Principles-Based Reserving

Hartford Actuaries Club

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Outline

- Overview of Principle Based Reserves
- Examples
- Outstanding Issues

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

Basic Framework

Based on Gross Premium Reserve (GPR):

- Reserve = PV of future benefits and expense (excluding FIT) less PV of future gross premiums
- Reserve assumptions will be determined for all material risks (mortality, interest, expenses, lapse, premium levels, etc.)
- Reserve assumptions will include a margin for adverse deviation (not best estimates)
- Discount rates will be pre-tax

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 (but limited).

Basic Framework (cont)

Deterministic Reserve:

- Uses a single set of assumptions that is aligned with economic reality, yet still provides an appropriate level of conservatism
- 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 defined to properly capture the "tail risk" of the contract (risks that have high impact, but low probability)
- Will use a CTE (conditional tail expectation) level that is set by regulators, such as 65 CTE
- Current thinking is that only interest rate and equity movements will be modeled stochastically

Basic Framework (cont)

"Prudent Best Estimate" Assumptions

- Assumptions will be based on "prudent best estimates" that include a provision for adverse deviation
- Definition: Conservative end of actuaries best estimate confidence interval
- Since actuarial judgment is involved, will need to set limits and controls on setting assumptions

Basic Framework (cont)

Asset Model Needed to Project Cash Flows

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

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:

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

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.

Implementation of PBA Reserves:

Product Pricing Process

Topics to Cover

- Product Pricing Process Address:
  - Assumptions
  - Pricing Process
  - Product Design
  - Marketing Implications
- Term Product – 20 Year Level Premium
- UL Product with No Lapse Guarantee

What are the risks?

- Variability in Benefits provided by the product or riders
  - Surrender Value
  - Death Benefits
  - Withdrawal and Loans
  - Other benefits
- Variability in Revenue
  - Premium payment level
  - Frequency of premium payments
  - Investment returns
- Variability in Expense Risk
  - Administrative expenses
  - Regulatory expenses
  - Overhead costs
  - Compensation
  - Reinsurance Costs

Pricing Process

PRG likely to lead to Additional Emphasis on Risk Management

- Assessing, measuring and determining the risks associated with the product will be the major change in product development and pricing.
- Substantially more discussion with the Valuation Actuary

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

Premium Information	***Age 45***
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

