

Indexed UL Under VM-20

Deterministic Reserve Considerations and Analysis
from the Life Reserves Work Group (LRWG)



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March 22, 2018

Life Actuarial (A) Task Force Meeting

Agenda

1 Deterministic Reserve (DR) and Stochastic Reserve (SR) scenario analysis for Indexed Universal Life (IUL)

2 Work to date

3 Considerations and alternative approaches

Appendix A: Definitions and analysis support

Appendix B: Analysis for variable products



1 | DR and SR scenario analysis for IUL



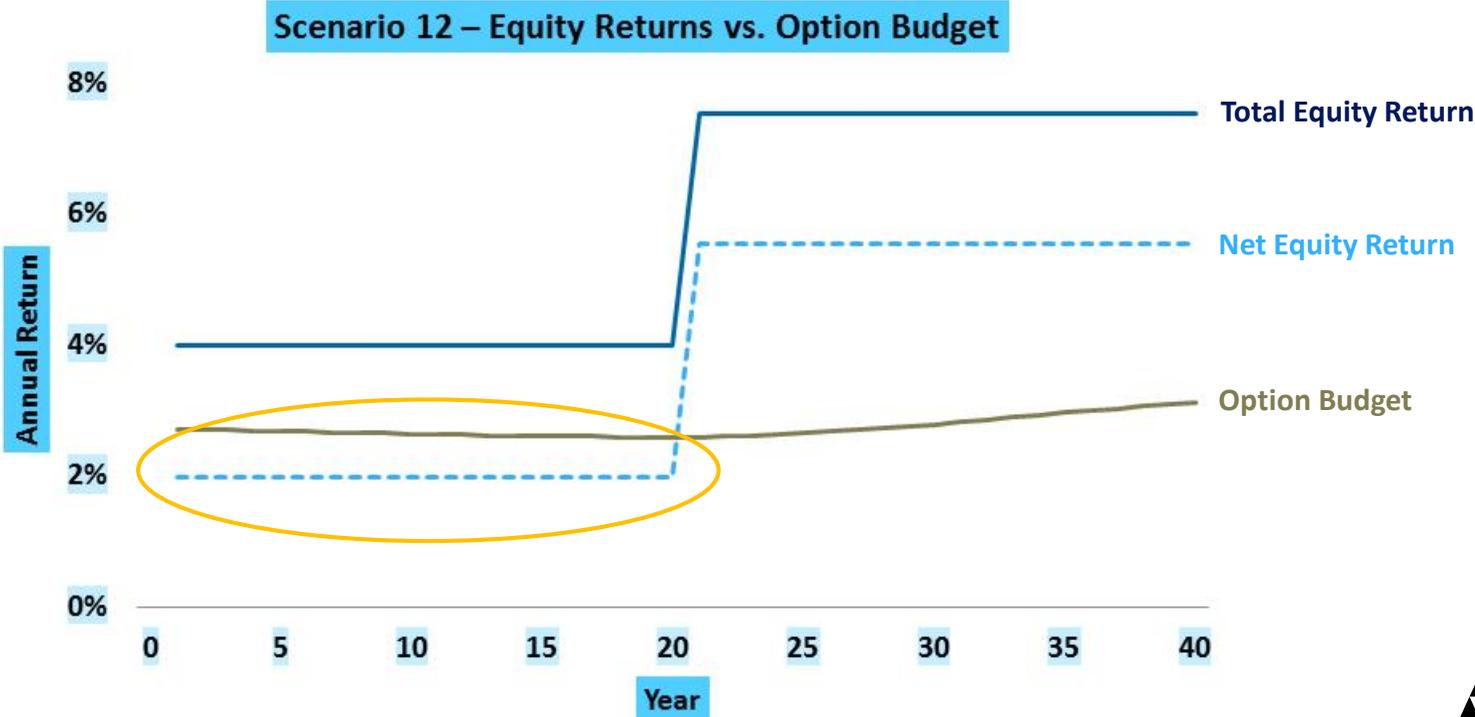
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DR scenario

In the **first 20 years**, the equity return net of dividend yield is approximately 2%, which is very low compared to the option budget. The opposite is true in later years, where a 5.5% net indexed credit is aggressive relative to the option budget.



