriate action from an array of risk and profit measures such as: Statutory, GAAP, Return on Equity, Market Consistent Pricing, Embedded Value

(3d) Analyze the capital requirements for a product and describe solutions such as securitization.

(3e) Describe when a stochastic model should be used, its advantages and disadvantages, how to build it and how to analyze its results

Sources:

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

Hardy, Investment Guarantees, Chapter 13 Equity Indexed Annuities

Commentary on Question:

This question primarily tests candidates' understanding of Equity Indexed Annuities (EIA), including the design of index-based interest credit options, investment strategy differences between a DA and EIA product, option hedging strategies, how the call spread option cost is determined and how participation rates impact indexed-credit option setting.

Solution:

(a) Describe the components involved in the computation of the interest credited to an EIA product.

Commentary on Question:

Full points were given if a candidate both identified the components and described them. Some candidates only listed the components and did not include a description for each component.

The components involved in the computation of interest credited are:

1. Index: The equity proxy that is used to calculate the level of interest that is credited to the Indexed Account Value (IAV)
2. Index Period: The period for which Index-Based Interest is credited

7. Continued

3. Index Growth%: There are two major categories of methods used to represent the growth in the Index
   a. Point-to-Point Index Growth% calculations use only two closing levels of the index over the index period.
   b. Average Index Growth% calculations are based on the average closing level of the index over the index period.
4. Participation rate: A percentage factor applied to the raw Index Growth%.
5. Caps: Has the potential to decrease the Index-Based Interest relative to the Index Growth%. If the cap is higher than the Index-Based Interest calculated, before the cap is applied, it has no effect on the interest applied to the IAV.
6. Floor Return: The Floor Return is usually 0%, but can be higher. A 0% floor on the Index-Based Interest calculation guarantees that the IAV will never be lower than the Single Premium and also guarantees that the IAV will never decrease.
7. Margin: Decreases the Index-Based Interest relative to the Index Growth%. The margin can be applied before or after Participation Rate in the Index-Based Interest calculation but cannot reduce the interest credited below 0%.
8. GMAV – the guaranteed minimum value for the annuity.

(b) BBF is currently marketing traditional declared-interest Deferred Annuities with 100% invested in fixed interest bonds. Compare investment strategies between EIA and Deferred Annuity products.

Commentary on Question:
Candidates did fairly well on this part of the question. Full points were given to candidates that identified the elements of crediting for each annuity type and the investment strategies applicable to each element.

For traditional declared interest deferred annuities, the investment covers necessary expenses and profit and the excess is used to give the policyholder a return, which is the declared interest rate. Therefore, 100% of the portfolio could be invested in fixed interest corporate bonds.

However, for EIAs, the credited rate is made up of two elements: the GMAV and the Index-Based Interest component. A majority portion of the premium could be invested in fixed interest corporate bonds to fund the GMAV, expenses, and profit. Then the remainder of the premium shall be used to determine an option budget to fund Index-Based Interest (Premium = GMAV Costs + PV of Expenses/Profit + Index-Based Interest Budget). The option budget is then applied at current option costs to determine the Index-Based Interest that can be afforded. Therefore, a different investment allocation strategy shall be used for this new EIA product.

7. Continued

(c) BBF's investment guideline has been relatively conservative in general, and the CFO of BBF wants to keep this relatively conservative investment tradition for this product.

(i) (*2 points*) Describe the two main strategies available to hedge the option risk on this product. Include any advantages or disadvantages in your description.

(ii) (*3 points*) Recommend a hedging strategy based on BBF's actual situation. Include in your recommendation considerations in implementing that strategy.

Commentary on Question:
Candidates did well at identifying and describing the two main hedge strategies available. Some candidates did not clearly identify advantages and disadvantages of each.

Most candidates did not receive full points on part ii because they did not include considerations in implementing the recommended strategy.

For part ii, points were given for a recommendation of dynamic hedging as well if the recommendation was properly justified given BBF's actual situation.

(i) Static hedging is essentially a buy-and-hold investment strategy and often involves the purchase of Over the Counter options. The most common EIA static hedge today involves the purchase of a call spread option on the index.
An advantage of static hedging is that it provides downside protection when index goes negative and provides relatively good match of gain from the option to indexed-based interest; therefore, it is a relatively conservative hedging strategy.

