

Principles-based Reserves for Life Products

ACSW Meeting
June 16, 2006

David Neve, Co-chair, Life Reserve Work Group

Overview of Session

- Description of proposed principles-based approach (PBA) for Life Products
- Modeling results
 - 20-year level term product
 - UL shadow account product
- Implementation of the new PBA approach
- Update of Recent LRWG Developments

Principles-based Approach for Life Products

Overview

Definition of Principles-based

1. Captures all of the material financial risks, benefits, and guarantees associated with the contracts, including any ‘tail risk’ and the funding of the risks.
2. Utilizes risk analysis and risk management techniques to quantify the risks. This may include stochastic models or other means of analysis that properly reflect the risks of the underlying contracts.



Definition of Principles-based

3. Incorporates assumptions and methods that are consistent with, but not necessarily identical to, those utilized within the company's overall risk assessment process.
4. Permits the use of company experience to establish assumptions for risks over which the company has some degree of control or influence.
5. Provides for the use of assumptions set on a prudent best estimate basis that contain an appropriate level of conservatism when viewed in the aggregate.



Definition of Principles-based

In contrast, a “rules-based” approach:

- Relies on a static formula that may not capture all of the risks of the contract.
- Uses prescribed valuation assumptions that are the same across all companies, regardless of differences in the risk profile of companies.



Observations of moving to a Principles-based approach (PBA)

1. Is consistent with the global trend toward Enterprise Risk Management
2. Relies more on actuarial judgment
3. Requires more sophisticated tools
4. Requires that a stronger regulatory governance process be in place, including independent review



LRWG Charge and Scope

LRWG = Life Reserve Work Group

Charge:

- Develop a proposal for a new Principles-based statutory reserve method for life products
- Coordinate with C3 Phase III work group (which is working on RBC requirements for life products)

Scope:

- Initially, scope was limited to UL
- Now, scope is all life products



Decisions made by LHATF at June 8 LHATF Meeting

1. June drafts of Model Regulation and three Actuarial Guidelines were exposed for comment (are available on Academy website)
2. Gross Premium Valuation method will be used for Deterministic Reserve, but the Greatest PV of Accumulated Deficiency (VACARVM approach) will be used for Stochastic Reserve.
3. Initial approach for PBA life reserves will be prospective only. May allow retroactive application to inforce (or subset) later.



Decisions made by LHATF

4. Determining assumption margins – general support for LRWG recommendation:
 - Determining margins will be left to the professional judgment of the actuary, rather than imposing prescribed numeric limits, caps or ranges on margin levels.
 - Robust guidelines will be provided in ASOPs, Actuarial Guidelines and regulations to identify the considerations and procedures that the actuary must follow.
 - If acceptable guidelines to establish margins are not established, then LHATF may decide to impose specific numeric limits, caps or ranges for some margins.



Basic Framework (cont)

Reserve is the greater of:

1. A deterministic, seriatim, single scenario reserve calculation
2. A stochastically derived reserve (if needed) using a prescribed CTE level

Since the stochastic reserve is done in the aggregate, risk offsets between contracts are recognized.



Basic Framework (cont)

Deterministic Reserve:

- Based on Gross Premium Valuation (GPV) method.
- $GPV \text{ reserve} = PV \text{ of future benefits and expenses, less } PV \text{ of future gross premiums.}$
- Is not designed to capture tail risk
- Is subject to a cash surrender value floor on a contract by contract basis



Basic Framework (cont)

Stochastic Reserve:

- Multiple scenarios will be used to properly capture the “tail risk” of the contract (risks that have high impact, but low probability)
- Current thinking is that only interest rates and equity returns will be modeled stochastically
- Will use a CTE (conditional tail expectation) level that is set by regulators, such as 65 CTE



Basic Framework (cont)

Stochastic Reserve, cont:

- Reserve for each scenario will be based on the same method used for C3P2 and VACARVM, that is, the Greatest PV of Accumulated Deficiencies (GPVAD)
- GPVAD reserve = starting assets plus the greatest PV of accumulated deficiencies in any future year
- The accumulated deficiency for each year in the projection is determined by taking the difference between the working reserve (a proxy for the statutory reserve) and the accumulated assets.



Basic Framework (cont)

“Prudent Best Estimate” Assumptions

- Assumptions will be based on “best estimates” plus a margin that includes a provision for adverse deviation and estimation error.
- Margins will be determined by the actuary using professional judgment, subject the guidelines established by the NAIC and ASOPs.
- The NAIC may prescribe numeric limits, caps or ranges on certain margins.



Basic Framework (cont)

Asset Model Is Needed to Project Cash Flows

- Asset Model is used to determine:
 - Discount rates
 - Earned rates for surrender benefits
 - Assets for GPVAD calculation for Stochastic Reserve
- Discount rates
 - Based on projected portfolio rates in each year
 - New money treasury rates will be prescribed for Deterministic Reserve; modeled for Stochastic Reserve



PBA Life Reserves

Implementation Example

Implementation of PBA Reserves

- Assumes the company is in the 3rd year after the effective date of PBA
- Assumes that the new PBA approach to reserves was not applied to the entire inforce block.

Implementation of PBA Reserves: Product Portfolio

Products currently being issued:

- Accumulation UL, no secondary guarantees
- UL with Shadow Account
- 20-year level term
- Variable UL

Implementation of PBA Reserves: Product Portfolio

Products No longer issued but on the books:

- Traditional whole life (numerous policy forms)
- Level term (numerous policy forms)
- ART Term (numerous policy forms)
- UL with SG (numerous policy forms)
- UL with no SG (numerous policy forms)

Implementation of PBA Reserves:
Reserve Valuation Process

Implementation of PBA Reserves: Reserve Valuation Process

1. Select Cash Flow model
2. Finalize Prudent Best Estimate valuation assumptions
3. Test blocks for Stochastic Reserve exclusion
4. Define scenarios for Stochastic Reserve
5. Define Asset Segments; allocate assets
6. Review assumptions, methodologies, and conclusions with PBA Reviewer (pre-release basis).

Implementation of PBA Reserves: Reserve Valuation Process

7. Build liability populations for Stochastic Reserve
8. Calculate Net Asset Earned Rates
9. Perform PBA reserve calculations
10. Complete aggregate Asset Adequacy Analysis
11. Complete certification and documentation requirements
12. Review documentation with PBA reviewer (post-release basis)

Step 1: Select Cash Flow Model

- Will need projection of cash flows for each future year. Need to project:
 - future liability cash flows (benefits, expenses, etc)
 - asset cash flows from starting assets (investment earnings, maturities, prepayments, etc).
- Model Regulation allows cash flows to be determined using methods and techniques used for cash flow testing under existing Guidelines and ASOPs.

