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**LOMBARDI, CHAPTER 10,
DEFERRED ANNUITIES****I. Introduction**

- A. Proper methodology not clearly defined prior to 1976 amendments to SVL.
- B. CARVM was developed by NAIC in the 1970's.
- C. Implementation was slow.
- D. Implementation was forced when CARVM was adopted for tax reserves.

II. Product Classification

- A. Annuity contract is insurance contract that guarantees to pay annuity payments either immediately or at some future date.

B. Fixed deferred annuity

- 1. Has minimum guaranteed interest rate credited to fund.
- 2. Company bears most of the investment risk.

C. Variable deferred annuity

- 1. Allows policyholder to invest in separate accounts.
- 2. Policyholder bears most of the investment risk.
- 3. Minimum death benefit is often guaranteed, thus classified as life contract.

D. Modified guaranteed annuity

- 1. Fixed deferred annuity with MVA.
- 2. Passes interest rate risk, not the default risk, to policyholder.

E. Equity indexed annuity

- 1. Fixed deferred annuity with credited interest rate that is X% of the increase in specified equity market index over a specified period.
- 2. Also guarantee credit of minimum rate on net deposits.
- 3. X% is participation rate.

F. Insurance Features

- 1. Living benefits that can be exercised by policyholder
 - a. Annuitization options.
 - b. Guaranteed minimum accumulation benefits (GMAB).
 - c. Guaranteed minimum income benefits (GMIB).
 - d. Guaranteed minimum withdrawal benefits (GMWB).
 - e. Guaranteed payout annuity floor (GPAF).
 - f. Tax equalization benefit.

2. Death benefits (GMDB)
 - a. Return of premium.
 - b. Reset, Roll-up and Ratchet or Step-up.
 - c. Earnings enhancement.
 - d. Combination of one or more of the above.
3. Nursing Home Waiver Rider.
4. Bailout Provision.
5. Market Value Adjustments (MVA).
6. Free Partial Withdrawals (FPW).
7. Annuity Purchase Rates Enhancements
 - a. Purchase Rates more favorable than Guarantees.
 - b. Waiver of Surrender Charge.
 - c. 2 Tiered Interest Credits.
8. Interest Index.
9. Equity Index.

III. CARVM

- A. Minimum standard for individual annuities.
- B. Minimum standard for group annuities unless issued to qualified pension plan or to IRA.
- C. Basic Application of CARVM
 1. Fund value is projected on guaranteed basis to determine future guaranteed benefits.
 2. Calculate PV of each future guaranteed benefit as of date of valuation – PV of future required valuation considerations.
 3. PV are taken at valuation basis for mortality and interest.
 4. CARVM reserve is greatest of the net PV so calculated.
- D. CARVM requires explicit recognition of future nonforfeiture values.
- E. Necessary to determine every possible future death benefit, nonforfeiture value and annuity payment at end of each contract year.

IV. Benefit Streams

- A. Integrated Benefit Streams is a series of possible benefit payments
 1. Integrated benefit streams ending in full withdrawal.
 2. Integrated benefit streams ending in annuitization.
 3. Integrated benefit streams ending via other elective benefits.
- B. Incidence Rates is probability that event will occur leading to benefit payment.

V. Determination of Valuation Interest Rates

A. Parameters determined at contract level

1. Method of valuation (issue year versus change in fund).
2. Whether or not contract permits cash settlement options.
3. Whether interest is guaranteed on premiums received 1 year after issue date.

B. Parameters determined at benefit level

1. Interest guarantee period and Plan Type.

C. Interest Guarantee Period

1. Stream ending in full withdrawal: # of years that guaranteed rate > valuation rate.
2. Stream ending in annuitization: # of years from issue date to annuitization date.
3. Stream ending via non-elective benefits: # of years from issue date to first benefit.

D. Plan Type

1. Withdrawal benefits without MVA: rates applicable under Plan Type C.
2. Annuitization: rates applicable under Plan Type A.
3. Non-elective benefits: rates applicable under Plan Type A.

