Overview of life insurance products and features

Aaron Sarfatti
Head of Strategy, AXA Equitable
Learning Objectives

At the end of this presentation, you will be able to:

• Understand how product design translates to liability cash flow profiles

• Explain how liability cash flow profiles create solvency risks for life insurers (focused on FIAs and VA GMWBs)
Contents

1. Session summary
2. List of major life insurance products
3. Fixed-indexed annuity product overview and risk profile
4. Variable annuity GMxB product overview and risk profile
1 Major life insurance product lines
"Engines of growth" are capital-intensive annuity products

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Reason for consumer purchase</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fixed Deferred Annuity (FDA)</td>
<td>Tax defer</td>
</tr>
<tr>
<td></td>
<td>Upfront premium to receive predetermined interest rate for a set period of time <em>(similar to bank CD)</em></td>
<td>✓</td>
</tr>
<tr>
<td>2</td>
<td>Payout Annuity, Structured Settlement, Pension Risk Transfer</td>
<td>Tax defer</td>
</tr>
<tr>
<td></td>
<td>Upfront premium to receive fixed payment at a specified interval for predetermined term or life</td>
<td>✓</td>
</tr>
<tr>
<td>3</td>
<td>Workers Compensation</td>
<td>Tax defer</td>
</tr>
<tr>
<td></td>
<td>Fixed premium (payroll deducted) to provide part income replacement if worker becomes disabled</td>
<td>✓</td>
</tr>
<tr>
<td>4</td>
<td>Fixed Index Annuity (FIA)</td>
<td>Tax defer</td>
</tr>
<tr>
<td></td>
<td>Similar to FDA, but with equity market participation (e.g., AV linked to equity index)</td>
<td>✓</td>
</tr>
<tr>
<td>5</td>
<td>Fixed Index Annuity w/ rider</td>
<td>Tax defer</td>
</tr>
<tr>
<td></td>
<td>FIA with a Minimum Withdrawal Benefit (i.e., withdrawals allowed even if AV=0)</td>
<td>✓</td>
</tr>
<tr>
<td>6</td>
<td>Variable annuity (VA)</td>
<td>Tax defer</td>
</tr>
<tr>
<td></td>
<td>Policyholder invests in tax deferred mutual funds, often with a minimum death benefit</td>
<td>✓</td>
</tr>
<tr>
<td>7</td>
<td>VA with GMxB</td>
<td>Tax defer</td>
</tr>
<tr>
<td></td>
<td>VA with a GMWB (like FIA GMWB)</td>
<td>✓</td>
</tr>
<tr>
<td>8</td>
<td>Term Life</td>
<td>Tax defer</td>
</tr>
<tr>
<td></td>
<td>Regular premium to receive fixed amount on death if within a defined timeframe (&quot;term&quot;)</td>
<td>✓</td>
</tr>
<tr>
<td>9</td>
<td>Permanent Life</td>
<td>Tax defer</td>
</tr>
<tr>
<td></td>
<td>Single or regular premium to gain fixed death benefit without a defined term</td>
<td>✓</td>
</tr>
</tbody>
</table>
Sales growth of recent products

Annuity industry overview
As of 2017

Bubble size indicates market size

VA (GMxB)
VA (non-GMxB)
SPIA
Str. Set.
FA/MYGA
FIA

Growth rate (3-year CAGR)

Source: LIMRA
FIA product overview and risk profile
Fixed-indexed annuity market history

US historical fixed index annuity sales
1995–2016

Overview

“Pioneering stage”
- Mainstream carriers introduced FIAs
- Focused on the bank channel
- GMWBs were rare or non-existent
- Annual industry sales reached $7 BN

“Growth Phase”
- Additional carriers, including private equity-backed insurers, introduced FIAs
- Sales increased to IMOs
- GMWBs flourish
- Annual industry sales reach $32 BN

“Maturation Phase”
- Broader set of insurance carriers enter the space
- Products introduced up-market into more mainstream distribution channels
- GMWBs elections remain prevalent
- Annual industry sales reach $61 BN