Select Cash Flow Model, cont.

Question: Use same Cash Flow Model used for cash flow testing, or develop new one?

Answer: Use same model as cash flow testing

- Expect most companies will use existing cash flow testing models
- Need to determine what modifications (if any) need to be made to cash flow model.

Step 2: Finalize Prudent Best Estimate Valuation Assumptions

Assumptions not stochastically modeled:

- Mortality
- Policyholder Behavior *
- Expenses *
- Asset Defaults
- Non-guaranteed elements *

Assumptions stochastically modeled:

- Interest rate movements
- Stock market performance

* dynamically modeled (i.e. will vary by scenario)

Prudent Best Estimate Assumptions, cont.

For assumptions not stochastically modeled:

Best Estimate:

Actuary's most reasonable estimate of the risk, with no provision for adverse deviation or estimation error

Prudent Best Estimate:

Best estimate adjusted for a margin that reflects a provision for adverse deviation and estimation error

Margin:

Determined by the actuary using actuarial judgment.
Note: some margins may be subject to limits and/or ranges determined by regulators.

Prudent Best Estimate Assumptions, cont.

Work with Pricing Area to update best estimate assumptions used in pricing

- What new experience studies have been done since initial pricing?
- Has experience changed enough to justify revising an assumption that was used in pricing for valuation purposes?

Conclusions:

- New lapse study has been completed since initial pricing indicating that valuation lapse assumptions need to be adjusted.
- Other assumptions need no adjustment.

Step 3: Stochastic Modeling Exclusion

- Review product portfolio for blocks with little or no tail risk.
- Two candidates for stochastic modeling exclusion:
 - 20-year term product with 90% reinsurance of mortality risk.
 - UL block with no secondary guarantees
- It must be demonstrated that the Deterministic Reserve adequately provides for the risks of the block in order to elect the Stochastic Reserve exclusion.

Stochastic Modeling Exclusion, cont.

Demonstration needs to:

- indicate that there is a reasonable assurance that the Stochastic Reserve will not be greater than the Deterministic Reserve for the current year.
- provide sufficient supporting information for an independent PBA reviewer to assess the reasonableness of the exclusion.
- If applicable, provide an effective evaluation of the residual risk exposure resulting from any risk mitigation techniques used, such as hedge instruments and reinsurance.

Stochastic Modeling Exclusion, cont.

Method used for stochastic exclusion test:

- Project cash flows using actual asset & liability records for the block to be tested as of 6/30.
- Calculate the Deterministic Reserve (DR) per the Model Regulation on the block being tested.
- Calculate several deterministic reserve amounts using a set of adverse deterministic interest rate scenarios (e.g. interest rates increase dramatically, and fall suddenly).
- If impact of adverse scenarios on the reserve is immaterial, then conclude the Stochastic Reserve (SR) is not necessary.

Stochastic Modeling Exclusion, cont.

Result of testing 20-year term:

- Immaterial differences between the various deterministic reserve levels (less than 1%).
- Conclusion: will only calculate Deterministic Reserve for this block.

Results of testing UL with no secondary guarantees:

- Result: material differences between the DR and the various deterministic reserve levels (up to 5%).
- Conclusion : Need to calculate the Stochastic Reserve for this block

Step 4: Define Stochastic Scenarios

Four Options:

1. Prescribed stochastic generators and model parameters
2. Pre-packaged scenarios generated from prescribed generators and model parameters
3. Pre-determined scenarios sets *
4. Stochastic models developed by the company if mandated calibration criteria established by the NAIC are met.

* A small number of prescribed paths that are not necessarily a representative sample of a larger set of stochastic paths, but a conservative sample created explicitly for PBA reserves. (This option creates an alternative for small companies)

Define Stochastic Scenarios, cont.

Conclusion: option #2: Prepackaged scenarios

- A representative sample of 1,000 scenarios was selected using the prescribed scenario picking tool.
- Representative scenarios were selected for:
 - U.S. Treasury rates
 - S&P 500 returns for GA assets
 - Fund performance for SA assets, using a blend of prepackaged scenarios for each fund
- Integration of interest returns and equity returns was done using prescribed method developed by the NAIC

Step 5: Define Asset Segments and Allocate Assets

Definition of “Asset Segment” (from proposed Model Reg):

A grouping of policies in a manner that generally follows the company’s asset segmentation plan, investment strategies, or approach used to allocate investment income.

Conclusion: use the same asset segments used in company’s asset segmentation

Asset Segments, cont.

Current Asset segments

Segment 1: All traditional whole life products

Segment 2: All term products

Segment 3: All UL products

Segment 4: All Variable UL products

Asset Segments, cont.

Segments with PBA products

Segment 1: None

Segment 2: 10% of total assets *

Segment 3: 15% of total assets *

Segment 4: negative asset balance *

* based on starting assets for each segment
(see next slide)

Asset Segments, cont.

Determine the starting asset amount

- Equals estimated PBA reserve, less any SA assets
- Estimated PBA reserve is based on pricing model. May eventually use prior years actual PBA reserve to estimate the current year PBA reserve
- Estimated PBA reserve is:
 - Segment 2: Term: 50% of premium
 - Segment 3: UL: 102% of account value
 - Segment 4: VUL: 90% of total account value

Asset Segments, cont.

Note: starting asset for segment 4 is negative:

| | | |
|----------------|-------|---------|
| Account value: | SA | 95,000 |
| | GA | 5,000 |
| | Total | 100,000 |

Estimated PBA reserve: 90,000 (90%)

SA Assets: 95,000

Starting assets: (5,000)

Asset Segments, cont.

Allocation of assets

For segments 2 and 3, the modeled assets in the PBA cash flow model will equal a pro-rata slice of each asset in the respective asset segment.

Segment 2: 10% of each asset

Segment 3: 15% of each asset

For segment 4, assets will be based on a negative cash balance (borrowing position) with an appropriate borrowing rate.

Asset Segments, cont.

Treatment of IMR

- Allocate the total IMR to each PBA block using an appropriate method.
- If positive, may include as negative asset (allows additional income producing assets to be used)
- If negative, must include as a positive asset (reduces income producing assets in starting assets).