Conceptual example

The scenario 12 (DR) equity growth rate causes unintuitive results for IUL

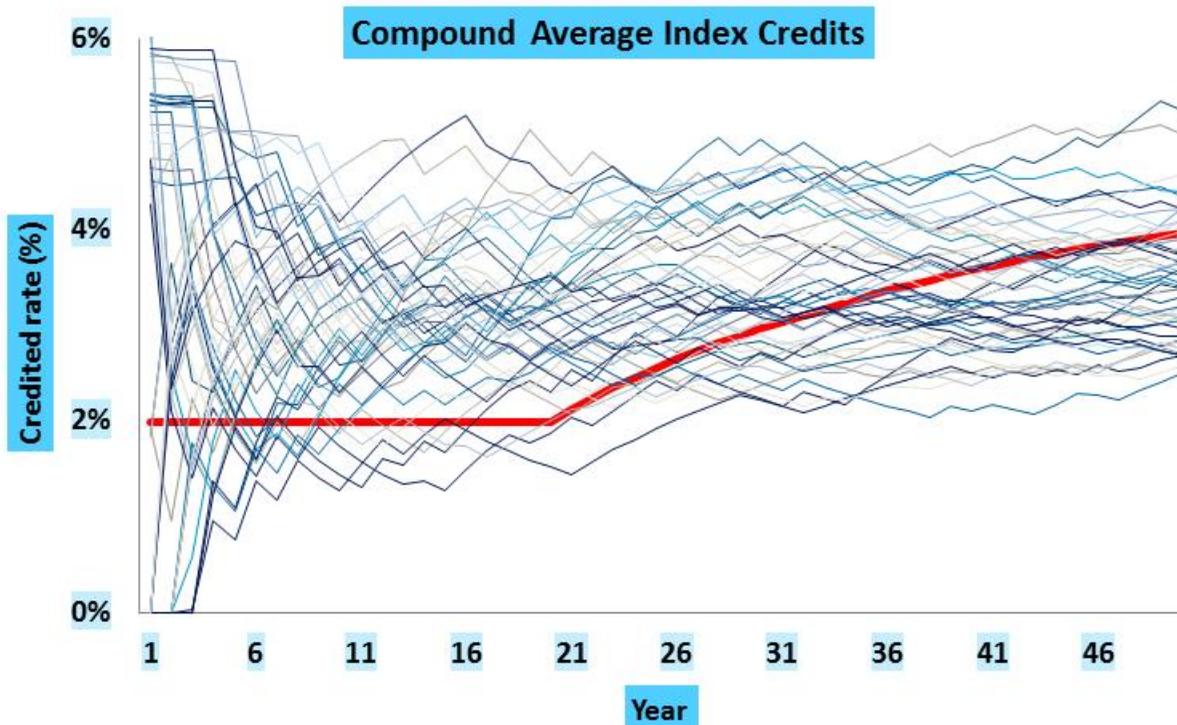
Product	Budget	Cap	Index return	Option return
A	1%	2%	2%	+100%
B	5%	10%	2%	-60%

The DR equity growth rates are low (~2%). This causes poor total returns in cases where the option budget is higher than the index return which is penalizing for most product designs.



Comparison to SR scenarios

Index credits for DR scenario (red line) are low relative to SR scenarios (other lines) for the first 20 years



Comparison to SR scenarios

Analysis of index credits and the “kicker” is being performed using IUL caps and the American Academy of Actuaries economic scenario generator. Analysis for the DR is shown in yellow and the SR in green.

Compound Average Index Credits											
	DR	Avg	Min	5th	10th	25th	50th	75th	90th	95th	Max
First 5 years	2.0%	3.2%	0.8%	1.4%	1.9%	2.3%	3.0%	4.2%	4.7%	4.9%	5.8%
First 10 years	2.0%	3.1%	1.3%	1.8%	1.9%	2.5%	3.1%	3.8%	4.0%	4.3%	4.6%
First 15 years	2.0%	3.2%	1.3%	1.7%	2.1%	2.6%	3.1%	3.6%	4.0%	4.2%	4.8%
First 20 years	2.0%	3.2%	1.5%	2.1%	2.3%	2.7%	3.2%	3.5%	4.1%	4.4%	4.8%
First 30 years	3.0%	3.4%	2.2%	2.3%	2.6%	2.9%	3.3%	3.9%	4.5%	4.6%	4.9%
First 50 years	4.0%	3.5%	2.5%	2.7%	2.7%	3.1%	3.5%	4.0%	4.2%	4.5%	5.2%