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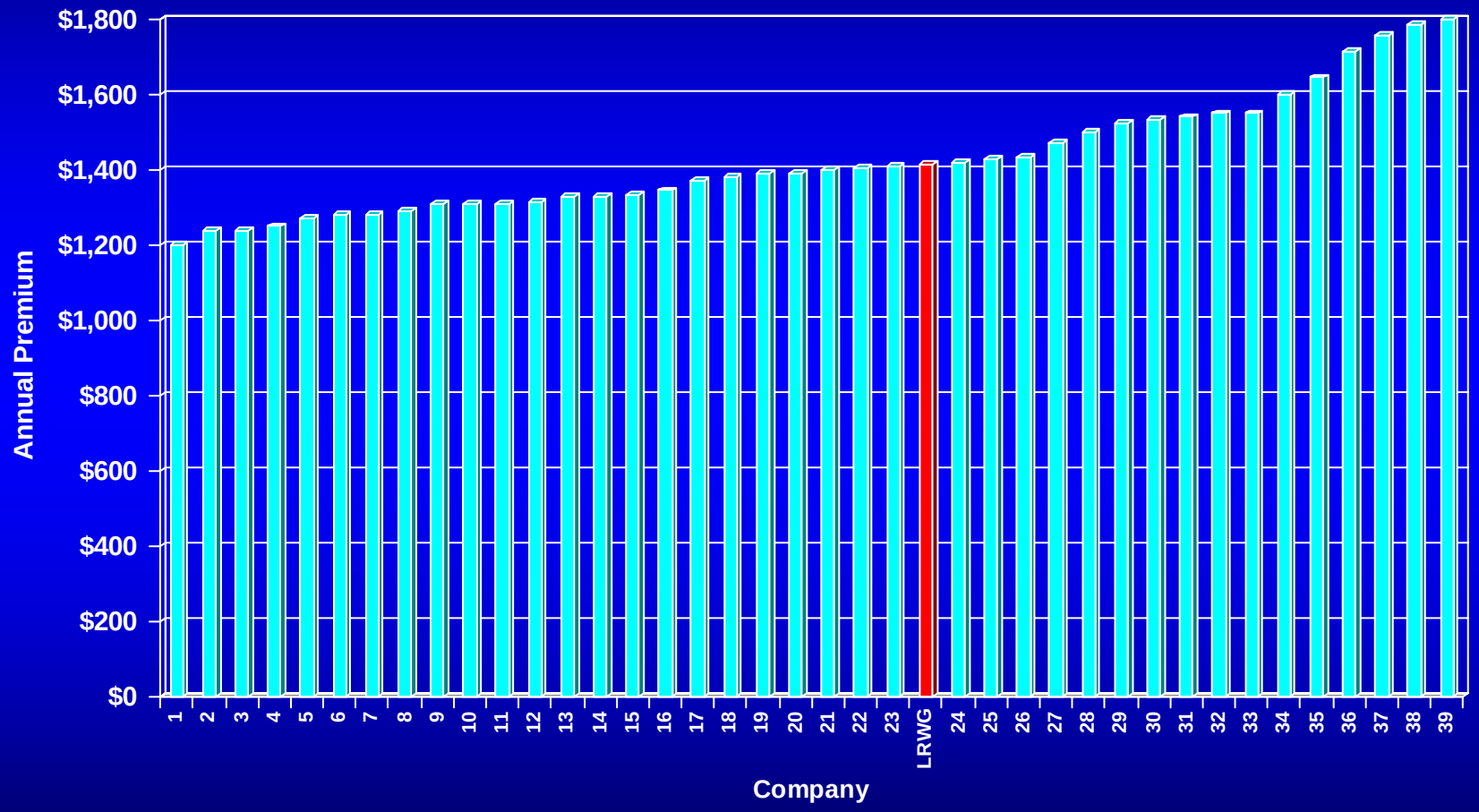
Market Perspective Premium Comparison

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



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Pricing: Valuation Mortality Assumption Steps

a) Develop Experience Mortality Curves, no improvement

b) Using an Industry Table adjust the curves reflecting credibility of experience

c) Add a margin to develop a prudent best estimate

d) Determine the valuation table which is closest to but not less than the Reported Reserve using prudent best estimates

e) Adjust the mortality curves for impaired lives and mortality deterioration, if any.

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.