Modeling SA Funds for Variable Products

- Similar to approach used for C3 P2
- Determine number of fund categories (i.e. large cap stocks, international stocks, etc.)
- Allocate each fund to a category
- Total investment return for each fund category will be determined by weighting the returns from selected prepackaged fund categories.
 - For Deterministic Reserve, path of returns is prescribed for each fund.
 - For Stochastic Reserve, paths of returns are stochastically generated for each fund

Step 6: Review Assumptions & Methods with PBA Reviewer

Once assumptions and methods are finalized, a meeting is scheduled to review conclusions with an independent peer reviewer (PBA Reviewer) on a “pre-release” basis.

Meeting is scheduled for early December.

An actuarial report is prepared that documents the assumptions, methods and conclusions, and is sent to the PBA reviewer in advance of the meeting.

“Pre-release” Review

- PBA reviewer needs to be satisfied that the valuation was done properly
- PBA reviewer will evaluate the judgment used by the valuation actuary rather than auditing
- Purposes of review are to:
 1. Improve the quality of the actuarial valuation
 2. Reduce the likelihood of material errors
 3. Provide pre-release “early warning”

Pre-release Review Conclusions

Two changes were identified by the PBA Reviewer during the pre-release review:

1. Mortality margin on 20-year term product is too low. Need to increase margin on mortality to produce a Z-value in the 8-9 range (Z-value will be defined later).
2. There is not enough experience to justify increasing the lapse assumption on the UL with shadow account product. Lower the lapse assumption back to the initial pricing level.

Valuation Actuary incorporates these changes before performing reserve calculations.

Step 7: Build Liability Populations

- Similar to cash flow testing procedures -- will build populations as of 9/30.
- For Deterministic Reserve (DR) : use actual 9/30 liability records at the contract level.
- For Stochastic Reserve (SR): use same policy groupings (i.e. modeling cells) used for cash flow testing based on 9/30 data.
- The Stochastic Reserve will be determined in the aggregate for all policies.

Build Liability Populations, cont.

Need to adjust results from 9/30 to 12/31 using an appropriate method.

- Calculate the DR and SR prior to year end using 9/30 data.
- Determine final Reported Reserve as of 9/30.
- After year end, calculate the DR reserve using 12/31 data.
- Multiply the 9/30 Reported Reserve by the ratio of the 12/31 DR to the 9/30 DR.

Step 8: Calculate Net Asset Earned Rates

For each asset segment:

- Determine a path of projected portfolio Net Asset Earned Rates for each year (or month, etc)
- This path of projected portfolio Net Asset Earned Rate will differ by each asset segment
- Only returns on GA assets are used (not SA returns)
- The Net Asset Earned Rate for each year (or month etc) will equal:

$$\text{Net Investment Income} / \text{Invested Assets}$$

Net Asset Earned Rates, cont.

Thus, the Net Asset Earned Rates will depend on:

- Projected Net Investment Earnings from the portfolio of starting assets
- Projected Net Investment Earnings from reinvestment assets
- The pattern of projected net liability cash flows (premiums less benefits and expenses)
- Pattern of projected asset cash flows from starting assets and reinvestment assets

Net Asset Earned Rates, cont.

Starting Assets:

Fixed income GA assets (bonds, commercial mortgages)

- Project gross investment earnings based on the contractual provisions for each asset.
- Default costs and investment expenses determined using prudent best estimate assumptions
- Asset optionality (i.e. call provisions, prepayments) will be modeled using prudent best estimate assumptions.
- Realized capital gains and losses due to asset sales (if any) will be projected following the company's current investment strategy.

Net Asset Earned Rates, cont.

Starting Assets, cont:

Equity investments in GA (stocks, real estate, etc)

- Determine number of equity categories (i.e. large cap stocks, international stocks); allocate assets to categories
- Total investment return for each category will be projected based on a path of S&P 500 returns, with total return on each category reflecting differences from S&P 500 return.
 - For Deterministic Reserve, path of S&P 500 returns is prescribed.
 - For Stochastic Reserve, paths of S&P 500 returns are stochastically generated.
- Investment expenses based on prudent best estimates

Net Asset Earned Rates, cont.

Reinvestment Assets:

- Net cash flows will be reinvested in a manner consistent with the company's investment policy for each asset segment.
- Disinvestment will be consistent with the company's investment policy and reflect reasonable short-term borrowing assumptions
- Net investment earnings on reinvested assets is based on:
 - Prescribed new money rates for fixed income assets
 - Prescribed S&P 500 returns for equity investments

Net Asset Earned Rates, cont.

New money rates, Deterministic Reserve:

- An ultimate new money treasury yield curve will be prescribed, based on a 65 CTE analysis of historical treasury curves.
- New money treasury curves for each future period will be based on a linear interpolation from current treasury curve at valuation date to the ultimate treasury curve.
- Spread over treasuries (net of defaults and invest. exp) is based on prudent best estimate, subject to an aggregate cap set by regulators.

Net Asset Earned Rates, cont.

New money rates, Stochastic Reserve:

- New money treasury curves will be stochastically generated for each year for each scenario.
- Spread over treasuries (net of defaults and invest. Expenses) is based on prudent best estimate, subject to an aggregate cap set by regulators.

S&P 500 equity returns:

- Deterministic Reserve: prescribed
- Stochastic Reserve: stochastically generated for each year for each scenario.

Net Asset Earned Rates, cont.

Net Investment Earnings in each period equals:

- Gross Investment income plus capital gains and losses minus default costs and investment expenses.
- Policy loan interest (net of investment expense) will be included
- Shall also include income from hedge instruments and amortization of the IMR.

Invested assets shall be determined in a manner that is consistent with the timing of cash flows and length of each future period (e.g. month, quarter, year, etc)

Net Asset Earned Rates, cont.

The Discount rates used in the Gross Premium calculation will be set equal to the path of Net Asset Earned rates

The path of Net Asset Earned rates will also be used to determine:

- 1) Asset crediting rates for surrender benefits
- 2) Other cash flow items impacted by earnings rates (such as the inflation assumption on expense growth)

Step 9: Perform reserve calculations

1. The Deterministic Reserve is a seriatim, policy by policy calculation.
2. The Stochastic Reserve is determined in the aggregate across all policies (except those subject to the SR exclusion)
3. A Conditional Tail Expectation (CTE) level of 65 is assumed for the Stochastic Reserve (will be determined by regulators)
4. Reserve calculations are based on the 9/30 data, and then the results are adjusted to 12/31 (as described previously)

Perform reserve calculations, cont.