Compound Average Index Kicker ¹											
	DR	Avg	Min	5th	10th	25th	50th	75th	90th	95th	Max
First 5 years	74%	114%	32%	50%	72%	83%	111%	147%	159%	186%	192%
First 10 years	74%	110%	52%	74%	80%	89%	109%	132%	146%	153%	156%
First 15 years	75%	109%	50%	72%	80%	89%	107%	126%	143%	155%	158%
First 20 years	75%	107%	63%	81%	84%	95%	107%	118%	128%	131%	145%
First 30 years	112%	109%	80%	85%	89%	100%	109%	117%	127%	133%	143%
First 50 years	140%	108%	81%	92%	93%	99%	107%	115%	122%	127%	138%

After 20 years, the DR scenario is worse than the 5th percentile of SR scenarios based on both index credits and index kickers

1. Equal to the compound average index credit divided by the compound average option budget



2 | Work to date



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Work to date

This issue was discussed among the LRWG in the first half of 2017. The Academy's research Task Force helped distribute a survey to representatives from 34 of the industry's 36 IUL writers.

The survey asked for projections of the Net Premium Reserve (NPR), DR and SR for the companies IUL products along with an alternative DR in which all deposits were transferred to the fixed account.

The collage consists of three overlapping screenshots of an email survey. The leftmost screenshot shows the email body text, including the American Academy of Actuaries logo and a detailed introduction. The middle screenshot shows the survey introduction page with the title 'IUL Reserve Projections' and an 'Introduction' section. The rightmost screenshot shows the survey data entry form, titled 'IUL Reserve Projections', with sections for 'Additional Information' and '7. Please describe how the index credit was determined...' and '8. Do you have any suggestions or observations...'. The form includes input fields and radio buttons for 'Ready Now', 'Sending Directly', and 'Unable to Provide'.



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Work to date

There was limited response to the survey, with only five companies submitting information. Of these submissions:

- Four included the projected SR
- Two included the projected DR under the alternate definition

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SURVEY OF INDUSTRY PRACTICE

IUL Reserve Projections for PBR:
Results from a Survey of Life Insurance Companies
December 8, 2017

Report by: Steve Jackson, Assistant Director for Research (Public Policy)
To: Dave Neve, Chair, and members of the Life Reserves Work Group, Life

Relevant Pool of Companies: According to Wink's Sales and Market Report, insurance companies offering indexed universal life (IUL) products as of 2016, 36 companies are listed in Appendix 1.

Sample: We contacted Academy members at 34 of the 36 companies (94% participation in the survey). Those 34 companies accounted for 94% of the by premiums, of IUL products in 2016.

Survey Time Period: 8/15/2017 - 9/11/2017.

Response: We received responses from 10 of the 34 companies contacted. Indicated they would be unable to provide the projections requested and 5 of the data requested.

Our 5 responding companies accounted for 26% of the total sales, measure IUL products in 2016.

Nature of Responses: the five companies all provided projections of policy guarantee, one company also provided projections of policies without a secondary guarantee. Among the submissions for policies with a secondary guarantee, some projected annually, some were submitted every ten years, and some were a summary of the periodicity of the responses:

For Policies with a Secondary Guarantee	Annual	Every 10 years
NPR	4	1
DR	4	1
SR	2	2
DR with fixed	2	0

Analysis Focused: We have restricted analysis to policies with secondary guarantee. The centrality of the relationship between the DR and the SR, we have used data points every 10 years (years 1, 10, 20, and 30) in order to include complete data for companies which submitted SR projections.

In Table 1, we describe the relationships among the projections for DR, SR, and NPR. We describe companies as always, never or sometimes displaying a certain relationship; always refers to a pattern which holds in years 1, 10, 20 and 30.

Table 1: Relationships between NPR, DR, SR

DR - SR	# of Companies	% of Companies
Always	1	25%
Never	0	0%
Sometimes	1	25%
NPR - DR	5	
Always	0	0%
Never	3	40%
Sometimes	2	20%

If the NPR is the dominant reserve and is included in starting assets it would distort the relationship between the DR and SR we wish to examine. Tables 2 and 3 show the relationship between the DR and SR, for companies where the NPR is not greater than the DR.