Policy Year-End	*Current Formulaic*	*Best Estimate*	*PBA Level 2*	*PBA Level 4*
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:
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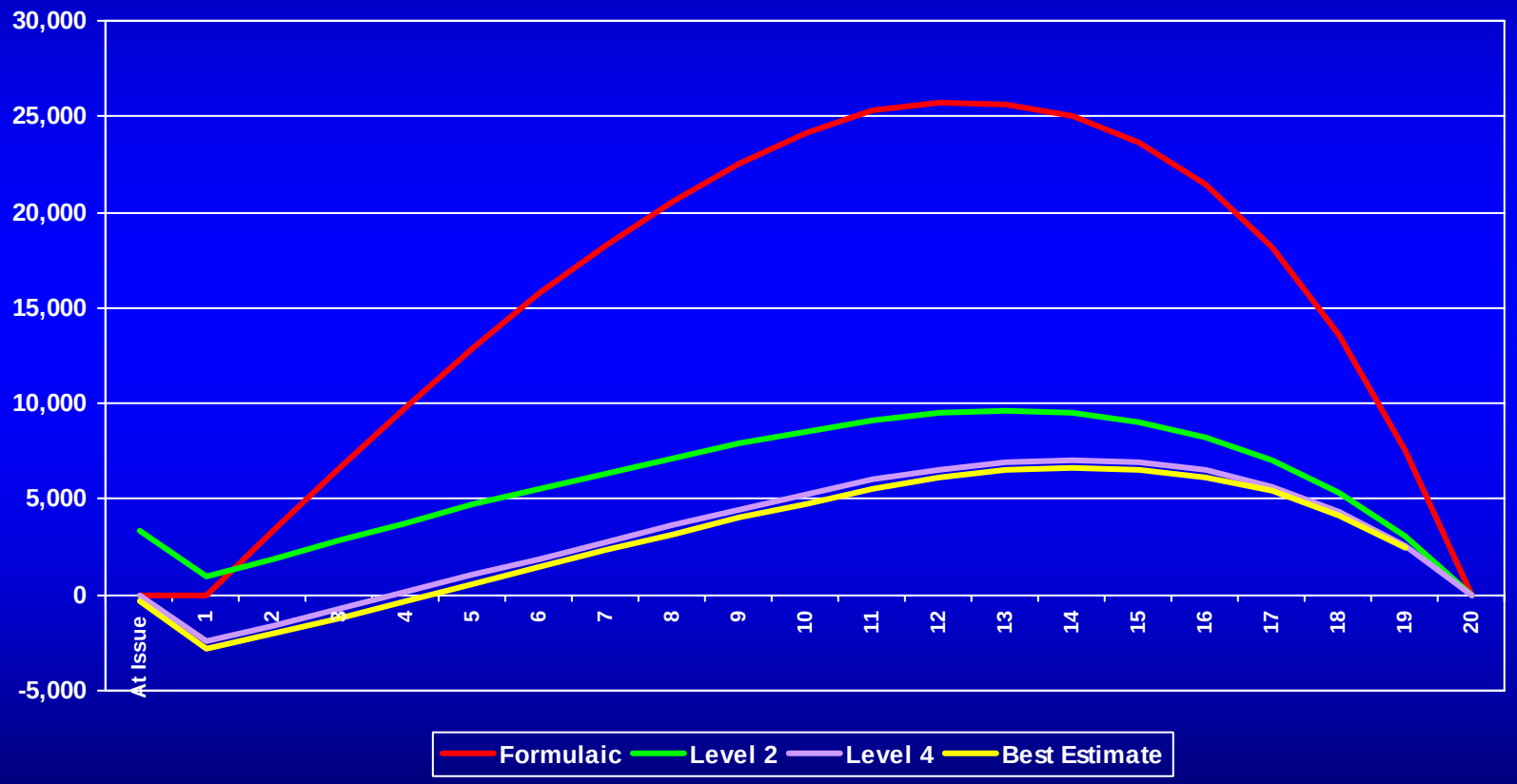

20 Year Term Examples:
Comparison of Z Levels and Deterministic Reserve Margins

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

Policy Year Z Values	***Current Formulaic***	***Best Estimate***	***PBA Level 2***	***PBA Level 4***
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

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Stochastic Reserve?

- Not Materially Different than Deterministic

Term Insurance

- Pricing Process
  - Deterministic
  - Stochastic
- How should reserves be determined at future dates.

Term Insurance

Pricing Process

- No Major Changes to the Pricing Process Expected
  - Likely deterministic cell based pricing
  - Reflect and adjustment for stochastic reserve impact.
  - May model stochastically to assess overall performance.
- Reinsurance

UL Products

Product Design

- Design Questions
  - Premium based guarantee or shadow account guarantee?
  - Multiple shadow or tiered shadow?
  - Catch up provision? With or Without penalty?
  - Other options?