Source: LIMRA Living Benefit Election Rate Survey, JPMorgan. Wink's Sales & Market Report
Insurer perspective: fixed annuities a funding source for investments

Key driver of unit economics for annuities is spread, which is equal to Investment Return on Assets – Cost of Funds

While annuities have a lower spread than traditional investments due to a higher cost of funds, they also provide leverage as they provide an additional source of funding.
Insurers invest most assets in a bond portfolio with:
- AA-BBB in average credit rating (variation)
- Duration similar to the surrender charge period

Typically include commissions, other acquisition expenses, and maintenance charges

Subject to the guaranteed minimum rate floor, which is typically ~1% in modern policies
- Older business may have floors as high as 5%

Cost of hedging optionality ("early exit if rates rise") or ("minimum interest rate floors")
- Cost is included even if you do not hedge the risk

Net spread a fraction of gross credit spread
- In recent times, as much as 70% of spread is lost to funding cost as the "cost of leverage"

Illustrative breakdown of spread earned

<table>
<thead>
<tr>
<th>Component</th>
<th>Illustrative Breakdown</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investment return</td>
<td>Risk free rate 4.5%</td>
<td>Insurers invest most assets in a bond portfolio with: AA-BBB in average credit rating (variation) and Duration similar to the surrender charge period.</td>
</tr>
<tr>
<td></td>
<td>Credit Spread 1.0%</td>
<td>Typically include commissions, other acquisition expenses, and maintenance charges.</td>
</tr>
<tr>
<td>Expenses</td>
<td></td>
<td>Subject to the guaranteed minimum rate floor, which is typically ~1% in modern policies and Older business may have floors as high as 5%.</td>
</tr>
<tr>
<td>Crediting rate</td>
<td></td>
<td>Cost of hedging optionality (&quot;early exit if rates rise&quot;) or (&quot;minimum interest rate floors&quot;) and Cost is included even if you do not hedge the risk.</td>
</tr>
<tr>
<td>Option cost</td>
<td>0.2%</td>
<td>Net spread a fraction of gross credit spread and In recent times, as much as 70% of spread is lost to funding cost as the &quot;cost of leverage&quot;.</td>
</tr>
<tr>
<td>Profit margin (i.e. spread)</td>
<td>0.6%</td>
<td></td>
</tr>
</tbody>
</table>
Investors push annuity companies to lever their “risky” net interest margin

1. **Net interest margin**
   - Funding cost “above risk free rate” makes NIM reliant on strong credit performance
   - NIM recently ~35% of credit spread of portfolio of assets backing liabilities
   - Expected NIM = 0.6% in this example

2. **Effect of leverage**
   - Leverage target ~14x
   - Leverage x exp. NIM = 14 x 0.6% = ~8.4%

3. **Annuity ROE**
   - Annuity ROE = (i) return on invested capital and (ii) levered NIM payoff
   - Return on invested capital = risk-free in this example
   - Annuity ROE = 2.5% + 8.4% = 10.9%
Interest rate floors also pose risk

Illustrative economic rate profile of an annuity product
5-year MYGA, with one year renewals, insurer perspective (assumes short term assets)

- Crediting rate guaranteed for 5 years while assets are short term (spread can grow or compress)
- Crediting rate adjusted annually based on contract terms to maintain target spread
- Crediting rate reaches minimum guaranteed rate on contract, compressing spreads
- Crediting rate increases to stay competitive – spreads stay consistent
### FIA risk profile