Table 2:
For 4 companies with projections for NPR, DR and SR:
Which companies have DR > NPR by projection year:
Of those companies where DR > NPR, which companies have DR > SR

	Year 1	Year 10	Year 20	Year 30
DR > NPR	3 (50%)	4 (100%)	4 (100%)	4 (100%)
DR > SR	2 (100%)	3 (25%)	2 (50%)	1 (25%)

The DR exceeds the SR in Year 1 and sometimes exceeds the SR in Years 10, 20 and 30. This is not intuitive for an indexed product, as a single deterministic scenario is not intended to capture equity return risk as well as a set of stochastic scenarios.

Table 3:
Average Reserve Amounts for NPR, DR and SR when DR > NPR
(Reserves in dollars per \$1,000 of insurance in force projected)

Number of Companies	Year 1	Year 10	Year 20	Year 30
NPR	2	4	4	4
DR	\$32.43	\$146.52	\$209.05	\$240.26
SR	\$38.89	\$174.46	\$317.58	\$448.42
SR	\$16.18	\$195.88	\$336.63	\$452.41



Work to date

Due to privacy and anti-trust concerns, only aggregate level information was made available. The survey results were not conclusive but do highlight situations where the DR is dominant.

Table 1: Relationships between NPR, DR, SR

	# of Companies	% of Companies
DR > SR	4	
Always	1	25%
Never	2	50%
Sometimes	1	25%
NPR > DR	5	
Always	0	0%
Never	2	40%
Sometimes	3	60%

- One respondent reported that the DR was always in excess of the SR

Table 2:

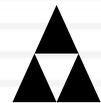
For 4 companies with projections for NPR, DR and SR:
Which companies have DR > NPR by projection year:
Of those companies where DR > NPR, which companies have DR > SR

	Year 1	Year 10	Year 20	Year 30
DR > NPR	2 (50%)	4 (100%)	4 (100%)	4 (100%)
DR > SR	2 (100%)	2 (50%)	2 (50%)	1 (25%)

- Over the first 20 projection years, the DR exceeded the SR in 50% or more of submissions where the DR was in excess of the NPR



3 | Considerations and alternative approaches



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Considerations

- 1** The stochastic reserve is intended to capture the more complex risks and guarantees associated with IUL products. The deterministic reserve is meant to capture insurance risks and moderate interest rate risk. An assumption could be made for the DR that all funds are transferred to the fixed account.
- 2** A somewhat adverse view is that the equity growth rate is exactly equal to the option budget
- 3** There will be unintuitive results when the index credit is disconnected from the option budget over a prolonged projection period



Alternative approaches

The following alternative approaches were discussed by the LRWG. **Approaches 1-2** were determined to be the most feasible from a calculation and regulatory perspective.

- 1** Assume all funds are transferred to the fixed account
- 2** Assume an index credit equal to a percentage (90-110%) of the option budget
- 3** Remove the DR requirement for IUL products
- 4** Revise the scenario 12 prescribed equity return path, potentially for just IUL products
- 5** Define a separate scenario 12 equity return path for IUL products that varies based on common crediting strategies



Appendix A | Definitions and analysis support



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Appendix A | Definitions

Definitions for terminology used throughout this presentation can be found below

Equity return

- The total equity return is the rate that an equity market increases including dividends
- The net equity return is equal to the total return less the assumed dividend rate

Option budget

- The option budget is the amount that the company has to spend to hedge the index guarantees
- Typically expressed as a percent, the option budget is equal to companies earned rate less the profit spread

Cap rate

- The maximum index growth that could be credited to the policyholder

Index credit

- The amount credited to the policyholder
- This is a function of the cap rate, floor rate (typically 0%) and participation rate

Index kicker

- This is the ratio of the index credit to the option budget
 - A kicker of more than 100% means that the index credit was larger than the amount spent on options
-



Appendix A | Assumptions

The assumptions supporting the analysis performed are described below. The calculations assume one-year point-to-point crediting with 100% participation and a 0% floor.