A disadvantage of static hedging is that volume can be an issue because option dealers do not typically like to deal in low volumes. If necessary, low volume options can be purchased, but because of the fixed cost involved in pricing and hedging risk from the dealer's perspective, it is difficult to realize an economical hedging program without high volumes. Therefore, static hedging requires an economy of scale dependent on issued premium volumes. In addition, there is no guarantee that dealers will always want to deal with a particular type of transaction at low fixed costs which can further stress option budgets.

Dynamic (Delta) Hedging involves monitoring the delta (and possibly other "Greeks") of the liability portfolio and holding a changing position in the index via futures or other instruments that track the index.

7. Continued

An advantage of delta hedging is the exactness of matching between the assets and the liabilities.

A disadvantage of delta hedging is that it involves constant monitoring of the portfolio and changes in the performance of the index, and measuring delta after these changes. Because delta changes every time the underlying security changes, delta hedging requires periodic rebalancing of the position held in the underlying security, or the security being held as its proxy (ie, futures). The frequency of rebalancing then affects the cost of the hedging program because of transaction costs to increase or decrease exposure. The cost of the hedge is then the sum of the resulting small losses. The hedging cost is a function of volatility and the cost is unknown until the end of the hedging period. A balance is necessary between higher rebalance frequency resulting in smaller buy high/sell low costs with high transaction costs, and lower rebalance frequency resulting in higher buy high/sell low spreads with low transaction costs.

Another disadvantage of dynamic hedging is that, because it involves an actual position in a security that tracks the index and is not structured like a call option, it does not provide downside protection. EIAs have a structure such that the Index-Based Interest is never negative, but dynamic hedging does not match this feature. If the index goes down, the dynamic hedge position has a negative return.

(ii) Although the cost of dynamic hedging is generally lower than the call spread option cost, static hedging provides a better match of the index gain to the index-based interest, therefore static hedging would be the more preferable hedging strategy given the relatively conservative investment guideline. Further, the disadvantage of static hedging of volume requirement shall not be an issue as BBF expects large volume of EIA sales through its newly acquired distribution channel.

For considerations in implementation, the funding ratio for static hedging needs to be determined (if Index-Based Interest is not a vested benefit upon surrender) to reflect expected lapsation during the index period. If actual lapse rates are higher than expected, the funding ratio would become too high and options would have to be sold, or unwound, held as a speculative investment, or applied to other derivative risks. If actual lapse rates are lower than expected, the writer is faced with having Index-Based Interest that isn't hedged and the possibility of having to purchase options at a higher cost than they could have been purchased for when the original hedging was done.

7. Continued

(d)

(i) Determine the cost of a call spread option. Show your work.

(ii) Calculate the maximum participation rate the company can afford to provide. Show your work.

Commentary on Question:
Candidates generally did very well on this part of the question. Some candidates did not receive maximum points since they did not show their work.

(i) The call spread option involves two transactions, the purchase of a plain vanilla call option and the sale of a call option with a strike equal to the cap rate of the liability being hedged.
Buy: Call option, Strike = 1000 (Lower Strike)
Sell: Call option, Strike = 1100 (Upper Strike)
Call spread Price = Call (Strike @ Lower Strike) - Call (Strike @ Upper Strike)
= Call Price(Strike @100%) – Call Price(Strike @ 110%) = 9.92%-4.26%=5.66%

(ii) Participation Rate = Hedge Budget / Call Spread Option Price at desired Cap Rate
= 3.5%/5.66% = 62%

The affordable participation rate is 62% given hedge budget of 3.50% and a cap rate of 10%.

8. Learning Objectives:

4. The candidate will understand actuarial requirements of product implementation and the monitoring of experience versus product assumptions.

Learning Outcomes:

(4a) Describe and evaluate compliance with illustration regulation and other policy form regulations

Sources:

LP-125-139: NAIC Life Insurance Illustrations Model Regulation

Commentary on Question:

This is a knowledge application and memo evaluation question. Due to the higher level of thinking process that the candidates are expected to go through, it is a very hard question for them to get a point. While a few candidates can recognize what was stated in the memo is good and what is bad without losing a great focus to the content of memo itself, most candidates just get into a whole lot of details on what should be included in a memo required by the NAIC Life Insurance Illustration Model Regulation regardless if these items are even mentioned in the question. For the part b, overall it is done a little bit better than part a. A few people can briefly introduce two legit alternatives without providing a lot of details, while some other candidates tried to provide one reasonable alternative and get one point.