<table>
<thead>
<tr>
<th>Market</th>
<th>Policyholder</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Credit risk</strong></td>
<td><strong>Behavioral risk</strong></td>
</tr>
<tr>
<td>The risk of elevated</td>
<td>The risk that policyholder behavior deviates from</td>
</tr>
<tr>
<td>incidence of default</td>
<td>expected/projected behavior, including:</td>
</tr>
<tr>
<td>in credit markets,</td>
<td>- Mortality (early death)</td>
</tr>
<tr>
<td>causing downgrades</td>
<td>- Longevity (outliving expectations)</td>
</tr>
<tr>
<td>and impacting fixed</td>
<td>- Surrender / Lapse (withdrawing funds before</td>
</tr>
<tr>
<td>income investments</td>
<td>allowed)</td>
</tr>
<tr>
<td></td>
<td>- Withdrawal amounts and timing</td>
</tr>
<tr>
<td><strong>Interest rate risk</strong></td>
<td></td>
</tr>
<tr>
<td>The risk of changes in</td>
<td></td>
</tr>
<tr>
<td>interest rates,</td>
<td></td>
</tr>
<tr>
<td>impacting the balance</td>
<td></td>
</tr>
<tr>
<td>sheet and policyholder</td>
<td></td>
</tr>
<tr>
<td>behavior</td>
<td></td>
</tr>
<tr>
<td><strong>Equity risk</strong></td>
<td></td>
</tr>
<tr>
<td>The risk that equity</td>
<td></td>
</tr>
<tr>
<td>markets decline,</td>
<td></td>
</tr>
<tr>
<td>impacting liabilities</td>
<td></td>
</tr>
<tr>
<td>on equity-linked</td>
<td></td>
</tr>
<tr>
<td>products</td>
<td></td>
</tr>
</tbody>
</table>
## Market risk profile – Fixed Annuities

<table>
<thead>
<tr>
<th>Risk</th>
<th>Condition</th>
<th>Result</th>
<th>FA</th>
<th>SPIA / SS/ DI</th>
<th>FIA</th>
<th>FIA w/ rider</th>
</tr>
</thead>
</table>
| Credit risk| Bond downgrades / defaults          | • When liabilities mature (or are surrendered early), assets must be sold at a discount  
• Significant downgrades / defaults result in impairments  
• As asset quality degrades, must de-lever to maintain rating |    |              |     |             |
| Interest rate risk | Decline in interest rates          | • If duration mismatch exists between assets and liabilities, yields may be adversely impacted *(if not perfectly matched, assets are typically shorter than liabilities)* |    |              |     |             |
|            | Increase in interest rates          | • Increased lapse rates when interest rates increase                    |    |              |     |             |
| Equity risk | Decline in equity levels           | • Policyholder guarantees become “in the money” earlier and cause claims to be at a greater cost to insurer  
• Fees earned on guarantees are lower due to lower account values |    |              |     |             |
|            | Increase in equity levels           | • Policyholders’ account values increase at a rate faster than fixed income assets |    |              |     |             |
3  VA product overview
Recap: Modern VA benefits provide downside protection, longevity protection

<table>
<thead>
<tr>
<th>Benefit type</th>
<th>Description</th>
<th>Customer need</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Downside</td>
</tr>
<tr>
<td></td>
<td></td>
<td>protection</td>
</tr>
<tr>
<td>GMDB</td>
<td>• Minimum payout on death, irrespective of underlying account performance</td>
<td>✓</td>
</tr>
<tr>
<td>Guaranteed minimum death benefit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GMAB</td>
<td>• Minimum account balance at maturity, irrespective of fund performance</td>
<td>✓</td>
</tr>
<tr>
<td>Guaranteed minimum accumulation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>benefit</td>
<td>• Guarantees the minimum payout value at time of annuitization</td>
<td>✓</td>
</tr>
<tr>
<td>GMIB</td>
<td>• Irrespective of fund performance or concurrent life annuity purchase basis</td>
<td></td>
</tr>
<tr>
<td>Guaranteed minimum income benefit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GMWB</td>
<td>• Permits guaranteed withdrawals from account without penalties</td>
<td>✓</td>
</tr>
<tr>
<td>Guaranteed minimum withdrawal</td>
<td>• Modern versions of the benefit provide guaranteed withdrawals for life</td>
<td></td>
</tr>
<tr>
<td>benefit</td>
<td>(Lifetime GMWB products)</td>
<td></td>
</tr>
</tbody>
</table>
VAs – dual mutual fund and guarantee businesses