Deterministic Reserve

1. Calculate the Seriatim Reserve for each policy, which equals $A + B - C$, where:

$A =$ PV of future benefits

$B =$ PV of future expenses (excluding FIT)

$C =$ PV of gross premiums and other revenue

The PV amounts are calculated using the path of discount rates for each asset segment

2. For each policy, take the greater of the cash surrender value and the Seriatim Reserve
3. The Deterministic Reserve equals the sum of the result from from step 2 for all policies.

Perform reserve calculations, cont.

Stochastic Reserve

1. Calculate the Scenario Reserve for each Scenario, which equals $A + B$:

$A =$ Starting Assets

$B =$ Greatest PV of accumulated deficiency

Where the accumulated deficiency in each year is the working reserve less the accumulated assets, and the PV amount is calculated using the path of discount rates for each asset segment,

2. Rank the Scenario Reserves from lowest to highest
3. Take the average of the highest 35% (the highest 350 of the 1,000) Scenario Reserves
4. Add the DR reserve to step 3 for policies subject to the Stochastic Reserve exclusion

Perform reserve calculations, cont.

Reported Reserve

1. Take the greater of the DR and SR as of 9/30.
2. Adjust the result of step 1 to reflect changes from 9/30 to 12/31 using the ratio of the DR as of 12/31 and 9/30.

Results:

Deterministic Reserve, 9/30: 425,000

Stochastic Reserve, 9/30: 450,000

Reported Reserve, 9/30: 450,000

Deterministic Reserve, 12/31: 437,000

Reported Reserve, 12/31: 462,705 = 450,000 * (437/425)

Step 10: Complete Aggregate Asset Adequacy Analysis

Principles-based versus Asset Adequacy Analysis

- Both involve more actuarial judgment than current “rules-based” valuation approach
- Asset adequacy analysis has few limits and controls; actuary has a high degree of discretion in setting assumptions
- In contrast, the Principles-based approach will have limits placed within the framework

Asset Adequacy Analysis, cont.

- Still need to perform asset adequacy analysis on all policies in the aggregate for the purpose of the Actuarial Opinion as required by the AOMR
- Two possible options regarding PBA reserves:
 1. PBA reserves are added to formulaic reserves and cash flow testing is performed on a combined basis.
 2. Per ASOP #22, the actuary may consider the PBA approach an acceptable asset adequacy analysis method, and thus, could exclude PBA reserves from cash flow testing.
- Conclusion: use option #1.

Step 11: Complete Documentation Requirements

Model Reg requires the actuary to prepare an Actuarial Report that includes:

- A description of the blocks subject to PBA
- Disclosure of the results of the DR and SR calculations
- Distribution of the Scenario Reserves
- Support for stochastic modeling exclusion
- Analysis of the impact of aggregation
- Disclosure of embedded spread on existing assets
- Documentation supporting assumptions

Step 12: Review Documentation with PBA Reviewer

Once the Actuarial Memorandum is completed, a “post-release” review is scheduled with the PBA Reviewer.

“Post Release” Review

Final evaluation that valuation actuary has:

1. Prepared proper documentation
2. Made proper disclosures
3. Complied with regulatory requirements

PBA Reviewer Sign-Off (Sample)

- I have reviewed the PBA valuation performed by [valuation actuary] and in my opinion:
 - All material risks are captured
 - The methods used are appropriate*
 - The models used are reasonable* for the purpose
 - The assumptions used are supportable*
 - The margins in the reserves are supportable*
 - The actuary has followed are relevant laws, regulations, AGs, and ASOPs
- Disclaimer: I am not expressing any opinion regarding adequacy of the reserves or solvency of the insurer.

* *Terms to be defined later*

Hot Topics under Discussion by the LRWG

Hot Topics

1. Incorporating GPVAD method into Stochastic Reserve calculation
 - Definition of “working reserve”
 - Impact on stochastic modeling exclusion
2. Small company issues
3. Treatment of equity-indexed UL
4. Modeling returns on equity assets for DR
5. Treatment on non-guaranteed elements



Hot Topics

6. Incorporating more robust guidance when actuarial judgment is required.
7. Aggregation level (degree of risk offsets) for Stochastic Reserve calculation
8. Modeling of Hedges
9. Embedded spread on starting assets
10. Tax treatment of the new PBA reserve (section 807 and 7702 impacts)



Modeling Results

20-year level term product
UL shadow account product

20 Year Term Product Description

| | |
|--------------------|--|
| Plan of Insurance: | 20 Year Level Term Guaranteed Premiums No Renewal Option after 20 yrs. |
| Gender/Issue Ages: | Male, 45 |
| Risk Class: | Best Non Smoker Class |