VI. Single Premium Deferred Annuity (SPDA)

A. Successive fund value formula

$$1. {}_{t+1}FV_{[x]} = {}_tFV_{[x]} + GP_{[x]+t} - EC_{[x]+t} + IC_{[x]+t} - PW_{[x]+t}$$

B. BI (t) is income from annuity purchased at t using either FV or CV.

C. Benefit Streams

1. Partial Withdrawal Benefits.
2. Full Withdrawals Benefits.
3. Annuitization Benefits.
4. Death Benefits.

D. PV of Benefit Streams

1. For full withdrawal, it is the sum of
 - a. PV of withdrawal benefits using valuation rate for CV and survival factor.
 - b. PV of death benefits using valuation rate and mortality rates for death benefits
2. For annuitization, it is the sum of
 - a. PV of partial withdrawals using valuation rate for CV and survival factor.
 - b. PV of annuitization benefits using valuation rate for annuitization benefits and survival factor.
 - c. PV of death benefits using valuation rate and mortality rates for death benefits.

E. Greatest Present Value

1. Basic reserve is larger of
 - a. Greatest PV of CV benefit streams.
 - b. Greatest PV of annuitization benefit streams.
2. If $CV >$ basic reserve, excess is recorded in Exhibit 5G and total reserve = CV.

F. Calendar Year Valuations

1. Common mistake is to calculate benefits at end of future CY.
2. Benefits must be calculated at end of each contract year.

VII. Continuous CARVM

- A. Common question when contract has surrender charge expressed as decreasing % of fund.
- B. Projecting to BEGINNING of policy years would produce larger PV.
- C. CARVM requires calculating PV based on benefits at END of each policy year.
- D. New York requires reserves calculated using maximum PV on ANY DAY.
- E. New York methodology is called Continuous CARVM.

VIII. Handling Certain Common Product Features

- A. Nursing Home Waiver is classified as a Non-elective Benefit.
- B. Bailout Provisions
 1. Phantom surrender charge should not be considered when comparing CV to basic reserve.
 2. Inappropriate to use future contingent surrender charges that may not be available.
- C. Purchase Rates More Favorable than Guarantees
 1. Can produce large discontinuities in policy reserve at annuitization date.
 2. Basic reserve shall be no less than 93% of amount to purchase annuitization benefits.
- D. Market Value Adjustments
 1. Should be excluded from all calculations.
 2. Reason is that it would be inconsistent with supporting assets.
- E. 2 Tiered Interest Credits: one for CV and another for annuitization
 1. First fund is used to determine greatest PV of CV.
 2. Second fund is used to calculate fund balances to purchase annuities and discounted.
 3. CARVM reserve is greatest PV produced by 2 sets of calculations.

IX. Change-in-Fund Valuation Basis

- A. Under issue year basis, valuation rate is determined as of issue date.
- B. Under change-in-fund basis, rates depend upon when change in fund value occurred.
- C. Advantage of change-in-fund basis: initial maximum rates are usually greater.
- D. Methodology is not defined precisely under CARVM.
- E. It considerably complicates the calculations.

X. Fixed Premium Deferred Annuities

- A. Same principles apply.
- B. PV of valuation consideration is subtracted from PV of future benefits and results are compared to determine basic reserve.

XI. Flexible Premium Deferred Annuities are reserved assuming no future premiums are paid.

XII. Variable Annuities

- A. Separate account funds (sub funds) must be classified into asset classes
 - 1. Equity class.
 - 2. Bond class.
 - 3. Balanced class.
 - 4. Money market class.
 - 5. Specialty class.
- B. Project sub funds using credited rate = valuation rate – asset-based charges.

XIII. Actuarial Guideline XXXIV

A. Introduction

- 1. Cost of GMDB cannot be determined using a deterministic model.
- 2. Reserve is determined by assuming an immediate drop followed by recovery..
- 3. Mortality rates are from 1994 VA GMDB Table.