**VA product**

Base contract
*Offers customers:*
- Tax deferral
- Estate protection
- Equity participation

Death benefit
*Offers customers:*
- Equity downside protection

Living benefit
*Offers customers:*
- Equity downside protection
- Longevity / income protection

**Mutual fund business**
- Collect asset-based fees in excess of expenses and commission
- Key value drivers include
  - Positive net flow, from high persistency and new business
  - Market appreciation
- Typically not hedged

**Guarantees business**
- Collect rider fees in excess of guarantee payouts
  - Writer can lock in an at-issue profit by pricing higher than the cost to fully hedge associated risks
  - Writer may also leave position unhedged to gain exposure to market appreciation and time value decay
- Increase net flow in the mutual fund business
- Benefits may be priced at break-even or loss if mutual fund business is profitable enough

How is value generated?
Summary of cash flows over the lifetime of a VA contract

Key VA cash flows

<table>
<thead>
<tr>
<th>Cash flow</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Base contract fees** | - Investment management fee: charged for management of the policy’s deposits; asset manager shares the fee with the insurer  
- Mortality & expense (M&E) fee: charged to offset expenses and mortality risk  
- Admin charge: fixed fee for contract admin; usually waived for large policies |
| **Rider fees** | - Fee to support guaranteed benefits  
- Often a fixed % of benefit base, such that the dollar amount increases as the benefit grows |
| **Surrender charges** | - Paid in the event that policyholder surrenders contract during the “surrender charge period”  
- Used to compensate for commissions paid |
| **Commissions** | - Initial: paid by insurer at policy issue  
- Trailing: paid by insurer after issue while business is in-force |
| **Claims** | - Guaranteed benefits paid by the insurer when the policyholder’s separate account assets are insufficient |
The core of the VA product is a standard investment contract

Illustration of a sample VA contract
No guarantees elected

Account value
- Tracks underlying funds
- Fees deducted annually
  - Guarantee fees
  - Management fees
- Compared to benefit base on death

Initial premium
Policyholder deposits an upfront sum and selects among a range of investment options
Insurers offer a variety of guarantees to remove investment downside risk

Illustration of a sample VA contract
With an elected guarantee

<table>
<thead>
<tr>
<th>Account value</th>
<th>Benefit base</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Tracks underlying funds</td>
<td>• A nominal amount that is decoupled from the underlying investment</td>
</tr>
<tr>
<td>• Fees deducted annually</td>
<td>• Not a cash value and cannot be withdrawn</td>
</tr>
<tr>
<td>• Guarantee fees</td>
<td>• Benefit can be exercised either by policyholder action or by contingent events – e.g., death, expiry</td>
</tr>
<tr>
<td>• Management fees</td>
<td>• Upon exercise: converted to a payout through contractually-defined mechanisms</td>
</tr>
<tr>
<td>• Compared to benefit base on death</td>
<td>• As the benefit is effectively a protective option, it can be either “in-the-money” or “out-of-the-money”</td>
</tr>
</tbody>
</table>

− **In-the-money**: if exercised today, the benefit payout would exceed the account value
− **Out-of-the-money**: if exercised today, the payout would not exceed the account value

Premium paid at contract issue

Account value & benefit base (USD)

Policyholder age

© 2018 National Association of Insurance Commissioners
GWMB provides flexibility to take income – usually for life

**GMWB provisions**

**Roll-up benefit**

- **Account value**
  - Decreases with withdrawals

- **Benefit base**
  - Roll-up usually stops once withdrawals start

- Insurer allows the policyholder to withdraw a fixed percentage of the benefit base each year
  - Percentage typically determined by age of first withdrawal
  - Benefit roll-up typically ends after the first withdrawal
  - Withdrawals in excess of the allowed amount are penalized and reduce the benefit richness

