

# Annuity Policyholder Behavior Fixed Annuities

**New England Actuarial Club  
November 18, 2010**

Kendrick Lombardo, AVP & Actuary, FSA, MAAA



## Agenda

- **Typical Product Design Features**
- **Key Liability Assumptions**
- **Lapse Rates Example**
- **Key Risks**
- **Simplified Analysis Model**
- **Determining Claims Cost**
- **Extend to other Imbedded Options**

**Note: This presentation is for education purposes only and should not be interpreted as promoting any MassMutual products or representing any MassMutual practices.**

## Product Design Features

- **Typical Book Value Fixed Deferred Annuity**
  - Single premium or flexible/multiple premium
  - Surrender charge on deposits withdrawn in the first x years
    - X typically between 5 and 9 years long
    - Starting between 5% & 8%, declining to between 1% & 3%
    - Typically 10% free withdrawal per year, without charges
  - No Market Value adjustment on withdrawal
  - No contract fee or annual charge
  - Min Guaranteed rate between 1% and 3%, depending on market conditions & term
  - Credited rate set for 1 or more years
    - Set by company after that – “trust me product”
    - Floored at minimum guaranteed interest rate
  - Deposit based commissions (all upfront on deposit)
    - 3.0% to 6.0%, depending on distribution and term
  - Guaranteed purchase rates for annuitization of contract value
  - Death Benefit providing contract value (waiver of surrender charges)

3

## Key Liability Assumptions

- **Contract Lapse Rates (Full Withdrawal)**
  - Vary by surrender charge level/contract duration and distribution channel
  - Credited Rate vs. New Money Yield (dynamic)
- **Partial Withdrawal**
  - Qualified vs. non-Qualified and Attained Age
  - Credited Rate vs. New Money Yield (dynamic?)
- **Ongoing Premiums**
  - Contract Duration
  - Min guarantee rate vs. new money yield (dynamic?)
- **Rate Crediting Strategy**
  - Function of investment yield minus a pricing margin
    - Duration of investments determines responsiveness of renewal rates
    - Shorter investments more responsive, but less stable
  - Floored Min Guaranteed rate
  - Competitive considerations (not too competitive or too uncompetitive)

4

## Lapse Rates

### Dynamic Lapses Rates Example

New Money Credited	Surrender Charge Period						Spike Yr	Ultimate
	1	2	3	4	5	6	7	8
-2%	0.2%	0.8%	1.4%	2.0%	2.4%	3.2%	5.0%	3.0%
-1%	0.3%	1.2%	2.1%	3.0%	3.6%	4.8%	15.0%	7.0%
0%	0.5%	2.0%	3.5%	5.0%	6.0%	8.0%	40.0%	12.0%
1%	0.8%	3.2%	5.6%	8.0%	9.6%	12.8%	60.0%	20.0%
2%	0.9%	3.6%	6.3%	9.0%	10.8%	14.4%	75.0%	25.0%

### Baseline Lapses Rates

- Dictates baseline length of investment duration, along with rate crediting strategy
- Amortization cost of any upfront expense amortization

### Dynamic Lapses Rates

- Sensitivity to market conditions/competing new product, how dynamic is behavior?
- Can add significant optionality into product cash flows, depending on
  - Product design (liquidity)
  - Distribution practices
  - Compensation and replacement structure

5

## Key Risks

### Key Risks

- Minimum interest rate guarantee
  - Investment yield unable to support minimum credited rate and pricing margins
  - Compounded by lower lapse rates (& extra deposits)
- Recovery of upfront compensation when higher lapses are experienced
- Book value withdrawals, with assets sold at a market value loss

### How to evaluate?

- 100% Market Consistent
  - Interesting analysis, but often impractical for the product
  - Requires earning only risk free (swap rate) yields with no spreads
  - 2.25% swap yield - 2.00% pricing margin = 0.25% credited rate
- Need to keep some risk to make profits/margins on risk taken
- Focus on the Key Risks above
  - Carve out key imbedded options costs, but not all risk
  - Not unlike hedging just the living benefit in a variable annuity

6

## Simplified Analysis Model

- **Model Goal**

- Understand nature and determine initial value of imbedded policyholder options

- **Model Assumptions**

- Risk neutral scenarios, swap rates scenarios calibrated to a basket of interest rate swaptions (those similar to the options imbedded in the product)
- Fixed Investment Spread of 1.75% over swap rates at issue
  - Grade to historical levels over x years
- Min Interest Rate of 1.00%
- Rate setting strategy
  - Initial Rate = Initial Investment Yield – Pricing Spread
  - Renewal Rates = Projected Annual Investment Yield – Pricing Spread
- Investment Strategy
  - Duration matching desired level of rate responsiveness and expected cashflows
  - Simple Example – 7 year bond, with extra cashflows invested in 3 year bonds
    - Limiting exposure to shock lapse
    - Shortening up over time as product gets more liquid
    - Increased responsiveness of rates as contract moves out of charge period

7

## Determining "Claims" Cost

### Setting Credited Rates . . .

Earned Rate	3.81%		Swap Rate	2.06%
<u>Pricing Spread</u>	<u>2.50%</u>	→	<u>Investment Spread</u>	<u>1.75%</u>
Credited Rate	1.31%	→	Investment Yield	3.81%
			Compensation	1.00%
			Expenses & Profit	1.00%
			<u>Hedge Cost</u>	<u>0.50%</u>
			Pricing Spread	2.50%

**Claims = Amount that Un-floored Credited Rate is under minimum guaranteed rate**

Year	Earned Rate	Pricing Spread	Unfloored Credited Rate	Floor "Claims" Lapses
1	3.81%	2.50%	1.31%	0.00%
2	3.99%	2.50%	1.49%	0.00%
3	3.86%	2.50%	1.36%	0.00%
4	3.74%	2.50%	1.24%	0.00%
5	3.40%	2.50%	0.90%	0.10%
6	3.27%	2.50%	0.77%	0.23%
7	3.17%	2.50%	0.67%	0.33%
8	2.88%	2.50%	0.38%	0.62%
9	2.70%	2.50%	0.20%	0.80%
10	2.56%	2.50%	0.06%	0.94%

8

## Extend to Other Imbedded Options

- **Compensation Recovery**

- Define Claims - PV of future account value/premium < X Years
- Pricing Spread earned on account value to recover compensation
- Do not need entire spread, no expenses and capital cost after lapse

- **Market Value Loss on Assets**

- Capture amount of asset loss on book value surrender

- **Example Hedge Costs (per year)**

1.00% Min Int Rate	0.24%
Compensation Recovery	0.08%
<u>Assets Sold at MV Loss</u>	<u>0.18%</u>
Total Cost Per year	0.50%

- **Use to compare product designs**

- Including crediting strategies, minimum interest rate guarantees, etc
- Split out customer into representative groups of behaviors or cohorts
- Know where you are spending imbedded option dollars

9



We'll help you get there.®

© 2009 Massachusetts Mutual Life Insurance Company, Springfield, MA. All rights reserved. [www.massmutual.com](http://www.massmutual.com).  
MassMutual Financial Group is a marketing name for Massachusetts Mutual Life Insurance Company (MassMutual)  
and its affiliated companies and sales representatives.