B. Steps to determine statutory reserve

- 1. Fund value, GMDB and other information must be determined as of valuation date.
- 2. Fund value is projected ignoring GMDB, at credited rate equal to valuation rate less asset-based charges.
- 3. From this projection, a set of benefit streams is determined.
- 4. Fund value is projected including GMDB, assuming fund value drops immediately and then recovers over the projection period.
- 5. From this projection, a stream of GMDB and a stream of NAR are determined.
- 6. An Integrated reserve is determined using all contract benefits, including GMDB.
- 7. A Separate account reserve is determined ignoring GMDB.
- 8. Reserve for GMDB = Integrated reserve – Separate account reserve ≥ 0 .

C. Projected Unreduced Account Values.

D. Base Benefit Streams

1. Cash value benefit stream.
2. Annuitization benefit stream.
3. Death benefit is the fund value.

E. Projected Reduced Account Values

1. For equity class: 14% immediate drop and Gross assumed return of 14%.
2. For bond class: 6.5% immediate drop and Gross assumed return of 9.5%.
3. For balanced class: 9% immediate drop and Gross assumed return of 11.5%.
4. For money market class: 2.5% immediate drop and Gross assumed return of 6.5%.
5. For specialty class: 9% immediate drop and Gross assumed return of 9.5%.

F. Projected Net Amount at Risk (NAR) = GMDB – reduced account value.

G. Integrated Reserve

1. CARVM reserve determined using all contract benefits, including GMDB.
2. It is the larger of
 - a. Greatest PV of CV benefit stream.
 - b. Greatest PV of annuitization benefit stream.

H. Separate Account Reserve

1. Reserve held ignoring the GMDB.
2. Basic reserve less PV of NAR.

I. Reserve for GMDB = Integrated Reserve – Separate Account Reserve ≥ 0 .

XIV. Actuarial Guideline XXXIX

A. Reserve for VA contracts with guaranteed living benefits (GLB) is the sum of

1. Aggregate reserves for VA contracts ignoring future revenues and benefits from GLB.
2. GLB reserves = Aggregate GLB charges from issue date to valuation date, for contracts still eligible for GLB.

B. Appointed actuary must perform standalone asset adequacy analysis of VAGLB reserve.

Source: Lombardi, Chapter 16, Risk-based Capital**Question 1**

(6 Points)

(a) What is the RBC Ratio of a company that has the following characteristics?

Dividend liability = 10M

Capital = 1 500M

Asset Valuation Reserve = 125M

$C_0 = 50M$

$C_{1a} = 100M$

$C_{1cs} = 300M$

$C_2 = 600M$

$C_{3a} = 100M$

$C_4 = 50M$

Source: Lombardi, Chapter 16, Risk-based Capital**Solution to Question 1**

(6 Points)

Statement**Points****(a) Calculation of RBC Ratio****6**

1. RBC Ratio = $\frac{\text{Total adjusted capital}}{\text{Authorized control level RBC resulting from formula}}$ 1

2. Total adjusted capital = Capital + Asset Valuation Reserve + 50% x Dividend liability 1

3. Authorized control level RBC = $C_0 + C_4 + \sqrt{(C_{1a} + C_{3a})^2 + C_{1cs}^2 + C_2^2}$ 1

4. Total adjusted capital = 1 500M + 125M + 50% x 10M = 1 630M. 1

5. Authorized control level RBC = $50M + 50M + \sqrt{(100M + 100M)^2 + 300M^2 + 600M^2}$
 $= 100M + \sqrt{(100M + 100M)^2 + 300M^2 + 600M^2}$
 $= 100M + \sqrt{40\,000M^2 + 90\,000M^2 + 360\,000M^2}$
 $= 100M + 700M = 800M$ 1

6. RBC Ratio = 1 630M / 800M = 203.75%. 1

TOTAL POINTS**6**