- Insurers incur claims equal to all withdrawals once the account value depletes

- Modern GMWBs allow withdrawals to continue for the lifetime of the policyholder

- Older GMWBs allow fixed number of withdrawals – e.g., 20 years at 5% per year
Result: Risky, long-dated cash flow profile

VA GMWB: Insurer cash flow profile

Risks in focus
- Interest rate risk
- Equity market risk
- Surrender rate risk (and other policyholder behavior)

Cash flow
- Collect fees
- Pay claims

Issue First withdrawal Account depletion Death of policyholder
Risk profile of modern VAs
How insurers define VA policy “value”

Illustrative cash flow profile
Typical policy with a GMDB guarantee

<table>
<thead>
<tr>
<th>Insurer cash flow</th>
<th>Collect fees</th>
<th>Pay claims</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Asset-based base contract fees</td>
<td>• Only if benefit base exceeds account value</td>
</tr>
<tr>
<td></td>
<td>• Rider fees, if any</td>
<td></td>
</tr>
</tbody>
</table>

Typical policy with a lifetime GMWB guarantee

<table>
<thead>
<tr>
<th>Insurer cash flow</th>
<th>Collect fees</th>
<th>Pay claims</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Asset-based base contract fees</td>
<td>• Mostly GMWB claims</td>
</tr>
<tr>
<td></td>
<td>• GMWB rider fees</td>
<td>• Modern GMDBs terminate when account depletes</td>
</tr>
</tbody>
</table>

Profitability = Present value of fees - Present value of claims
Risk profile of modern VAs

Market risk
Market risk profile

What would happen to product profitability if equity performance worsens and interest rates decline?

Illustrative cash flow profile
Typical policy with a modern GMDB guarantee

Lower equity returns
Lower account value and asset-based fees

Lower interest rates
Increase present value of claims

Profitability is reduced

Typical policy with a lifetime GMWB guarantee

Lower equity returns
Accelerate account value depletion and lengthen the claims-paying period

Profitability is reduced

© 2018 National Association of Insurance Commissioners
Risk profile of modern VAs
Policyholder behavior risk
# Policyholder behavior risk

<table>
<thead>
<tr>
<th>Behavior</th>
<th>What is it?</th>
<th>Why does it impact valuation?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Surrender (lapse)</strong></td>
<td>• Policyholder terminates the contract and guarantee in exchange for full payment of the account value, less applicable surrender charges</td>
<td>• Determines <strong>how many policyholders will remain in-force to collect claims</strong></td>
</tr>
</tbody>
</table>
| **Withdrawal delay**  | • Represents the timing of the policyholder’s first withdrawal from the account value  
• For most GMWBs, the first withdrawal terminates the benefit roll-up | • For GMWBs, determines **when policyholders begin incurring claims**  
  - Withdrawal timing and amount decide how fast account value depletes |
| **Withdrawal amount** | • The amount withdrawn in each year once the policyholder has begun withdrawing  
• GMWBs specify a guaranteed maximum withdrawal amount per year; withdrawals above the maximum highly penalize the benefit base | • Determines **how much claims each policy incurs**  
  - Withdrawal timing and amount decide how fast account value depletes  
  - For GMWBs, the first withdrawal usually terminates benefit growth – e.g., roll-up  
  - For all guarantees except lifetime GMWBs, withdrawals erode the benefit base  
  - For lifetime GMWBs, withdrawals in excess of the guaranteed amount reduce the benefit base |
Policyholders have many behavioral choices

Behavioral choices and resultant impact for a sample modern GMWB policy

Account value & benefit base evolution

USD

“Accumulation phase”
Before first withdrawal

“Income phase”
After first withdrawal

Excess withdrawal

“Payout phase”
After depletion (only for lifetime GMWBs)

Major behavioral choices

1. **Should I take a first withdrawal?**
   - What are my income needs?
   - What are the consequences of withdrawing?