Solution:

(a) Critique the memo above with respect to the NAIC Life Insurance Illustrations Model Regulation.

The memo has filed the certification with the Chief Actuary of the ABC Company instead of with the board of directors. This should be corrected in the memo. The Illustration Actuary can not be the responsible officer. The memo is certifying to information that the responsible officer should certify to which is incorrect. For the 3rd bullet point, the reference that the expense information was provided to the agent should be deleted. Also in the 4th bullet point, we should get rid of the reference that Illustration formats used by ABC meet the requirements of the regulation since this is the responsibility of the responsible officer rather than Illustration Actuary. The memo should state that the actuary meet the Academy requirements for making this certification & requirements of the state. In the end, a statement as 'Non-guaranteed elements illustrated for new policies are consistent with those illustrated for similar in force policies, except as follow:…' should be added.

(b) Your marketing department does not want to provide an illustration for an illustrated policy form at time of sale. Describe alternative solutions in order for your company to comply with this request.

8. Continued

Alternate 1:
If the Term policy has no non-guaranteed elements, then a ledger with values is not an illustration and is not covered by the regulation. So you could make the term policy fully guaranteed.

Alternate 2: Do not illustrate the form at time of application and do the following:
Firstly, create a form signed by the producer and applicant that no illustration was provided and that an illustration conforming to the policy as issued will be provided no later than at time of policy delivery.
Then, require that the form be submitted at time of application.
Lastly, send the required illustration with the policy form.

Alternate 3:
In the annual certification, change the policy form to be not marketed with an illustration. Not allow the use of an illustration prior to the first policy anniversary.

9. Learning Objectives:

3. The candidate will understand the relationship between the product features, their inherent risks, and the selection of appropriate pricing assumptions, profit measures and modeling approaches.

Learning Outcomes:

(3e) Describe when a stochastic model should be used, its advantages and disadvantages, how to build it and how to analyze its results

Sources:

Stochastic Modeling Text - Intro, Sections 1-4 (See VanDam email 2/3/13)

Commentary on Question:

Overall, candidates missed many of the key concepts on this question. Part a) had several steps needed to calculate the correct forward rates. Many candidates were able to correctly calculate the spot rates in step 1, but missed the calculation of the forward rates at time zero in step 2. Very few candidates attempted step 3.

Solution:

(a) Calculate $F_1(1)$ and $F_2(2)$, where $F_t(t+T)$ is the time *t* rate *T* years forward, and $T = 0$ for both.

Step 1: Convert the given Par Yields into continuously compounded spot rates using the bootstrap method.

$$S(0,1) = -\ln\left(\frac{1}{1+.02}\right) = 1.98\%$$

$$S(0,2) = -\frac{1}{2}\ln\left(\frac{1-\left(C(0,2)e^{-S(0,1)}\right)}{1+C(0,2)}\right)$$

$$S(0,2) = -\frac{1}{2}\ln\left(\frac{1-\left(.025e^{-.0198}\right)}{1+.025}\right) = 2.48\%$$

$$S(0,3) = -\frac{1}{3}\ln\left(\frac{1-\left(C(0,3)e^{-S(0,1)}\right)-\left(C(0,3)e^{-2*S(0,2)}\right)}{1+.035}\right)$$

$$S(0,3) = -\frac{1}{3}\ln\left(\frac{1-\left(.035e^{-.0198}\right)-\left(.035e^{-2*.0248}\right)}{1+.035}\right) = 3.48\%$$

Step 2: Determine forward rates (at time zero) by converting spot rates using the provided formula

F0(0) = S(0, 1) = 1.98%

F0(1) = 2*S(0, 2) - 1*S(0,1)
= 2*.0248 - 1*.0198 = 2.98%

9. Continued

F0(2) = 3*S(0, 3) - 2*S(0,2)
= 3*.0348 - 2*.0248 = 5.48%

Step 3: Determine forward rates of the scenario

F1(1) [July 1, 2015 rate on July 1, 2015] = F0(1) + Σ Λφ =
= .0298 + .0066*(-1.5988) - 0.0010*(-0.7991) = 2.00%

F1(2) [July 1, 2016 rate on July 1, 2015] = F0(2) + Σ Λφ =
= .0548 + .0087*(-1.5988) + 0.0008*(-0.7991) = 4.03%

F2(2) [July 1, 2016 rate on July 1, 2016] = F1(2) + Σ Λφ =
= .0402 + .0087*(.9673) + 0.0008*(-0.9475) = 4.79%

(b) Describe other methodologies in calculating stochastic risk-free rates for the GMAB.