Equity return

- Total equity returns based on the “US Diversified” market from the Academy’s scenario generator as of 12/31/2016
- Net equity returns assume a 2% dividend rate which is subtracted from the total equity return

Option budget

- Earned rate determined using a 1.5% spread over 20-year treasuries using the Academy’s scenario generator as of 12/31/2016 with 8% turn-over
- No starting portfolio was assumed in determining the portfolio earned rate
- A 1.5% profit spread is subtracted from the earned rate to arrive at the option budget

Cap rate

- The Black-Scholes formula is used to calculate the cost of options
- Volatility is assumed to be 20% at the money with a 35bps strike skew

Index credit

- Based on the product evaluated this is equal to:
$$\text{Max}\langle \text{Min}(\text{Cap rate} | \text{Net equity return}) | 0 \rangle$$



Appendix A | Analysis tool

An Excel based tool was built in order to perform this analysis and shared with the LRWG members. This tool allows the user to easily modify the assumptions and refresh results.

Assumption notes

- Economic assumptions use interest and equity returns from the AAA ESG as of 12/31/2016
- Equity returns use the "US diversified" rate

Calculation notes

- Example assumes a one-year PTP crediting IUL product
- The option budget is calculated using a simplified investment assumption with a target spread applied
- The cap rate is solved for using Black-Scholes. Calculations are refreshed by pressing the button below.

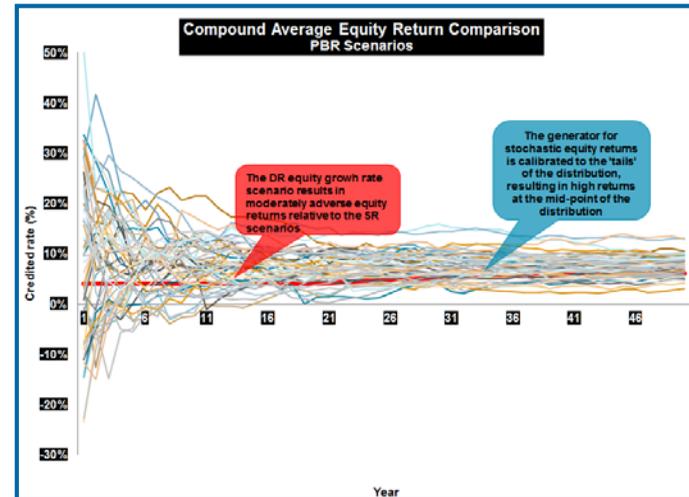
Run first N scenarios of 1000

N =

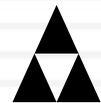
Assumptions		Current Scenario	50	Years	51
Investments					
Strategy	20 year corporates				
Credit spread	1.5%				
Portfolio turn-over rate	8.0%				
Cap setting					
ATM volatility	20.0%				
Volatility skew	0.35				
Spread					
Dividend Rate					

Year	Economic			
	UST - 1yr	UST - 20yr	Equity Return	
1	1.3%	3.0%	29.1%	
2	1.1%	2.8%	11.3%	
3	0.9%	2.7%	11.3%	
4	0.4%	2.4%	15.9%	
5	0.4%	2.3%	0.0%	
6	1.1%	2.5%	2.9%	

Year	Assumptions				ATM Call Calculation				ITM Call Option Calculation							
	r	Dividend Rate	t	Equity Return	Strike Ratio	Growth Rate	Volatility	d1	d2	Call(K,t)	Strike Ratio	Growth Rate	Volatility	d1	d2	Call(K,t)
1	1.2%	2.0%	1	29.1%	100.0%	0.0%	20.0%	0.06	(0.14)	7.47	105.9%	5.9%	17.9%	(0.27)	(0.45)	4.43
2	1.1%	2.0%	1	11.3%	100.0%	0.0%	20.0%	0.05	(0.15)	7.40	105.9%	5.9%	17.9%	(0.28)	(0.46)	4.37
3	0.9%	2.0%	1	11.3%	100.0%	0.0%	20.0%	0.05	(0.15)	7.32	105.9%	5.9%	18.0%	(0.29)	(0.47)	4.32
4	0.4%	2.0%	1	15.9%	100.0%	0.0%	20.0%	0.02	(0.18)	7.12	105.9%	5.9%	17.9%	(0.32)	(0.49)	4.17
5	0.4%	2.0%	1	0.0%	100.0%	0.0%	20.0%	0.02	(0.18)	7.12	105.7%	5.7%	18.0%	(0.31)	(0.49)	4.22
6	1.1%	2.0%	1	2.9%	100.0%	0.0%	20.0%	0.05	(0.15)	7.41	105.5%	5.5%	18.1%	(0.26)	(0.44)	4.54
7	1.0%	2.0%	1	5.7%	100.0%	0.0%	20.0%	0.05	(0.15)	7.37	105.4%	5.4%	18.1%	(0.26)	(0.44)	4.56
8	0.4%	2.0%	1	-5.8%	100.0%	0.0%	20.0%	0.02	(0.18)	7.10	105.4%	5.4%	18.1%	(0.29)	(0.47)	4.34
9	1.3%	2.0%	1	17.7%	100.0%	0.0%	20.0%	0.07	(0.13)	7.50	105.2%	5.2%	18.2%	(0.23)	(0.41)	4.77
10	1.2%	2.0%	1	20.4%	100.0%	0.0%	20.0%	0.06	(0.14)	7.46	105.1%	5.1%	18.2%	(0.23)	(0.41)	4.78
19				1.6%	2.2%	26.7%										
20				1.2%	2.4%	13.4%										



