

Implementation of C-3 Phase II

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Background

- C-3 Phase I implemented 12/31/2000 covered fixed annuities and single premium life
- Also starting in 2000, there was specific C-3 held for Variable Annuity Guaranteed Living Benefits (Vaglbs); very punitive
- Still there was no C-3 held for Guaranteed Minimum Death Benefits (GMDBs)

Background (cont.)

- First American Academy of Actuaries (AAA) C-3 Phase II Report at Winter 2002 NAIC meeting
- Summer of 2005 an effective date of 12/31/05 was set for C-3 Phase II
- C-3 Phase II covers the risk of VA guarantees

Background :Examples of Variable Annuity Guarantees

- Guaranteed Minimum Death Benefit (GMDB)
 - Return of Premium (ROP) – guarantees return of premium upon death of annuitant adjusted for withdrawals
 - Reset – guarantees death benefit equal to account value on 5th contract anniversary; can also have 1 year resets
 - Ratchet – guarantees death benefit equal to account value on contract anniversary, but death benefit can never decrease; can also have monthly and 5 year ratchets
 - Rollup – Return of Premium with 5% simple interest up to 200% of premium
 - Combo – death benefit is maximum of roll-up and reset

Background :Examples of Variable Annuity Guarantees

- Guaranteed Minimum Income Benefit (GMIB)
 - Ratchet – in the event of an annuitization, the largest AV at any contract anniversary can be used to purchase a payout annuity at gtd purchase rates
 - Rollup – at annuitization premiums rolled up at 5% interest can be used to purchase a payout annuity at gtd purchase rates

Background :Examples of Variable Annuity Guarantees

- Guaranteed Minimum Withdrawal Benefit (GMWB)
 - Lifetime income is guaranteed based on percentage of income benefit base;
 - Percentage based on owner's age at first withdrawal
 - Income benefit base can be a ratchet or rollup

Background :Examples of Variable Annuity Guarantees

- Guaranteed Minimum Accumulation Benefit (GMAB)
 - Premium is guaranteed for some period of time, 3, 5, 7, or 10 years regard less of market performance

Example: Ratchet GMDB

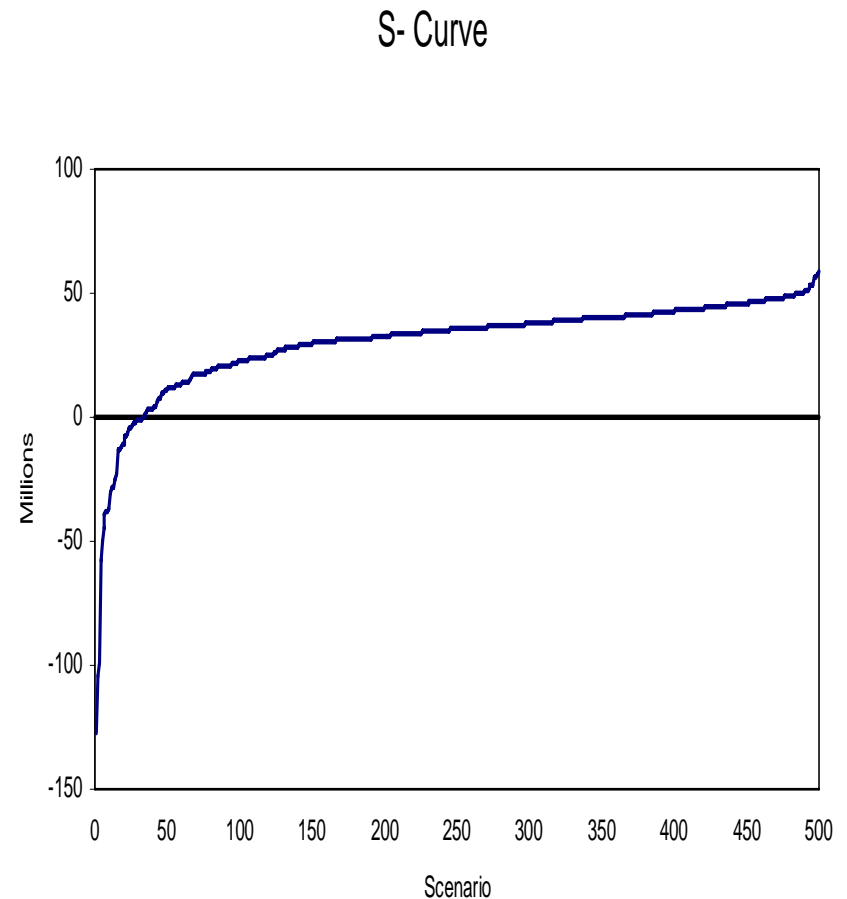
Contract Anniversary	Account Value	Death Benefit
0	100,000	100,000
1	110,000	110,000
2	120,000	120,000
3	90,000	120,000
4	80,000	120,000
5	75,000	120,000