Commentary on Question:
To get full credit for part b) it was important to describe the model instead of just listing the model name. Many candidates were not able to identify methodologies for calculating stochastic risk-free rates. Partial credit was given for the models in Investments Guarantees by Hardy even though the models in that book are more appropriate for modeling equity returns.

- HJM/BGM framework
  - generates arbitrage-free scenarios consistent with zero coupon bond prices implied by forward rates
- Use realistic scenarios over longer time scales
  - for longer time scales, the expectation values for future interest rates may not exhibit a term structure that is typical in the historical data, the level of rates may not be consistent with the historical average
  - Scale the overall volatility to bring the scenario-based calculation of swaption prices in line with the prices of liquid swaptions using standard optimization techniques
- Parametric models have advantages over PCA-based modeling of interest rate scenarios
  - these models have readily interpreted parameters that can be useful in extrapolating yield curve dynamics to large times, providing a reasonableness check on the unregulated results generated using PCA models
- A multi-factor model (two-factor Hull-White) must be used where inversion frequencies are important

9. Continued

- the simplest multi-factor model is the two-factor Hull-White model, characterized by a stochastic long-term rate that has its own volatility and mean reversion, independent of the short-rate
- When there is interest rate volatility, this interest rate volatility becomes a component of the overall equity volatility
- excess equity volatility must be recalibrated for the presence of stochastic interest rates

The Hardy models include:

- Wilkie
- Lognormal
- Autoregressive (AR, ARCH, GARCH)
- Regime switching lognormal
- Empirical model
- Stable distribution

10. Learning Objectives:

2. The candidate will understand the design and purpose of various product types, benefits and features.

3. The candidate will understand the relationship between the product features, their inherent risks, and the selection of appropriate pricing assumptions, profit measures and modeling approaches.

Learning Outcomes:

(2b) Construct and recommend a design that is consistent with the market needs identified in the idea generation.

(3a) Identify and explain the setting of an appropriate assumption for product characteristics such as the following:
- (i) Riders
- (ii) Policyholder dividends
- (iii) Equity linked
- (iv) Embedded options
- (v) Return of premium
- (vi) Secondary guarantees
- (vii) Payout annuity benefits
- (viii) Crediting methodology
- (ix) Other non-guaranteed elements.

Sources:

Atkinson & Dallas, Life Insurance Products and Finance, Chapter 3 Pricing Assumptions

LP-127-13: Product Design of Critical Illness Insurance in Canada

Marketing for Actuaries, 2000 Edition, Chapter 6 Marketing and Pricing

Commentary on Question:

The goal of this question was to test the candidates' knowledge of how distribution channels can affect pricing assumptions and experience for a product. Candidates are expected to understand the impact to key assumptions for each distribution channel. The candidates are further challenged with a situation when given an unintuitive assumption and they are expected to challenge the assumption. Also, in the calculation part of the question, the candidates are put in a real life situation where there is no good experience to rely on to estimate the morbidity deterioration at time of selective lapse and are required to make a ballpark estimate using mortality deterioration as a reference. The goal is to see if the candidates can use their knowledge of selective lapse deterioration on a new decrement.

