Welcome to Bermuda!

Annuity Reinsurance: Views on Experience

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Grotto Bay, May 13-15, 2008

Views on *Experience*

- From RIA's history
  - **What experience has taught us**
  - What 'Experience' do we possess?
- From RCL's ongoing operations
  - Experience Studies

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TJR1

Guaranteed Minimum Death Benefits

Death Benefit Development – Reach Threshold

- Frequency of ratchets
  - 1 day not ‘worth’ anything
- Annual rollups
  - 10% not viable
- 5% rollup plus annual ratchet?
  - Plus selection!
- Return of premium (persistency risk)
  - Some VA writers extend an automatic ratchet

TJR15

Guaranteed Minimum Death Benefits

Death benefit risk management, 1998

- Capacity becomes scarce resource
- Prominent reinsurers disappear
  - Risk taking capacity is scarce
  - Risk takers can and will discriminate
- VA writers must consider retaining risk
  - Not much pricing room for product development

TJR2

Guaranteed Minimum Income Benefit

How does GMIB differ from GMDB?

- Waiting period
- Annuitization rates
- Behavior
- Profits during income phase

TJR3

Guaranteed Min Benefits

Risk management, Capital Markets

- Each risk stands alone
- Use exchange traded options
- The price of certainty

Guaranteed Min Benefits

Risk management, Actuarial Techniques

- Risks viewed collectively
- Risks viewed as long term
- Use surplus to absorb fluctuations
- Uncertainty

TJR4

Tips on Risk Analysis

- Stochastic modeling
  - Best estimate assumptions
  - Examine those scenarios on the tail
  - What can you gain, what can you lose, rather than blind adherence to a percentile
  - Sensitivity testing

TJR5

Tips on Risk Analysis

- Catastrophic modeling
  - Simple deterministic model
  - When done right, very beneficial
  - Move beyond historical performance

How will reinsurance be structured in the future?

- Range of approaches, based on niche marketing
- Risk sharing, but beyond realistic outcomes
- Tie-in sales
- Move away from original terms, since reinsurers can afford to discriminate
- New business limits, time and $$

GMDB Issues

Present Conditions for DB reinsurance...

- Almost all current offerings are reinsurable
- Some rollups pulled, and ratchets remain
- Recommendations
  - Leverage existing profile
  - Retain rollups, and increase retail charges on all GMDB designs
  - Seek stop loss reinsurance to reduce tail risk

TJR6

GMDB Issues

Rollup versus Ratchet

- Assume a 100% stock contract of $1,000
- Assume a 50% (and 25%) drop in stocks
- Assume 0% (and 5%) recovery for 10 years
- What is claim amount in year 5?
  - ROP = $500 (and $43)
  - MAV = $500 (and $43)
  - 5% rollup = $776 (and $319)

TJR16

GMDB Issues

DB Wrap-up

- Reinsurers can and will discriminate
- VA writer must develop opinion on worst case, and build your reinsurance program accordingly

Living Benefit Issues

Present Conditions for LB reinsurance...

- Many current offerings are not reinsurable
- Recommendations
  - Leverage existing profile
  - WB: add waiting period
  - AB: restrict some assets to fixed account
  - IB: restrict annuitization to every x years

TJR12

Thoughts on LB Reinsurance

- Biggest Surprise?
  - Retail prices improve
    - Money available for risk management
- Some WB's can be reinsured
    - Pricing no longer requires imprudent assumptions on exercise rates (not so in 2003)
- Stop loss remains sound option
    - Especially in current environment

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Natural Hedging Issues

- Natural hedging requires similar underlying assets
- EEB sales disappointing
  - Combination GMDB/ EEB may become mandatory
- GMDB inforce promising
  - Scale is key
  - Must view as package
- All about improving your risk profile so you can weather a storm without panic

Natural Hedging - EEB

- Scenario #1 - 50% correction in year 2
  - PV GMDB claims = -$45 million
  - PV GMDB premium = $14 million
  - Net result is -$31 million

- Is one of the worst cases for GMDB, but how would EEB perform?
  - PV EEB claims = -$1 million
  - PV EEB premium = $22 million
  - Net result is $21 million

Conclusions

- Revisit creative ideas often!
- Talk has always been cheap. If a reinsurer says they're experts in risk, ask for proof.
- Variable annuity reinsurance is only hard for reinsurers that lack creative technical skills.