2. **Should I surrender?**
   - Do I need all my money now?
   - What's the benefit that I’m giving up & what are alternative investment options?

How much should I withdraw?

- How much income do I need?
- What are the consequences of various withdrawal amounts?
- *For GMWBs:* what do I gain by not withdrawing the guaranteed max?

Should I surrender?

- For GMWBs: what do I gain by not withdrawing the guaranteed max?

Insurer cash flow profile

Collect fees

Pay claims

Issue

First withdrawal

Account depletion

© 2018 National Association of Insurance Commissioners
Withdrawal start date determines timing, size of claims

Illustrative cash flow profile
Lifetime GMWB policy with no benefit growth potential

- Early withdrawals for policies with no or low benefit growth potential decrease profitability
- Earlier withdrawals lead to earlier account value depletion – which marks the commencement of claims payments
- Claim payment in each year post-depletion are unaffected – for products with low benefit growth potential

Lifetime GMWB policy with high benefit growth potential

- Early withdrawals for products with high benefit growth potential could increase profitability
- Earlier withdrawals accelerate account depletion and lengthen claims period
- Early withdrawals forgo future benefit growth and thus reduce the size of claim payments post-depletion
- Especially in low interest rate environments, the forgone benefit growth may be a large windfall for the insurer
Withdrawal amount ("efficiency") affects time of claims

Illustrative cash flow profile
GMWB policy withdrawing below the guaranteed maximum

Withdrawals below the guaranteed maximum typically increase the contract’s profitability to the insurer

- Below-max withdrawals
  - Increase account value and asset-based fees
  - Delay account depletion and shorten claims period

GMWB policy withdrawing above the guaranteed maximum

Excess withdrawals increase contract profitability, as the benefit base is penalized

- Above-max withdrawals
  - Accelerate account depletion and lengthen claims period

Below-max withdrawals
- Remaining amount is usually not credited or "rolled over"

- Most products do not offer partial credit for unwithdrawn portion of the guarantee
- Reduction in claims typically exceeds increase in fees

Above-max withdrawals
- Reduce claims, as the benefit base is penalized

- Penalty is especially severe for large withdrawals if benefit is in-the-money, as benefit base is reduced “proportionally”
- Similar to a full surrender in effect – i.e., “scales down” the contract and all associated attributes

© 2018 National Association of Insurance Commissioners
Full surrenders determine volume of claims

Illustrative cash flow profile
In-the-money GMWB guarantee

• A deeply in-the-money policy is close to the claims-paying phase, with little remaining fees left
• Insurer loses little incremental fee revenue but saves on large near-term claims payments if the policy surrenders

Out-of-the-money GMWB guarantee

• An out-of-the-money policy is far from the claims-paying phase and has material amounts of fees left
• Insurer loses large amount of incremental fee revenue upon surrender, which dominates over claims saved

Surrenders for in-the-money policies increase portfolio profitability as policies forgo substantial claims

Surrenders for out-of-the-money policies decrease portfolio profitability as lost fees are larger

These future cash flows do not occur if policyholder surrenders

Collect fees
Pay claims
Issue Surrender Time

Collect fees
Pay claims
Issue Surrender Time
Surrender rates an “at-risk” assumption

Assume that we have the following portfolio:

- **Product cash flows**: fees of $1,000 per year for the first 10 years, followed by claims of $5,000 per year thereafter for 10 years.
- **Surrender and mortality rates**: 3.0% of the population surrenders or dies per year.
- **Discount rate**: 0%

Cumulative cash flow profile of the portfolio

Assume that we also have three companies with different assumptions:

<table>
<thead>
<tr>
<th>Company</th>
<th>Surrender/mortality assumed</th>
<th>Reserves established</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4.0%</td>
<td>19,208</td>
</tr>
<tr>
<td>B</td>
<td>5.0%</td>
<td>16,940</td>
</tr>
<tr>
<td>C</td>
<td>2.0%</td>
<td>24,601</td>
</tr>
<tr>
<td>Reality</td>
<td>3.0%</td>
<td>21,752</td>
</tr>
</tbody>
</table>