Appendix B | Analysis for variable products



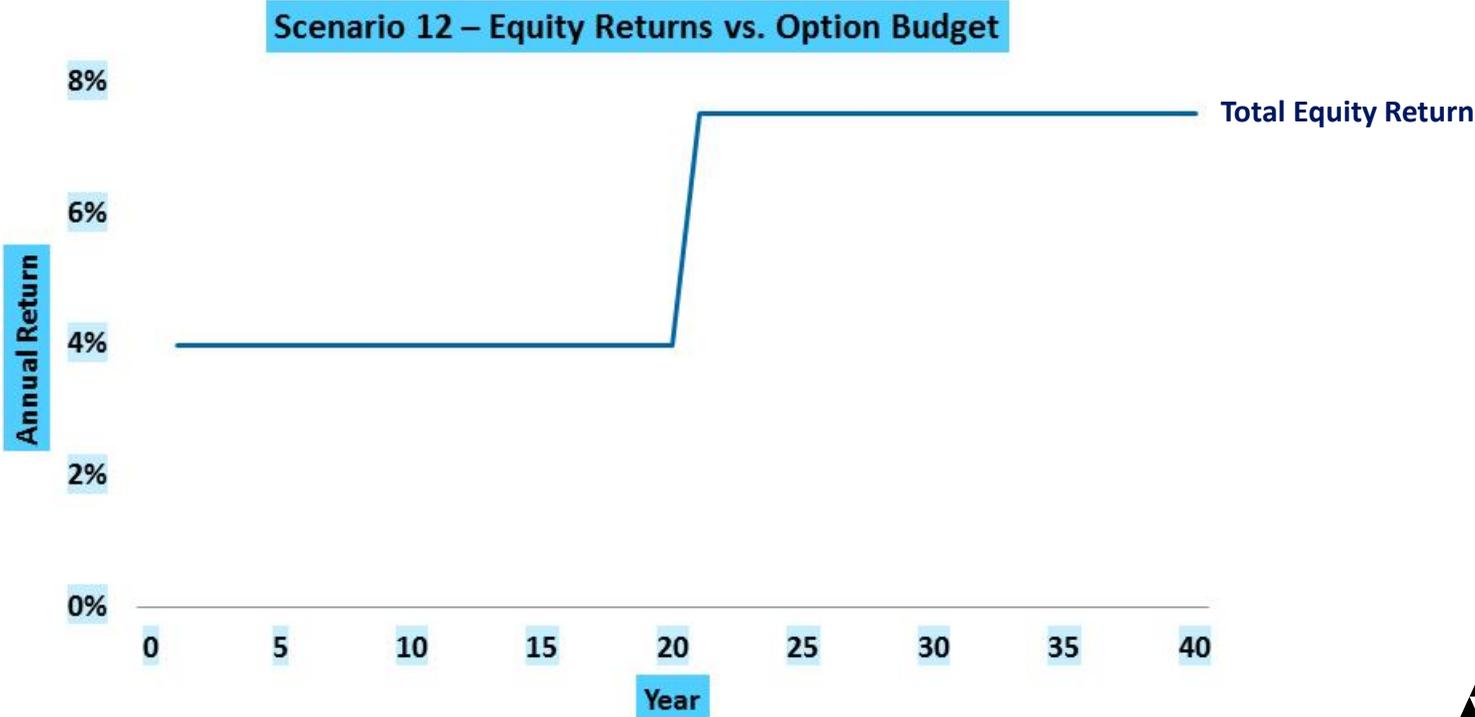
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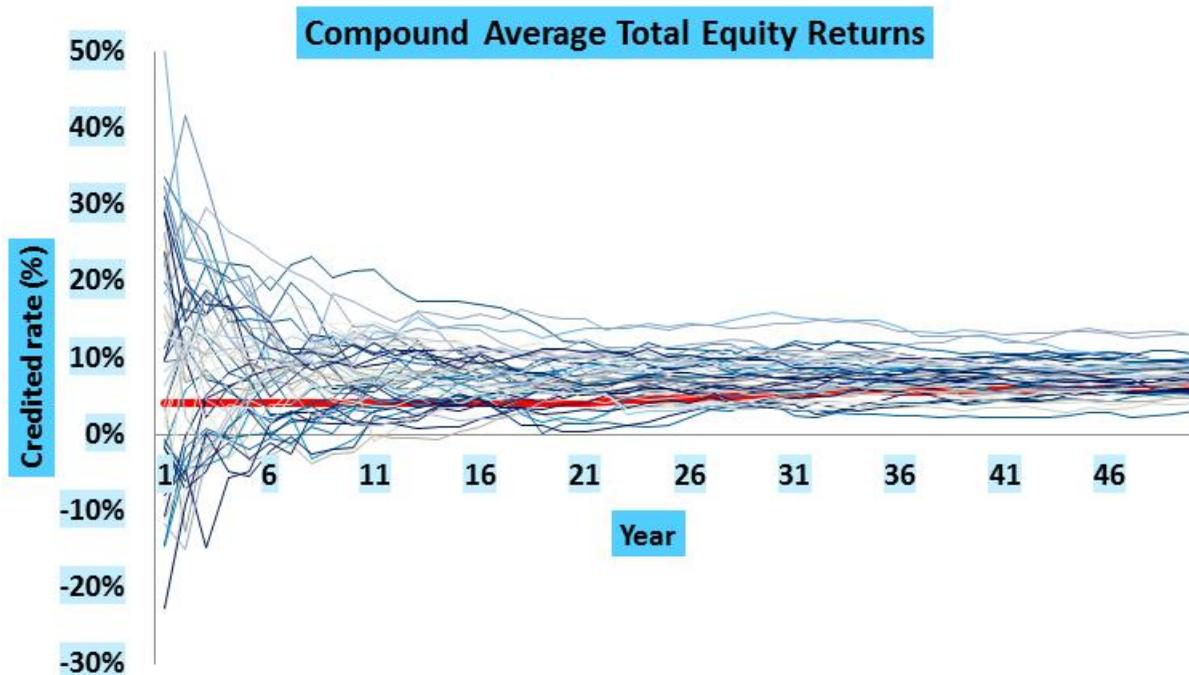
DR scenario