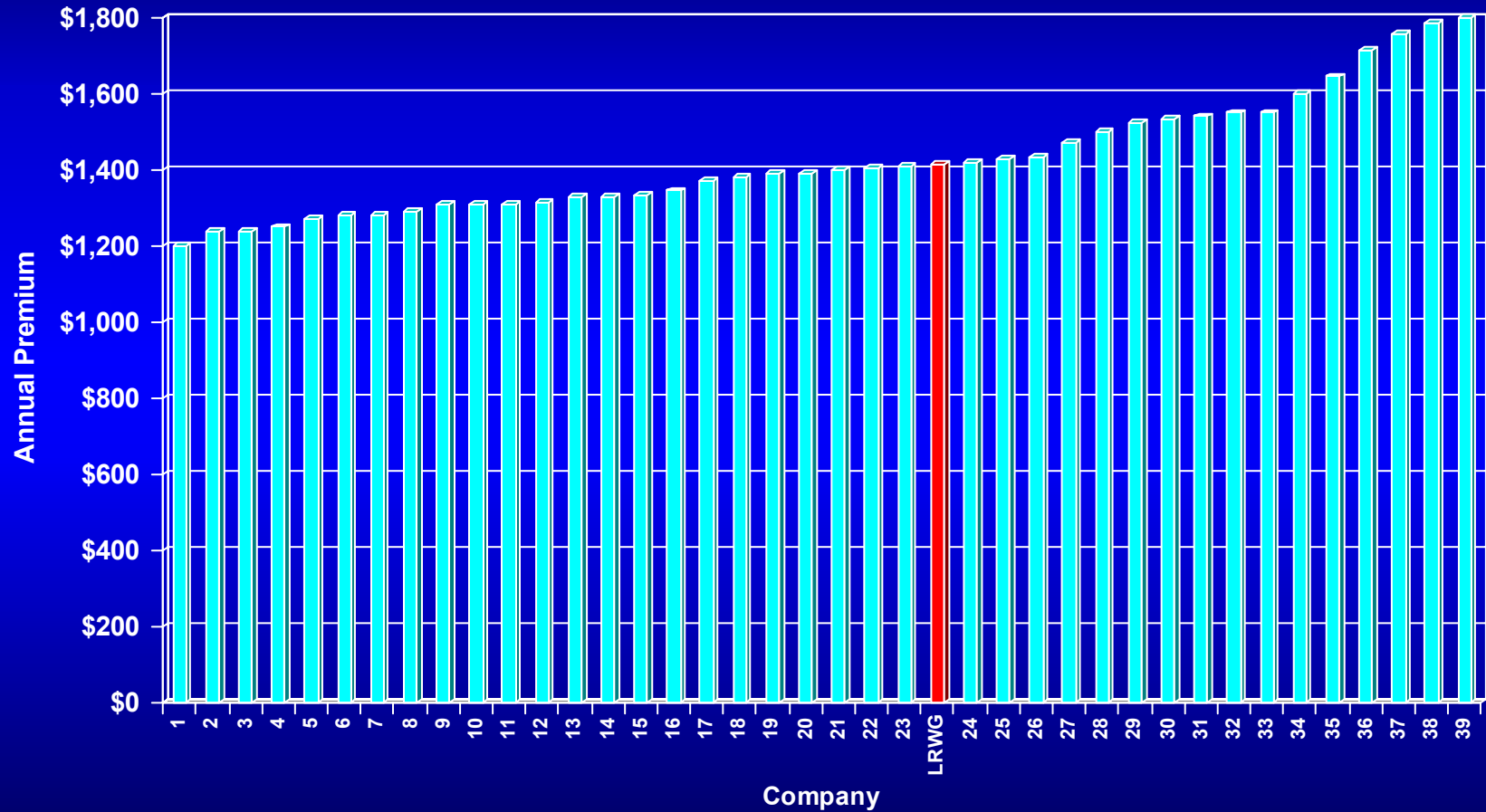
| <i>Premium Information</i> | <i>Age 45</i> |
|--|---------------|
| Annual Rate per \$1000 | \$1.35 |
| Policy Fee | \$65.00 |
| Total Premium \$1,000,000 Face | \$1,415.00 |
| | |
| Pre-Tax IRR on Distributable Earnings ⁽¹⁾ | 10% |

(1) Reflecting capital of 100% of claims and 5% of reserves. Reserves using PBE assumptions



Market Perspective Premium Comparison

Issue Age 45, Best Class – Annual Premiums for \$1,000,000 Face Amount



Three Margin Levels

Numbering consistent with LRWG Reports

Best Estimate: No Margins

Level 2: Deterministic Interest, but mortality margin of 9.375 deaths per 1000 divided by e_x , 30% lower lapse rates

Level 4: Deterministic interest scenario, mortality margin of 3.2%, no other margins



20 Year Term Examples: Deterministic Terminal Reserves at Different Margin Levels

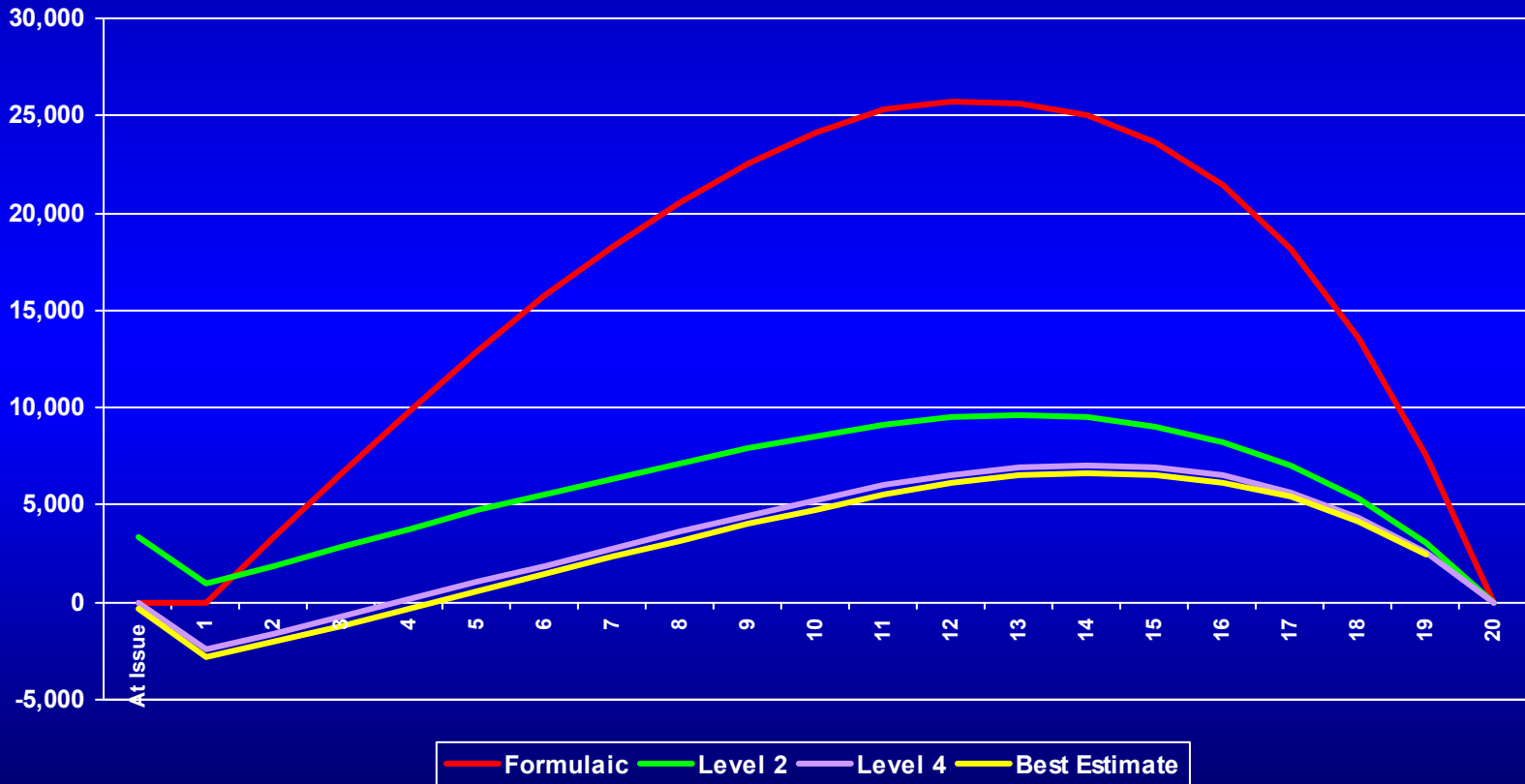
Male, 45, Best Class, \$1,000,000, Annual Premium of \$1,415.00.