1. All companies assumed to have 3.0% annual mortality and 0.0% annual lapse rates after account value reaches zero.
2c Path of failure for a VA company (subjective but informed view)
# Phases of a VA company failure

<table>
<thead>
<tr>
<th>Interest rate decline</th>
<th>Reduce equity hedging</th>
<th>Assumption unlock</th>
<th>Equity decline</th>
</tr>
</thead>
<tbody>
<tr>
<td>RBC Ratio (start = 500%)</td>
<td>• 500% (no immed. impact)</td>
<td>• 400%</td>
<td>• 250%</td>
</tr>
<tr>
<td>Description</td>
<td>• Interest rates decline below company expectations, where VM20 scenarios test</td>
<td>• Equity hedge costs rise (higher notional) • Hedge budget no longer supports full protection</td>
<td>• Reserve increase from adverse policyholder behavior experience • Fewer “good” lapses, more “bad” lapses • Adverse utilization</td>
</tr>
<tr>
<td>Source of problem?</td>
<td>• Companies mostly not economically hedging rates • VM20 lenient on “low for long” int rate capital</td>
<td>• Company pressure to maintain profitability / salvage balance sheet</td>
<td>• Adverse PHB can sharply increase reserves – “not hedgeable”</td>
</tr>
<tr>
<td>Potential regulatory solutions?</td>
<td>• Revise VM20 IR generator • Increase (sharply) the share of “low for long” scenarios</td>
<td>• Strengthen equity calibration criteria in AG43</td>
<td>• Elevated regulatory scrutiny • “Vulnerability analysis” submit by companies • Standard Scenario (new)</td>
</tr>
</tbody>
</table>
Appendix | Reference slides
Insurers offer numerous benefit growth mechanisms (1 of 3)

Three main types of benefit growth provisions
Type 1: return of premium

- **Account value**
  - Tracks underlying funds
  - Fees deducted annually
    - Guarantee fees
    - Management fees
  - Compared to benefit base on death

- **Premium paid at contract issue**

- **Benefit base: return of premium**
  - Guarantees to return at least the initial premium, adjusted for withdrawals

- **Benefit payout**
  - Benefit is first payable out of the account value
  - If the benefit base is lower than the account value:
    - Beneficiary receives account value
    - Insurer incurs no claims

- **Account value returned on death**

- **GMDB payout on death**

<table>
<thead>
<tr>
<th>Account value &amp; benefit base (USD)</th>
<th>300,000</th>
<th>250,000</th>
<th>200,000</th>
<th>150,000</th>
<th>100,000</th>
<th>50,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Policyholder age</td>
<td>55</td>
<td>57</td>
<td>59</td>
<td>61</td>
<td>63</td>
<td>65</td>
</tr>
<tr>
<td>Premium paid at contract issue</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Account value</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benefit payout</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GMDB payout on death</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Account value returned on death</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

© 2018 National Association of Insurance Commissioners
Insurers offer numerous benefit growth mechanisms (2 of 3)

Three main types of benefit growth provisions
Type 2: roll-up

Account value
- Tracks underlying funds
- Fees deducted annually
  - Guarantee fees
  - Management fees
- Compared to benefit base on death

Benefit base: roll-up
- Benefit base grows at a guaranteed interest rate

Benefit base: return of premium
- Guarantees to return at least the initial premium, adjusted for withdrawals

Policyholder age

Account value & benefit base (USD)
- Premium paid at contract issue
- GMDB payout on death
- Account value returned on death

© 2018 National Association of Insurance Commissioners
Insurers offer numerous benefit growth mechanisms (3 of 3)

Three main types of benefit growth provisions

Type 3: step-up

- **Benefit base: step-up**
  - Benefit base rises to the account value regularly to “lock in” gains