UL Product Description

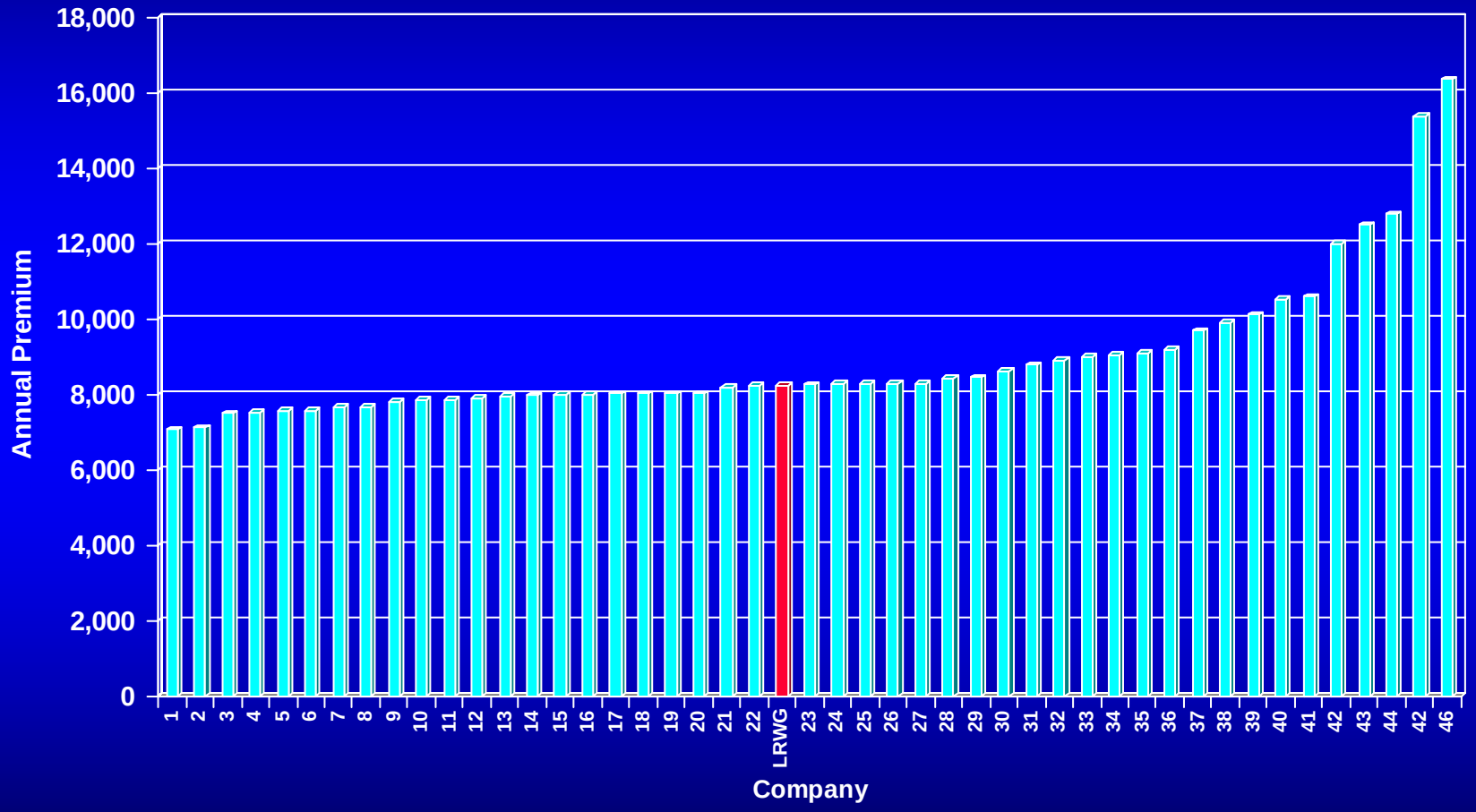
Plan of Insurance:	UL – No Lapse Guarantee Shadow Fund Design (significant sales loads)
Gender/Issue Ages:	Male, 45
Risk Class:	Best Non Smoker Class

Premium Information	***Age 45***
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