| <u>Policy Year-End</u> | <u>Current Formulaic</u> | <u>Best Estimate</u> | <u>PBA Level 2</u> | <u>PBA Level 4</u> |
|----------------------------|------------------------------|--------------------------|------------------------|------------------------|
| At Issue | \$ 0 | \$(362) | \$3,309 | \$3 |
| 1 | \$ 0 | (2,834) | 947 | (2,448) |
| 2 | 3,386 | (2,026) | 1,888 | (1,618) |
| 3 | 6,673 | (1,184) | 2,813 | (760) |
| 4 | 9,859 | (309) | 3,752 | 130 |
| 5 | 12,892 | 611 | 4,699 | 1,063 |
| ... | ... | ... | ... | ... |
| 10 | 24,145 | 4,791 | 8,554 | 5,263 |
| 15 | 23,686 | 6,567 | 9,068 | 6,956 |
| | | | | |
| Discount Rate Margin | | None | Deterministic | Deterministic |
| Mortality Margin | | None | 0.009375/ex | 3.2% |
| Lapse Rate Margin | | None | 30% | None |



20 Year Term Examples: Deterministic Terminal Reserves at Different Margin Levels

Male, 45, Best Class, \$1,000,000, Annual Premium of \$1,415.00.



Possible approach to compare aggregate impact of all assumption margins

The LRWG is exploring the use of a number we are calling “Z” to provide for the quantitative comparison of the aggregate impact of all assumption margins. It is defined as follows:

$$Z = \frac{\text{Reserve held} - \text{Best estimate liability}}{\text{Present value of capital requirement}}$$

“Z” represents the amount by which the pre-tax return on capital is expected to exceed the return on invested assets:

$$\text{ROC} = Z + i \quad (\text{pre-tax})$$



Possible approach to compare aggregate impact of all assumption margins

- Given this connection with the return on capital, one can determine whether the aggregate impact of all margins are within a reasonable range.
- For these illustrations, the level of capital was set equal to 100% of claims plus 5% of the reserve.
- “Z” could be used as a disclosure item to compare the aggregate impact of all assumption margins.



20 Year Term Examples: Comparison of Z Levels and Deterministic Reserve Margins

Male, 45, Best Class, \$1,000,000, Annual Premium of \$1,415.00.

| <u>Policy Year</u> <u>Z Values</u> | <u>Current</u> <u>Formulaic</u> | <u>Best</u> <u>Estimate</u> | <u>PBA</u> <u>Level 2</u> | <u>PBA</u> <u>Level 4</u> |
|---------------------------------------|------------------------------------|--------------------------------|------------------------------|------------------------------|
| At Issue | 4.5% | 0.0% | 45.7% | 4.5% |
| At 10 Years | 228.4% | 0.0% | 44.4% | 5.6% |
| | | | | |
| Discount Rate Margin | | None | Deterministic | Deterministic |
| Mortality Margin | | None | 0.009375/ex | 3.2% |
| Lapse Rate Margin | | None | 30% | None |



Stochastic Reserve?

- Not Materially Different than Deterministic
- Need to update for GPVAD approach

UL Product Description

| | |
|--------------------|---|
| Plan of Insurance: | UL – No Lapse Guarantee Shadow Fund Design (significant sales loads) |
| Gender/Issue Ages: | Male, 45 |
| Risk Class: | Best Non Smoker Class |

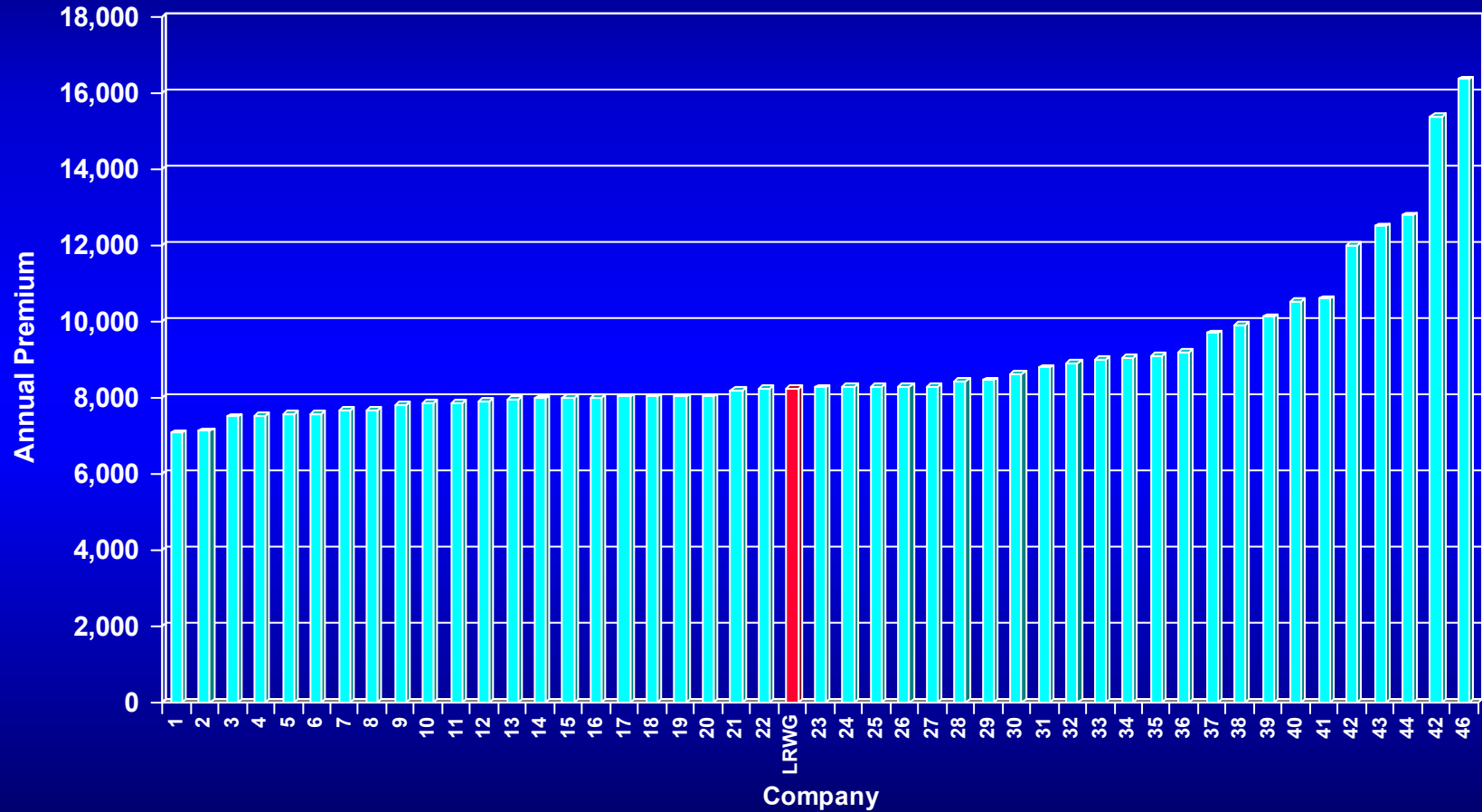
| <i>Premium Information</i> | <i>Age 45</i> |
|--|---------------|
| All Pay No Lapse Premium (fully commissionable) | \$8,233 |
| Face Amount | \$1,000,000 |
| Pre-Tax IRR on Distributable Earnings ⁽¹⁾ | 13.4% |
| Breakeven Year (Profit Accumulated at 6%) | 16 |