Arbitrage-free Techniques

- VA’s don’t usually fit into Black-Scholes
- Retail annuities are complex, but capital markets need simplicity
- Consider ROP GMDB

Arbitrage-free: GMDB Techniques

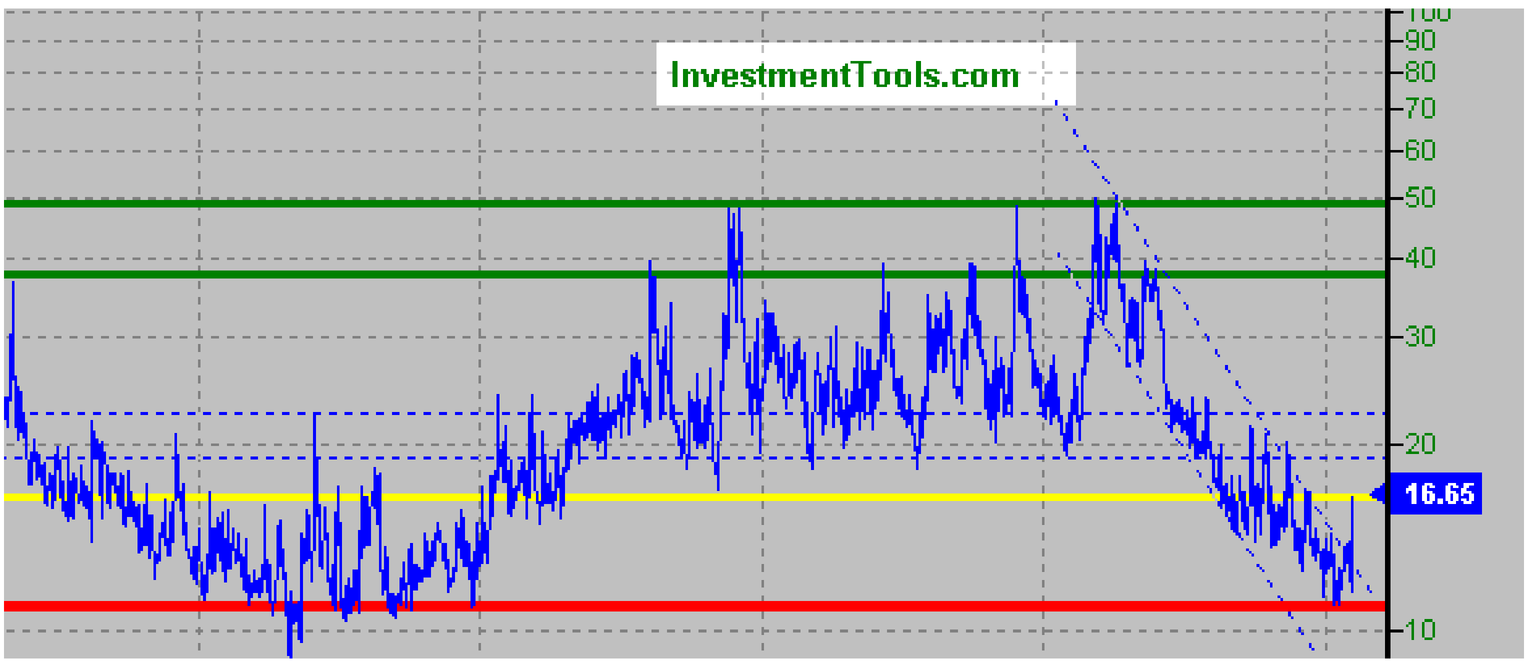
- Project mortality claims in each year using a worst-case equity scenario
  - Total 20 year claims of $37 million per $1 billion retail
- 20 put options, one per year
- B-S cost is $4.4 million at t=0
  - [Div = 2%, RFR = 3-5%, Vol = 16%]