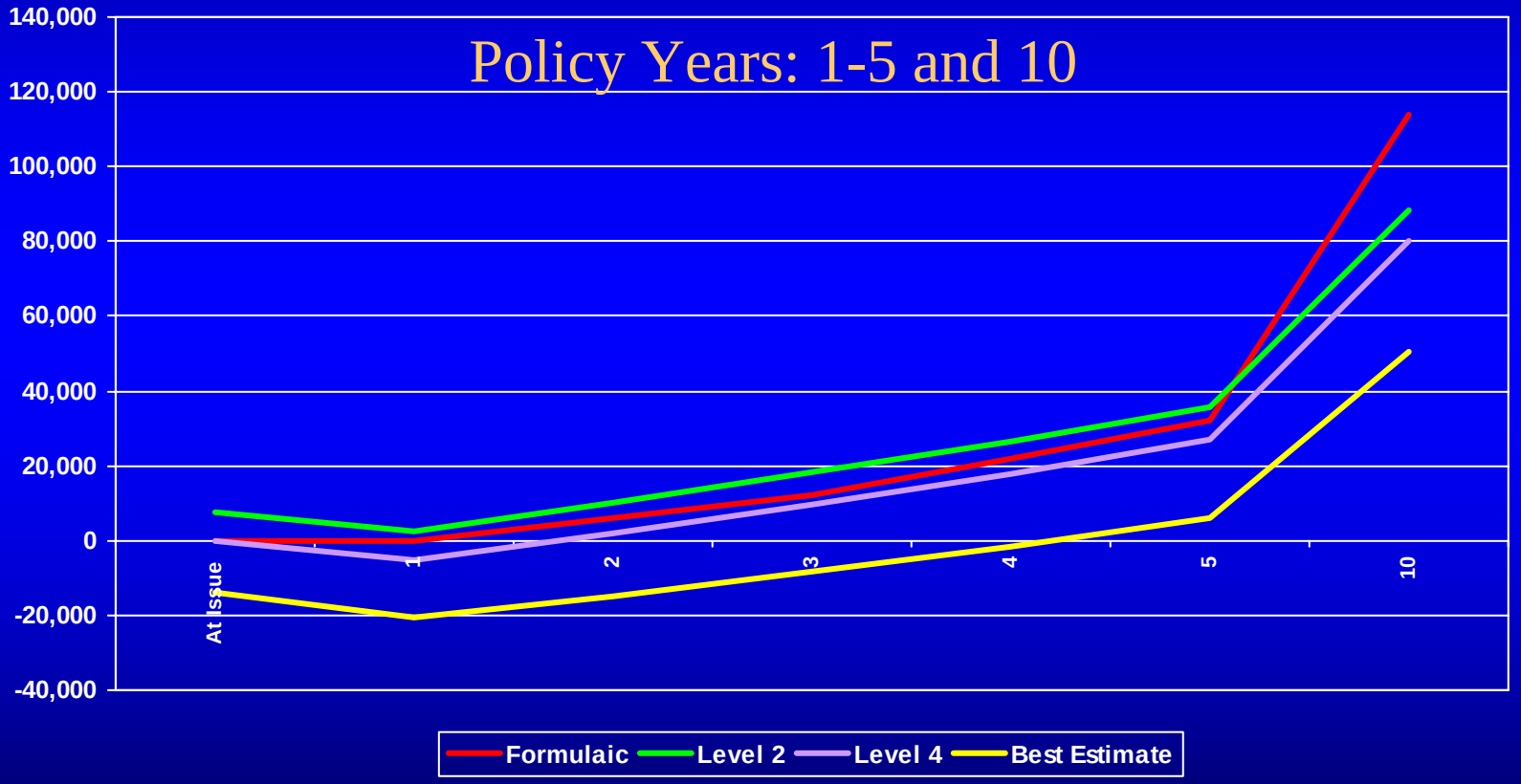
UL with Shadow Account Value No Lapse Guarantee: Deterministic Terminal Reserves at Different Margin Levels

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

Policy Year-End	*Current Formulaic*	*Best Estimate*	*PBA Level 2*	*PBA Level 4*
At Issue	$ 0	($13,865)	$7,787	$92
1	$43	(20,585)	2,536	(5,275)
2	6,140	(14,778)	10,092	1,935
3	11,947	(8,480)	18,107	9,679
4	21,916	(1,642)	26,621	18,000
5	32,140	5,778	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