10. Continued

Solution:

(a) Calculate the deteriorated incidence rate of the remaining inforce policies using mortality deterioration as a reference. Show all work.

qdNorm = 4.0 per 1,000
qdSelect = 1.00 per 1,000
qwNorm = 0.05
qwExtra = Expected Lapse Rate – qwNorm = 0.20 – 0.05 = 0.15
SelectPct = 40%
qwSelect = qwExtra x SelectPct = (0.15) 40% = 0.06
qwNonSel = qwExtra – qwSelect = 0.15 – 0.06 = 0.09
qdActual = [(1 – qwNorm – qwNonSel) qdNorm – (qwSelect) qdSelect] / [1-qwNorm – qwExtra]
qdActual = [(1 – 0.05 – 0.09) x 4 per 1,000 – (0.06) x 1 per 1,000] / [1 – 0.05 – 0.15] = (3.44 - 0.06) / .80 = 4.225 per 1,000
The deterioration is qdActual / qdNorm = 4.225 / 4.00 = 1.05625 or 5.625%. The deteriorated morbidity rate using mortality as a reference is 1.05625 x 14.0 per 1,000 = 14.7875 per 1,000.

(b) Explain the implications for the incidence deterioration calculation using preservation of total "incidents" and the rate of selective lapsation.

The point in scale rates shouldn't be lower as newly selected policies have just been underwritten and should be fairly healthy vs remaining block. After 10 years, average health for the remaining block should have deteriorated as some healthy policies would have lapsed to seek better premiums and a lot of poor health policies would stay. The fact that the point in scale rates are lower than newly selected rates is unintuitive and AMD should check their incidence rate table and the calculation.

The degree of selective lapsation will depend on whether the premiums are actually cheaper on the market if the insured gets re-underwritten. Insurers may or may not pass this unintuitive result through to the market.

(c) Compare how the persistency and morbidity assumptions of the CI product may be affected if they were sold through:

- AMD's life and property and casualty insurance career sales force
- Independent agents who only sell CI
- A direct marketing strategy targeting tech-savvy young adults and students through internet advertising and an online application

10. Continued

Commentary on Question:
This part of the question is knowledge utilization that strays off the syllabus so if there are appropriate answers which are not listed here, give the candidate credit.

To get full marks, candidates must give at least one example of how persistency and morbidity would vary under each distribution channel. That is give 4 points for each assumption/distribution explanation. Maximum of 24 points.

Persistency:

Life and Property & Casualty agents:
Persistency may be lower because life and property & casualty agents are new to the product and will not have a high level of confidence in their product knowledge.

Third Party:
Persistency will likely be better than ABC's life and property & casualty agents as the independent agents will already have knowledge of the critical illness product (at least initially) and be able to make a more confident sale.

Online:
Online sales may have better persistency as the buyers will be initiating the sales themselves and they will only purchase it if they are committed to keep it.

Morbidity:

Life and Property & Casualty agents:
By selling these products through ABC's career sales force, ABC would have better control over the sale. The career sales force agents have stronger connections with ABC, will act on ABC's best interest and more interested to sell the product to people who have better health.

Third Party:
Selling through independent agents could lead to deteriorated morbidity because the agents are more commission motivated, probably know ABC's underwritten loophole, and will send in every application that has been declined or rated elsewhere.

Online:
The morbidity experience through this channel should be worse as only people who really need the policy would go through all the researches and initiate the purchase themselves.

11. Learning Objectives:

2. The candidate will understand the design and purpose of various product types, benefits and features.

3. The candidate will understand the relationship between the product features, their inherent risks, and the selection of appropriate pricing assumptions, profit measures and modeling approaches.

Learning Outcomes:

(2b) Construct and recommend a design that is consistent with the market needs identified in the idea generation.

(3a) Identify and explain the setting of an appropriate assumption for product characteristics such as the following:
- (i) Riders
- (ii) Policyholder dividends
- (iii) Equity linked
- (iv) Embedded options
- (v) Return of premium
- (vi) Secondary guarantees
- (vii) Payout annuity benefits
- (viii) Crediting methodology
- (ix) Other non-guaranteed elements.

(3c) Analyze results and recommend appropriate action from an array of risk and profit measures such as: Statutory, GAAP, Return on Equity, Market Consistent Pricing, Embedded Value

Sources:

Atkinson & Dallas, Life Insurance Products and Finance, Chapter 3 Pricing Assumptions

Predictive Modeling for Life Insurance by Deloite http://www.soa.org/files/pdf/research-pred-mod-life-batty.pdf

Marketing for Actuaries, 2000 Edition, Chapter 6 Marketing and Pricing

LP-127-13: Product Design of Critical Illness Insurance in Canada

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

Commentary on Question:

This question tested the candidate's knowledge on identifying and explaining the advantages of a simplified issue CI product and predictive underwriting model. The majority of the candidates were able to identify the low cost, fast turnaround nature of the SI product and predictive model.