(1) Reflecting capital of 6% of reserve, \$1.30 per 1000 of Net at Risk, 25% of premium. Reserves using PBE assumptions



Market Perspective Premium Comparison

Issue Age 45, Best Class – All Pay No Lapse Premiums for \$1,000,000



Three Margin Levels

Numbering consistent with LRWG Reports

Best Estimate: No margins

Level 2: Deterministic interest Scenario, mortality margin of 9.375 deaths per 1000 divided by e_x , 30% lapse margin, 5% expense margin

Level 4: Deterministic interest scenario, mortality margin of 1.20%, No lapse margin, 5% expense margin



UL with Shadow Account Value No Lapse Guarantee: Deterministic Terminal Reserves at Different Margin Levels

Male, 45, Best Class, \$1,000,000, Annual Premium of \$8,233

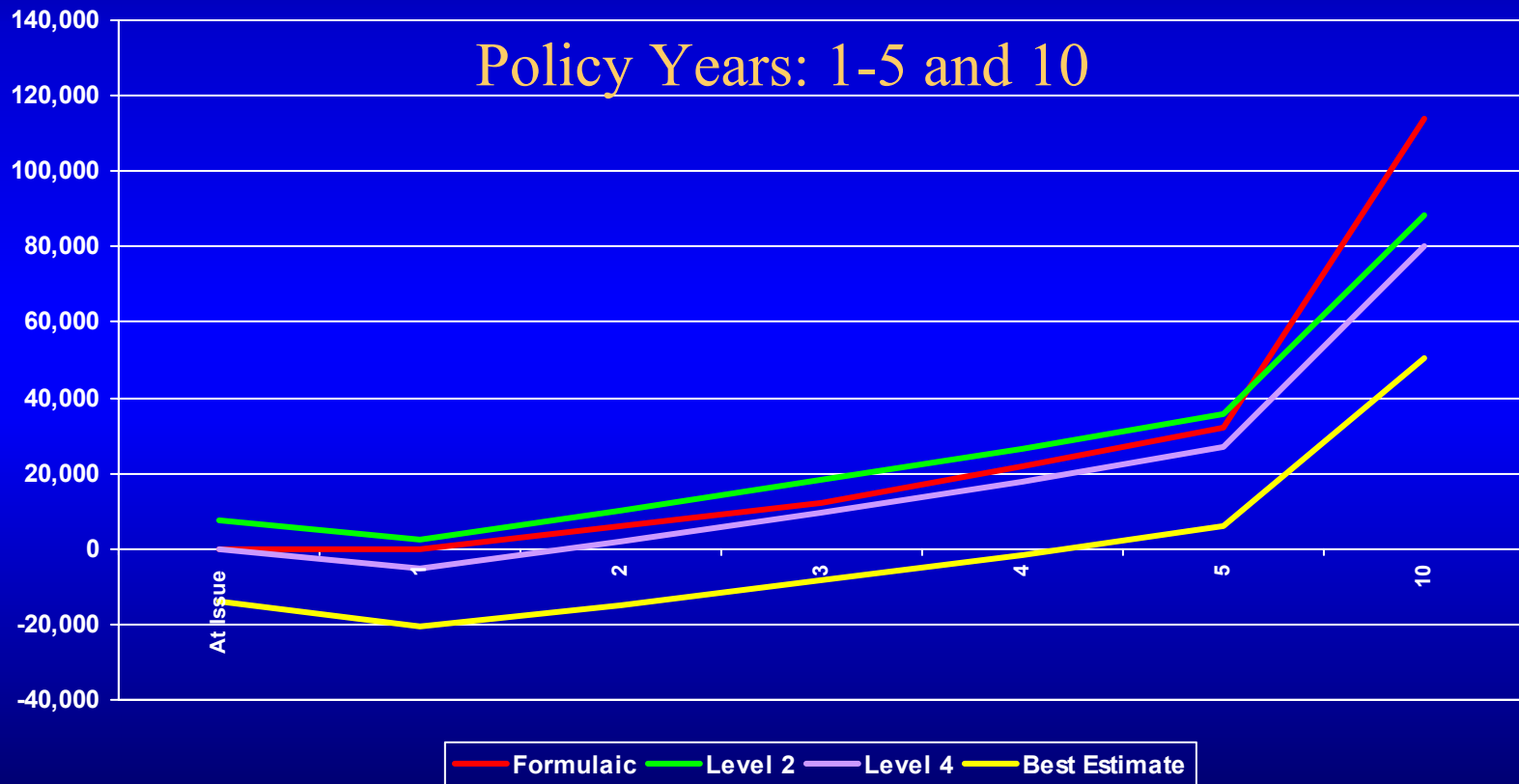
Revised

| <u>Policy</u> <u>Year-End</u> | <u>Current</u> <u>Formulaic</u> | <u>Best</u> <u>Estimate</u> | <u>PBA</u> <u>Level 2</u> | <u>PBA</u> <u>Level 4</u> |
|----------------------------------|------------------------------------|--------------------------------|------------------------------|------------------------------|
| At Issue | \$ 0 | (\$13,865) | \$7,787 | \$92 |
| 1 | \$43 | (20,585) | 2,536 | (5,275) |
| 2 | 6,140 | (14,788) | 10,092 | 1,935 |
| 3 | 11,947 | (8,480) | 18,107 | 9,679 |
| 4 | 21,916 | (1,652) | 26,621 | 18,000 |
| 5 | 32,140 | 5,785 | 35,663 | 26,932 |
| ... | ... | ... | ... | ... |
| 10 | 113,966 | 50,560 | 88,473 | 79,941 |
| 20 | 323,901 | 175,365 | 225,090 | 217,099 |
| 30 | 536,476 | 353,302 | 404,430 | 394,106 |