The Need for a Principles Based Approach

- Vaglbs (Variable Annuity Guaranteed Living Benefits) are complicated benefits with high risk in tail scenarios
- Different companies have different product designs with a wide variety of risk
- One size doesn't fit all
- Require an approach that won't have to be tailored every time a new product design is created
- Varying product designs, target markets, scenarios, and assumptions mean varying capital and reserve needs
- Competition is fierce; the end of new product designs are nowhere in sight!
- Need to keep in step with international valuation

What is a left tail scenario?

- Left tail scenarios have very poor results meaning losses
- The worst scenarios are usually those in which markets climb and then plummet
- This gives a chance for the benefit to become in-the-money (ITM)



Sources of Guidance

- RBC Rules for Interest Rate Risk and Market Risk (LR024)
- June 2005 AAA Report titled “Recommended Approach for Setting Regulatory Risk-Based Capital Requirements for Variable Annuities and Similar Products
- September 2005 Practice Note for the Application of C-3 Phase II and VACARVM
- Larry Gorski
- Peer Reviewers – E &Y

Requirements of Regulation

- Stochastic Scenario Results
- Alternative Methodology
- Standard Scenario
- Reporting Requirements

Calculation of Stochastic Results

Scenario

1	S(1)	S(2)	S(3)...	S(n)
2	S(1)	S(2)	S(3)...	S(n)
3	S(1)	S(2)	S(3)...	S(n)
.				
.				
.				
1000	S(1)	S(2)	S(3)...	S(n)

- Calculate $S(t)$ = accumulated gain/deficiency for each time step of each scenario.
- Calculate the present value of $S(t)$ for each scenario. Find the minimum.
- Rank the present value results for each scenario.
- To calculate 90% CTE, average the worse 100.

Alternative Methodology

- Can only use if there are no VAGLBs
- Good option for small companies without a lot of resources
- Seriatim
- Attaches different factors to different policies

Standard Scenario

- This is a prescribed scenario that specifically dictates revenues, benefits, and other assumptions like lapses, withdrawals, mortality etc.
- Need to run this seriatim and crunched at possibly more than one valuation date
- Used as a floor and validation of crunch
- C-3 Market Rate Risk is max of standard scenario amount and stochastic result
- Obstacle - Code did not exist in modeling system so worked with Milliman to get code into ALFA

Calculation of Standard Scenario Amount (SSA)

- $SSA = CSV + ANR_n - \text{hedges and aggregate reinsurance}$
- $ANR_t = ANR_{t-1}(1+i) + (\text{margins} - \text{benefits})$
adjusted for taxes and reinsurance and with interest until end of year
- Note that because of reinsurance adjustment the SSA can actually be less than CSV

Calculation of Market Rate Risk

- Stochastic result is added to CSV and compared to the Standard Scenario Amount (SSA). The maximum is the Total Assets Required (TAR).
- Subtract Reserves from TAR. Apply smoothing and transition rules and tax effect to get market rate risk .

Implementation Phase at Nationwide Life -Scope

- Sent Scope statement from June 2005 AAA report to all Line of Business actuaries to see if they had products falling under scope
- Result
 - Individual Variable Annuities (IVA)– the entire block of business
 - Payout Annuities (PO)- variable annuities in payout phase
 - Individual Variable Life –GMAB rider was in development but wouldn't be sold before the 12/31/05 effective date

Implementation Phase - Early

- Called together a group of 15 people including a project manager, 8 FSA's, 4 ASA's, 1 computer specialist, 1 student
- Named a Project Lead
- Met bi-weekly starting in September 2005 just after the valuation symposium and then went to weekly in January
- Outlined tasks and assigned to subgroups