11. Continued

Solution:

(a) Describe advantages of:

(i) A simplified issue CI product.

(ii) A predictive underwriting model.

Commentary on Question:
For part (i) only four of the points listed below were required for full marks. Candidates were generally able to identify most of the criteria.

- Make underwriting faster, more economical, more efficient and more consistent
- Model can show if medical underwriting (and its costs) are justified
- Decisions from model are not biased like human decisions
- Shorten and reduce invasiveness of underwriting, reduce wastage
- Underwriter will be able to handle larger volumes
- Process: get the application, calculate a score, policy is offered ot it goes through traditional UW
- Data: third party marketing data, application, MIB, MVR, prescription database
- A predictive model can be used to target the right (and healthy and affluent) customers
- Cross selling: use data on current customers to target cross sales, don't forget that f existing client go through underwriting process and the offer is less interesting than what was presented, this can make him lapse his existing policy.
- Predictive model can help a company identify which customers are valuable and not for their profitability
- Additional predictive model applications: identify which customers are more likely to lapse, combine many models, workforce analytics (efficiency of agent recruiting)
- Take advantage of protective value studies
- streamlined data processing via automated software packages
- Reduce underwriting costs
- Reduce time spent doing the underwriting

For part (ii) only two of the points listed below were required for full marks. Candidates were generally able to identify most of the criteria.

- There are only a few questions so applicants will prefer it over more complicated applications

11. Continued

- There are only a few questions so agents will prefer it over learning more complicated applications
- Agents paid quicker since underwriting is faster
- It's a way to enter new distribution channels (internet, direct response, banks)
- Be an innovator with a unique product to stay ahead of the competition

(b)

(i) Compare the factors impacting the persistency and morbidity assumptions of both CI products assuming that the factors from life insurance persistency studies apply to CI.

(ii) Propose changes that CBS could make to improve the morbidity for its simplified issue product.

Commentary on Question b(i):
For part (i) only four points were required under persistency and two points were needed under morbidity to receive full marks.

- *Most candidates were able to identify medically underwritten policies exhibit higher-than-average persistency and lower morbidity rates are to be expected on simplified issue policies due to anti-selection. Candidates were divided when discussing the relationships between persistency and the size of the premium or policy size. Only a few candidates linked the quality of the sales process to policy persistency.*
- *Many candidates failed to understand the question. Instead of comparing simplified issue against fully underwritten business, most focused on the common factors that affect both blocks, resulting in low marks across the board.*

Correct answers to b(i) are:
Persistency:

- Product-Related: There may be lower-than-average persistency as this is a term product versus a permanent product (the goal is protection versus accumulation).
- Product-Related: The simplified issue product has a higher premium so it may have better persistency than the fully underwritten product.
- Product-Related: Higher-than-average persistency is found on policies that are medically underwritten.
- Product-Related: Larger policy sizes and more underwriting will be done on the fully underwritten product (this underwriting is similar to preferred underwriting) so higher-than-average persistency can be expected
- Product-Related: Simplified issue sales will likely be issued as applied for, therefore increasing persistency.
- Product-Related: No policy loans are available, so higher persistency is likely.

11. Continued

- Sales-process Related: The degree of understanding: Critical Illness products are complex and require a lot of education for the prospect to make a purchase decision. Persistency will be enhanced if the customer clearly understands the benefits of the insurance.

Morbidity:

- Selection process: Higher morbidity rates are to be expected on simplified issue policies.
- "Persistency & Morbidity:
- Compared to the nonmedical tests done in the fully underwritten plan, simplified issue underwriting has fewer medical questions so the simplified issue product will screen out fewer unhealthy risks. Unhealthy lives are more likely to persist then healthy lives. Therefore the simplified product could have better persistency than the fully underwritten product."