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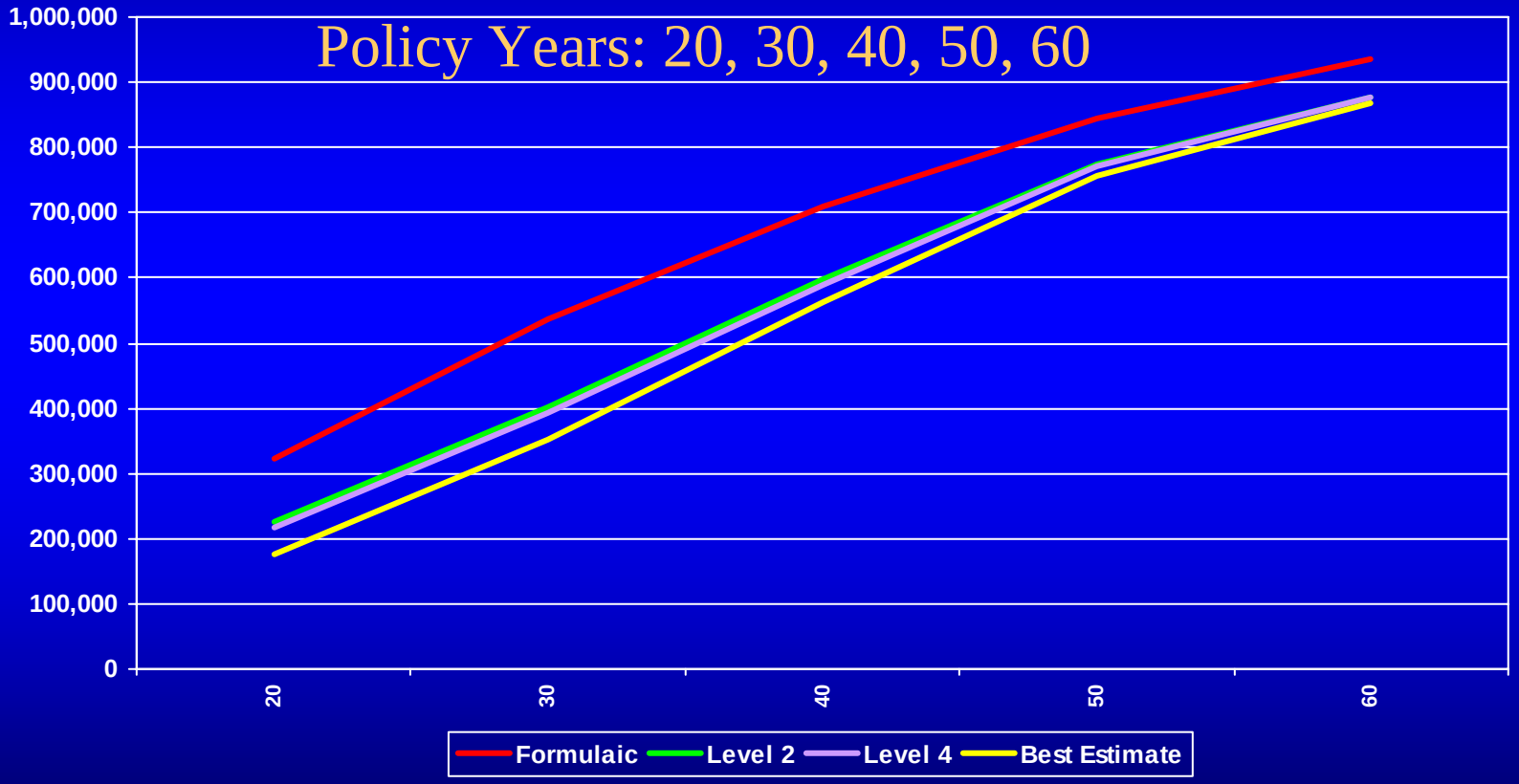

UL Shadow Account – No Lapse Guarantee Example: Comparison of Z Levels and Deterministic Reserve Margins

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

Policy Year Z Values	***Current Formulaic***	***Best Estimate***	***PBA Level 2***	***PBA Level 4***
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.
- Varies by duration

Universal Life Insurance with No Lapse Guarantees

- Model construction considerations
- Pricing Process –
  - Stochastic? Or
  - Deterministic?
- How should reserves be determined at future dates.
- Reinsurance

Update of recent LRWG developments

Hot Topics Under Discussion by the LRWG

- Discount Rate
- Embedded Spread on Starting Assets
- Gross premium valuation vs. PV of greatest accumulated deficiency (VACARVM approach)
- Limits on assumptions margins – both individual assumptions and in the aggregate
- Aggregation (degree of risk offsets)

Hot Topics Under Discussion by the LRWG

- Treatment of Federal Income Taxes in cash flows
- Treatment of equity investments in cash flows
- Prospective only versus application to all or a portion of inforce policies
- Tax treatment of the new PBA reserve (section 807 and 7702 impacts)