Type 2: roll-up

- **Benefit base: roll-up**
  - Benefit base grows at a guaranteed interest rate

Type 1: return of premium

- **Benefit base: return of premium**
  - Guarantees to return at least the initial premium, adjusted for withdrawals

**Account value**

- Tracks underlying funds
- Fees deducted annually
  - Guarantee fees
  - Management fees
- Compared to benefit base on death

**Premium paid at contract issue**

GMDB payout on death

**Account value returned on death**

Policyholder age

© 2018 National Association of Insurance Commissioners
### VA – Market risk detail

<table>
<thead>
<tr>
<th>Market risk type</th>
<th>Base contract</th>
<th>Guarantees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equity</td>
<td>Asset-based fees are directly linked to fund performance</td>
<td>Insurer incurs claims from the guarantees only when the market value of the guarantees exceed the account value – i.e., the guarantees are &quot;in-the-money&quot;</td>
</tr>
<tr>
<td></td>
<td>Poor equity performance reduces account value – and thereby fee income</td>
<td>Poor equity performance can erode the account value and drive the guarantees to become &quot;in-the-money&quot;</td>
</tr>
<tr>
<td>Interest rate</td>
<td>Affects general account investment returns</td>
<td>Declining interest rates increase the present value of claims payments, which are long-dated and can last for 40-50 years</td>
</tr>
<tr>
<td></td>
<td>Little sensitivity otherwise</td>
<td>The time value of optionality is also linked to interest rates, as option pricing assumes assets earn the risk free rate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Interest rates may affect policyholder behavior and change the cash flow profile materially</td>
</tr>
<tr>
<td>Implied volatility – both</td>
<td>Little sensitivity</td>
<td>The time value of optionality is intimately linked to implied volatility in equities and interest rates (for bond funds)</td>
</tr>
<tr>
<td>equity and interest rates</td>
<td></td>
<td>Greater chance of option becoming “in-the-money”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Heightened implied volatility drives up the option cost and therefore the insurer’s liability</td>
</tr>
</tbody>
</table>
## Insurers policyholder behavior exposure

<table>
<thead>
<tr>
<th>Behavior</th>
<th>What is the optimal behavior?</th>
<th>How does it affect insurers?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Surrender (lapse)</strong></td>
<td>• Surrender when the benefit is out-of-the-money and/or interest rates are high, as more attractive investment options exist&lt;br&gt;• Do not surrender if the benefit is in-the-money and/or if interest rates are low</td>
<td>• Contract is profitable if interest rates are high and the benefit is out-of-the-money&lt;br&gt;• Surrenders would therefore reduce profitability&lt;br&gt;• The guarantee becomes very costly if it is in-the-money and interest rates are low</td>
</tr>
<tr>
<td><strong>Withdrawal delay</strong></td>
<td>• For most GWMBs, withdraw as early as possible unless the maximum withdrawal rate increases soon&lt;br&gt;• If the GMWB has a high roll-up, it may be beneficial to delay further if interest rates are low&lt;br&gt;• For non-GMWBs with dollar-for-dollar withdrawals, withdraw until account value depletes (“stripping”)&lt;br&gt;• For non-GMWBs with proportional withdrawals and growth potential, never withdraw</td>
<td>• Withdrawing early depletes the account earlier, thereby lengthening the claims-paying period&lt;br&gt;• Delaying for a withdrawal rate increase or roll-up increases the guaranteed amount per year&lt;br&gt;• Insurer collects no fees but retains a costly guarantee liability&lt;br&gt;• No withdrawals prevents the benefit from being reduced and becoming less generous</td>
</tr>
<tr>
<td><strong>Withdrawal amount</strong></td>
<td>• For most GMWBs, withdraw the guaranteed maximum withdrawal amount&lt;br&gt;• If a roll-up is provided for an unwithdrawn guarantee, it may be beneficial to withdraw below the maximum</td>
<td>• High withdrawals accelerate account depletion&lt;br&gt;• Abstaining from excess withdrawals prevents the benefit from being reduced</td>
</tr>
</tbody>
</table>