Commentary on Question b(ii):
This is a knowledge utilization question. Candidates must get at least 8 answers to get full credit. Candidates were given marks for correct answers that were not included in the rubrics (as instructed)

- Use third party data on the applicant from MIB (Medical Insurance Bureau), MVR (Motor Vehicle Record) and electronic prescription databases and feed it into a predictive model. Then use a score from the predictive model to determine if more underwriting is necessary to improve the morbidity.
- Monitor experience to understand what is causing anti-selection and revise the applicant/product for this.
- Occasionally let a random component in the applicants that need to go through more UW requirements so the agents can't predict when this will happen or not
- ABC should avoid the side-by-side comparison of the two products to avoid the sentinel effect and sell the two products to two different target markets to get better morbidity experience.
- Avoid selling simplified issue and fully underwritten products together – this will reduce the amount of rated and declined applicants going to the simplified issue product.
- Ensure the right questions are asked on the application
- Set the simplified issue sale to be aligned with a need or life event to improve the standard risks applying
- Set the price to be not too much higher than the fully underwritten price to encourage less substandard lives to consider the product
- Only offer the product for smaller face amounts where comparable fully underwritten product underwriting requirements are also low. Keep face amount ranges separate.

11. Continued

- Differentiate the benefits like only offer simplified as Cancer only to target a different market or use as counter offer for individuals that don't qualify for fully underwritten product due to heart conditions
- Sell in target markets where information asymmetries are high and where the sentinel effect is reduced.
- Decline highly substandard risks or even somewhat substandard lives by setting a limit on the level of substandard risk.
- Lower the issue age
- Lower the maximum coverage age
- Increase the waiting period
- Increase the survival period
- Link the agent's bonus to the occurrences of future claims
- ROP
- Reinsurance
- level premium structure
- Lower premium jump between renewal

12. Learning Objectives:

3. The candidate will understand the relationship between the product features, their inherent risks, and the selection of appropriate pricing assumptions, profit measures and modeling approaches.

Learning Outcomes:

(3c) Analyze results and recommend appropriate action from an array of risk and profit measures such as: Statutory, GAAP, Return on Equity, Market Consistent Pricing, Embedded Value

(3d) Analyze the capital requirements for a product and describe solutions such as securitization.

Sources:

Atkinson & Dallas, Life Insurance Products and Finance, Chapter 11 Profit Measurement and Analysis

Atkinson & Dallas, Life Insurance Products and Finance, Chapter 10 Required Capital

Commentary on Question:

Cashflows and distributable earnings are fundamental items and candidates well prepared should be able to answer, in relation to performing a cash flow plus present value calculation.

Most candidates were able to establish cash flows but perhaps their timing of, for example, death benefits was off by one period. Therefore they did not receive full points. Candidates received partial credit for formulas but needed correct calculations to get full credit.

Solution:

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

Distributable Earnings (t) = Premium – Benefits – Expenses + Investment Income on Cash Flows – Increase in Reserve + Investment Income on Reserves – Increase in Required Capital + Investment Income on Required Capital

Profit %Premium(n) = PVProfit(n) / PVPremium(n)

Time	Prem	DB	Acq Exp	Maint Exp	Inforce Amt	Cash Flow	Inv Inc - CF	Incr In Res	Inv Inc- Res	Increase in RC	Inv Inv - RC	Dis Earning
-	7,000	-	8,000	100.0	1,000,000	(1,100)	-	15,000	-	8,000		(24,100)
1	6,979	3,000		99.7	997,000	3,879	(28)	10,000	375	2,000	200	(7,573)
2	6,948	4,500		99.3	992,500	2,348	97	(5,000)	625	-	250	8,320
3	6,923	3,500		98.9	989,000	3,324	59	(10,000)	500	(5,000)	250	19,133
4	6,895	4,000		98.5	985,000	2,797	83	(5,000)	250	(2,000)	125	10,255
5	-	4,500			980,500	(4,500)	70	(5,000)	125	(3,000)	75	3,770

12. Continued

PV of Dist Earnings =	(24,100)	+ (7,573)	+ 8,320	+ 19,133	+ 10,255	+ 3,770
	1.03^0	1.03^1	1.03^2	1.03^3	1.03^4	1.03^5
PV of Premium =	7,000	+ 6979	+ 6947.5	+ 6923	+ 6895	+ 0
	1.03^0	1.03^1	1.03^2	1.03^3	1.03^4	1.03^5
Profit of % Prem =	PV of Dist Earnings		=	6,262	=	19.1%
	PV of Premium			32,786		