Arbitrage-free: GMDB Limitations

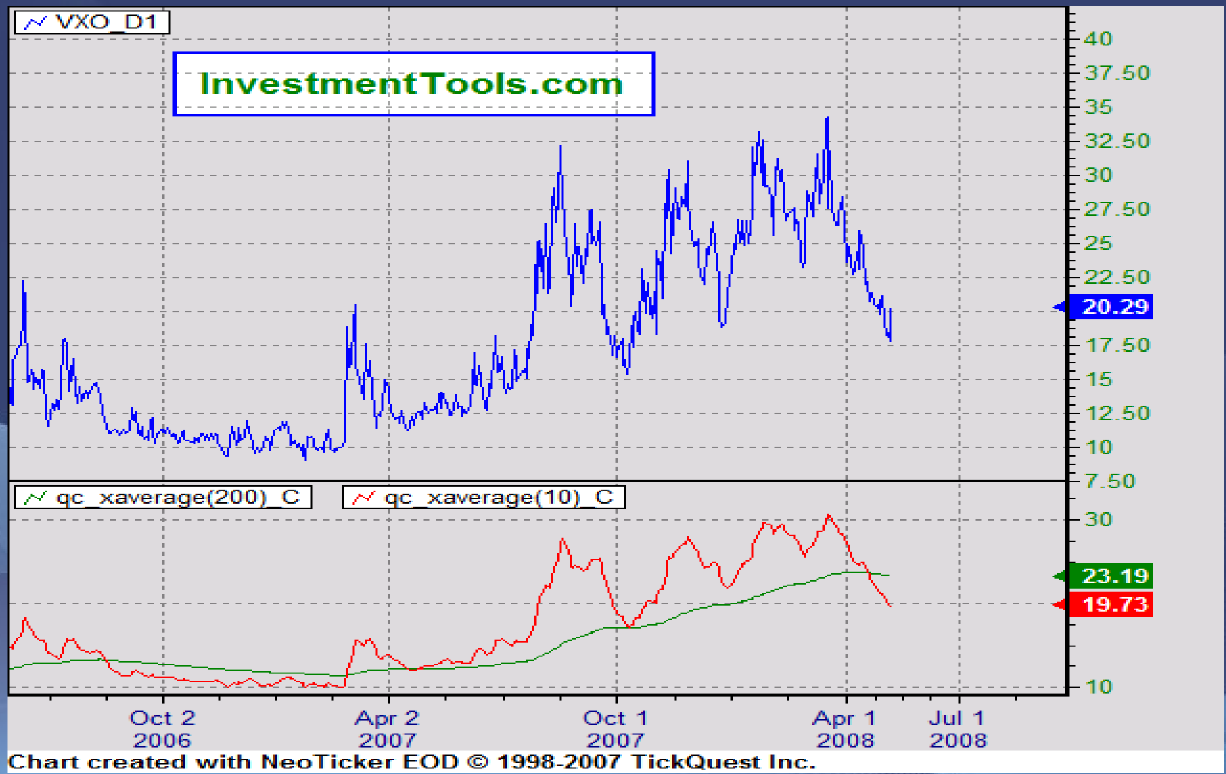
- Option cost not fixed. What if assumptions change?
  - $4.4 mil becomes $6.0 mil (vol=20%)
  - $6.0 mil becomes $7.0 mil (div=3%)

Arbitrage-free: GMDB Limitations

- Why worry about vols?
  - Vix last decade or so (1995-2005)



VIX since 2006



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Arbitrage-free: GMDB Limitations

- Equity allocation risk
  - 65% becomes 75%
  - $7.0 mil becomes $9.2 mil
- Persistency risk
  - Behavior, what if lapses drop with AV?
  - $9.2 mil becomes $10.9 mil

TJR10

Arbitrage-free: GMDB Limitations

- Basis risk
- Actual mortality deviations
  - Match period with claims since put options are not aggregate covers
- Expense risk
  - How frequently to re-hedge?
  - Risk management involves grouped seriatim data

Reinsurance and Residual Risks

- Terms are set for 2+ years, so impervious to changes in B-S, allocation
- Premiums paid over time, so persistency risk is lessened
- Risk of mortality fluctuations, basis risk, and expense risk is eliminated

TJR9

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TJR14

Experience *(Data)*

- Treaties we administer/analyze
  - 16 DB
  - 11 IB
  - 10 Other
- "The bear market [2000-02] caused a wide-spread shut-down of the VA reinsurance market."
  - Then what have we been doing the last 8 years?