| Discount Rate Margin | | None | Deterministic | Deterministic |
| Mortality Margin | | None | 0.009375/ex | 1.2% |
| Lapse Rate Margin | | None | 30% | None |
| Expense Margin | | None | 5% | 5% |



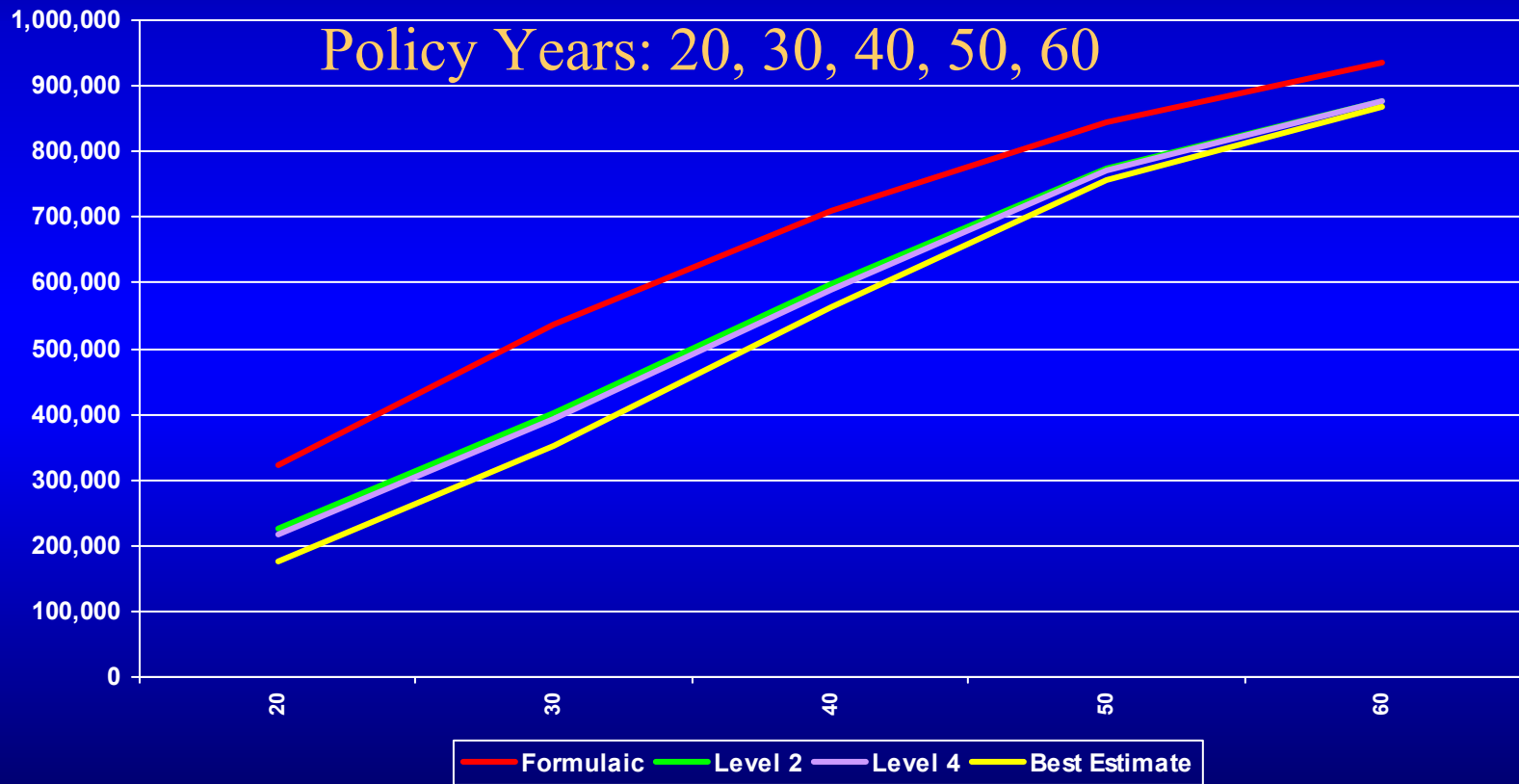
UL Shadow Account – No Lapse Guarantee Example Deterministic Terminal Reserves at Different Margin Levels

Male, 45, Best Class, \$1,000,000, Annual Premium of \$8,233



UL Shadow Account – No Lapse Guarantee Example Deterministic Terminal Reserves at Different Margin Levels

Male, 45, Best Class, \$1,000,000, Annual Premium of \$8,233



UL Shadow Account – No Lapse Guarantee Example: Comparison of Z Levels and Deterministic Reserve Margins

Male, 45, Best Class, \$1,000,000, Annual Premium of \$8,233

| <u>Policy Year</u> <u>Z Values</u> | <u>Current</u> <u>Formulaic</u> | <u>Best</u> <u>Estimate</u> | <u>PBA</u> <u>Level 2</u> | <u>PBA</u> <u>Level 4</u> |
|---------------------------------------|------------------------------------|--------------------------------|------------------------------|------------------------------|
| At Issue | 9.0% | 0.0% | 12.9% | 9.0% |
| At 10 Years | 27.9% | 0.0% | 12.5% | 9.6% |
| | | | | |
| Discount Rate Margin | | None | Deterministic | Deterministic |
| Mortality Margin | | None | 0.009375/ex | 1.2% |
| Lapse Rate Margin | | None | 30% | None |
| Expense Margin | | None | 5% | 5% |



Stochastic Reserve?

- Approximately 6% higher than Deterministic for a mature block of business under the GPV approach.
- Varies by duration
- Need to update for GPVAD approach