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**SOCIETY OF ACTUARIES**  
**Individual Life & Annuities United States – Design & Pricing**

# Exam DP-IU

## MORNING SESSION

**Date:** Thursday, May 2, 2013

**Time:** 8:30 a.m. – 11:45 a.m.

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### INSTRUCTIONS TO CANDIDATES

#### General Instructions

1. This examination has a total of 120 points. It consists of a morning session (worth 60 points) and an afternoon session (worth 60 points).
  - a) The morning session consists of 6 questions numbered 1 through 6.
  - b) The afternoon session consists of 6 questions numbered 7 through 12.The points for each question are indicated at the beginning of the question.
2. Failure to stop writing after time is called will result in the disqualification of your answers or further disciplinary action.
3. While every attempt is made to avoid defective questions, sometimes they do occur. If you believe a question is defective, the supervisor or proctor cannot give you any guidance beyond the instructions on the exam booklet.

#### Written-Answer Instructions

1. Write your candidate number at the top of each sheet. Your name must not appear.
2. Write on only one side of a sheet. Start each question on a fresh sheet. On each sheet, write the number of the question that you are answering. Do not answer more than one question on a single sheet.
3. The answer should be confined to the question as set.
4. When you are asked to calculate, show all your work including any applicable formulas.
5. When you finish, insert all your written-answer sheets into the Essay Answer Envelope. Be sure to hand in all your answer sheets since they cannot be accepted later. Seal the envelope and write your candidate number in the space provided on the outside of the envelope. Check the appropriate box to indicate morning or afternoon session for Exam DP-IU.
6. Be sure your essay answer envelope is signed because if it is not, your examination will not be graded.



**\*\*BEGINNING OF EXAMINATION\*\***  
**Morning Session**

- 1.** (10 points) ASD Life is a leader in selling a fully underwritten 15-year renewable term insurance product. Policies are now reaching the renewal period and ASD has decided to introduce a new “Term-to-Term Replacement Program” to help manage replacement activity. This new program was designed to provide extra incentive to the agent by paying full first year commission for any replaced policy, whereas the previous program only paid 50%. The new replacement term policy will only require simplified underwriting.
- (a) (2 points) List other strategies that can help manage replacements.
- (b) (4 points) For a policyholder considering whether to replace their current term policy:
- (i) Describe the most appropriate problem-solving strategy.
- (ii) Describe the purchase decision process.
- (c) (4 points) Evaluate whether the pricing assumptions for the currently sold fully underwritten 15-year renewable term product need to be changed when the “Term-to-Term Replacement Program” is introduced. Justify your answer.

2. (10 points) With respect to a variable annuity product with a guaranteed lifetime withdrawal benefit:

- (a) (1 point) List the benefits of using stochastic modeling.
- (b) (1 point) It has been proposed that you reduce the number of scenarios in a stochastic analysis. Critique this proposal.
- (c) (2 points) Describe the sources of volatility in the valuation of embedded options.
- (d) (6 points) You are given:
  - The embedded option value was shocked up and down in the following manner:
    - Funds: 1% independently
    - Interest rates: a parallel shift in the 1-year forward curve of 0.1% up and down
    - Implied volatility: a parallel shift to the volatility surface of 1%
  - One year forward rate is 4.25%

	Time 1	Time 2	Option Value at Time 1	
			Downward Shock	Upward Shock
Option Value	3000	2350		
Index Values of Funds				
S&P	1090	1070	3009	2990
Russell	1520	1490	3007	2992
NASDAQ	840	730	3003	2996
SBIG	1050	1060	3004	2996
EAFE	1010	1050	3007	2992
Money Market	1030	1070	3006	2994
Average Forward Rate	4.50%	5.25%	3100	2900
Implied Volatility	0%	0%	2800	3200

- (i) Construct an attribution analysis for the change in value of the option. Show your work.
- (ii) Determine the percent of change explained by this analysis. Show your work.

- 3.** (10 points) ABC Life is considering the feasibility of an Annuity/Long-Term Care Insurance (LTCI) combination product.
- (a) (1 point) List the key questions that should be answered at this stage of the product development process.
  - (b) (3 points) While they determine whether to build a fully operational administrative system, ABC's approach is to put a manual administrative system in place so they can quickly launch their Annuity/LTCI product. Describe the advantages and potential hidden costs of this approach.
  - (c) (6 points)
    - (i) Describe the three common benefit structures of Annuity/LTCI combination products.
    - (ii) For each benefit structure, demonstrate how it works by using a simple numerical example with an initial premium amount of 100,000, and a LTCI benefit of 4% of account value per month.

- 4.** (10 points) BAL Life wants to launch a new term product. Historically, BAL has been a permanent insurance provider, and does not have relevant experience for the new product.
- (a) (3 points) Explain why partnering with a reinsurer could prove beneficial to the development of the new term product.
  - (b) (2 points) Describe the two major reinsurance methods available for term products.
  - (c) (5 points) Critique the following statements with respect to reinsurance. Justify your answers.
    - (i) The recapture feature in a treaty reduces the cost of reinsurance.
    - (ii) A first dollar arrangement is always more desirable than an excess reinsurance arrangement.
    - (iii) Riskier policies are placed at a company that uses facultative reinsurance.
    - (iv) Reinsurance cedes away all of the expected profits to the reinsurers.
    - (v) Reinsurance administration is complex.

5. (10 points) MKA Life is a stock company that is developing a Universal Life product. You are given the following:

- MKA Shareholders expect a rate of return of 12%.
- Investment earnings rate is 7%.
- The initial strain is low.

The following pricing measures for this product have been calculated:

- Embedded value is positive using a 7% discount rate.
- ROI is 40%.
- ROE is 10% using pre-tax solvency earnings as the basis for profit.
- Profit as Percentage of Premium is 5% using a 7% discount rate.

(a) (5 points) For the pricing measures above:

- (i) Define each measure.
- (ii) List the advantages and disadvantages of each.

(b) (2.5 points) Assess the pricing measures as calculated above and recommend changes where appropriate.

(c) (2.5 points) Recommend other profit considerations to determine whether this product is viable.

**6.** (10 points)

- (a) (2 points) Describe the considerations in entering the Equity-Indexed Universal Life (EIUL) market from the perspective of:
- (i) a company that only offers Variable Universal Life (VUL)
  - (ii) a company that only offers Equity Indexed Annuities (EIA)
  - (iii) a company that only offers Universal Life (UL)
- (b) (2 points) KWR Life is considering the launch of its first EIUL. Describe the potential costs and benefits that KWR Life should consider in determining whether to move forward with the development of the new product.
- (c) (6 points) KWR's product development committee has proposed the following product design:

Crediting Method	Monthly averaging
Participation Rate	Initially 90%, guaranteed to never fall below 65%
Index Cap	Initially 8%, guaranteed to never fall below 5%
Index	Dow Jones Industrial Average
Initial Index Allocation	Premiums allocated to indexed accounts on the 15 <sup>th</sup> of each month.
Fixed Account Option	Yes, allocate at any time
No Lapse Guarantee	Yes

- (i) Critique the proposed product design.
- (ii) Recommend an alternative design which balances the needs of the potential customer and KWR.

**\*\*END OF EXAMINATION\*\***  
**Morning Session**

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