Subgroups and Responsibilities

- Hedging
- Standard Scenario – IVA
- Standard Scenario – PO
- Stochastic Assumptions IVA
- Stochastic Model (includes Liability crunching) IVA
- Fund Mapping IVA
- Stochastic Scenarios
- Stochastic Model PO
- Technology – actual running of stochastic IVA model
- Actual Calculation of Market Rate Risk

General Questions for entire group

- Integrated or non-integrated model? If non-integrated return for general account?
- Include Hedging?
- Generate our own scenarios or use scenarios from the Academy?
- Handling the C-3 Phase I portion of IVA?
- Use Peer Reviewer?
- Valuation Date: 9/30 or 12/31?
- Is Alternative Methodology an option?

Hedging

- Code did not exist to hedge so decided not to include any dynamic hedging this year
- Included puts held as of 12/31/05 in both the stochastic model and the standard scenario model
- Needed to add code to modeling system for valuation of puts using Black-Scholes Method

Stochastic Assumptions :Prudent Best Estimates

PBE=best estimate + PAD (provision for adverse deviation)

- Premium and subsequent deposits
- Withdrawals and lapses
- Mortality
- Annuitization Rates
- Purchase Rates
- Utilization rates for Guarantees
- Commission rates
- Expenses
- Revenue Sharing -controversial
- Asset Allocation, rebalancing, and transfer

Source for PBEs

- Experience studies-internal and external
- Pricing Assumptions
- Inforce data – commissions
- Baseline assumption and sensitivity testing

Fund Mapping

- Two different attempts at regression yielded unsatisfactory results
- Decided to go back to the basics
- Manually mapped 94 of the largest 100 funds representing 98% of assets to the 6 scenarios indices as well as 183 of the smaller funds
- Remaining funds mapped based on prior regressions, generic mapping for a given Morningstar category, and judgment

Obstacles

- Not getting AAA scenarios until late in January
- Run- time
- Conversion of model from PTS to ALFA
- Instructions were unclear sometimes
- Limitations of modeling system
 - Partial results
 - Modeling of assumptions

Crunching - IVA

- Company (LIC or LAC)
- Issue age
- Gender
- GMDB benefit info
- Living benefit info
- Beneficiary Protector info
- Surrender Charge and free partial withdrawal
- Extra Value Rider
- Reinsurance Treaty
- Equity%
- GMAB ITM%
- GMIB ITM%
- GMDB ITM%
- Issue Year
- Issue Qtr

Crunching

- NLIC IVA : 683,083 policies crunched to 93,745 cells
- NLAIC IVA: 36,105 policies crunched to 8,059 cells
- NLIC Payouts: seriatim run

Successes

- Reserve Adequacy Testing (RAT) process
 - Allowed fairly thorough review of model to get comfortable with results
 - Homegrown “utilities” that allowed easy manipulation of needed output
 - Sometimes the model would just “bomb”, but due to RAT all the kinks were worked out before running C-3 Phase II
- Fantastic team- everyone stepped up to the plate

Successes –Grid Computing

- Computer Grid allowed us to run stochastic scenarios in a timely manner
- 200 Blade processors w/1 GB of RAM
- Each scenario ran anywhere from 9-14 hours (no assets in projections)
- Actual turnaround time for submitting runs and harvesting results was 7-8 days
- Standard Scenario 2 workstations w/ 3 GB of RAM

Reporting Requirements

- Need to calculate line 35 Market Rate Risk by March 1 for JURAT
- June 15th Actuarial Certification and Memorandum supporting line 35
- See handout for specific requirements

Sensitivity Testing

- Ran the worst 10 scenarios with the exception of the crunching sensitivity where we ran more
- Ran on the entire population
- Measure was pv of accumulated after tax gain

Sensitivities

- Increased Mortality
- Decreased Mortality
- Increased utilization of GMIB benefits
- Decreased surrenders
- Increased surrenders
- Quarterly vs. Annual projections frequency
- Seriatim vs. Modeled inforce population
- No Revenue Sharing

Results

- After hundreds of hours of work our market rate risk was calculated to be 0
- Projection starts with actual stat reserves then immediately go to CSV, which causes a lot of profit to cushion poor results later
- Only one scenario with negative results
- Write up of memorandum took a significant amount of time