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TJR8

Experience *(Data)*

- Treaty Performance
  - Amendments
  - Financial
    - More than $200 million cash flow, since inception
  - Data integrity
  - Analysis
    - Book of Business

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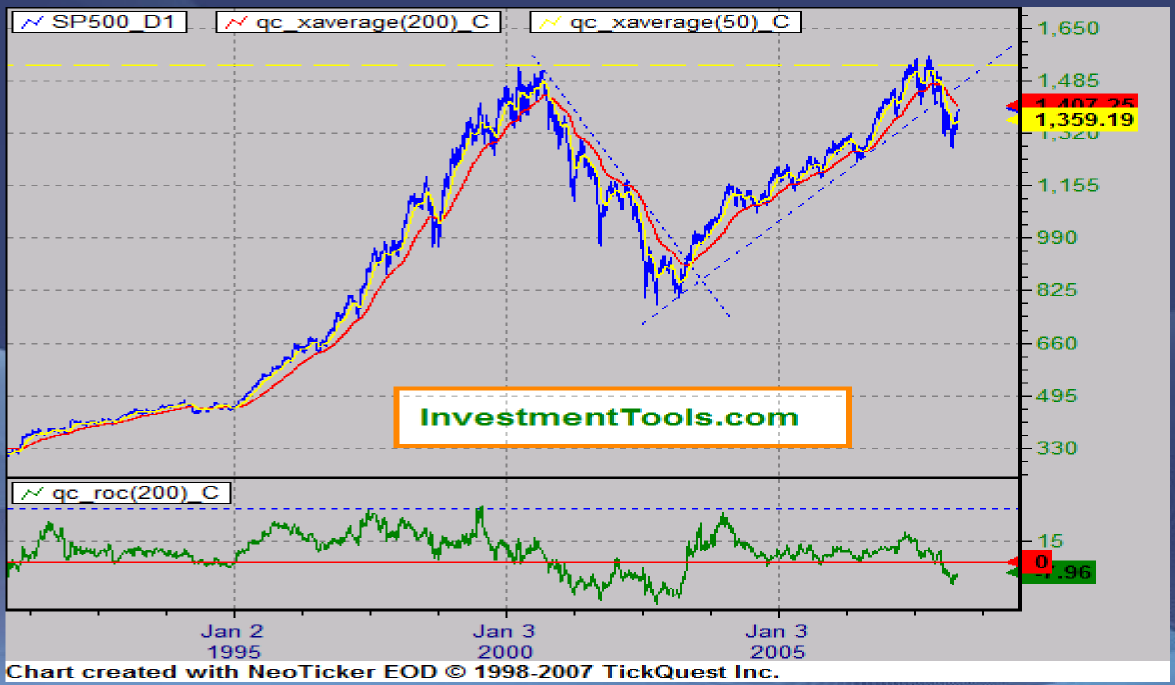
Experience *(Data)*

- Market Results SPX chart last 10 yrs



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  - **Experience Studies**

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Putting *Experience* to Work

- Data-focused organization
- Excess Capacity
  – We’ve always used extra time to analyze our treaties, and to assess other treaties
- RCL’s dental survey
  – Reinforced the industry appetite for insights, and the importance of data integrity

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Putting *Experience* to Work

- GMDB
  - Recent study is first step in understanding outcomes and selection
- Persistency
  - Logical next step, affects all annuities
  - Correlation between annuity performance and contract holder behavior
- Living Benefit utilization

Putting *Experience* to Work

- Retail Product Design
  - Accounting treatment considerations
  - Combination products
- New Reinsurance Structures
  - Aviation model
  - PBR and more