The use of Scenario 12 equity returns for the DR scenario were originally recommended by the LRWG's Variable Universal Life (VUL) Subgroup in the context of a VUL product. The fund returns underlying VUL are not subject to caps, floors and other indexing features and this scenario is viewed as moderately adverse.



Comparison to SR scenarios

Total equity returns for DR scenario (red line) are moderately adverse when compared to the SR scenarios in all years



Comparison to SR scenarios for VUL

Analysis of total equity returns performed using the American Academy of Actuaries economic scenario generator. Analysis for the DR is shown in yellow and the SR in green.

Compound Average Equity Returns											
	DR	Avg	Min	5th	10th	25th	50th	75th	90th	95th	Max
First 5 years	4.0%	8.5%	-5.5%	-3.4%	-0.3%	4.3%	7.7%	12.8%	18.2%	20.0%	25.2%
First 10 years	4.0%	7.8%	-2.3%	0.1%	1.5%	4.1%	7.2%	11.8%	13.6%	14.5%	21.4%
First 15 years	4.0%	7.8%	-1.0%	1.1%	1.7%	4.5%	7.4%	10.7%	13.5%	14.7%	21.5%
First 20 years	4.0%	7.3%	0.3%	1.9%	3.8%	5.7%	6.9%	9.5%	10.5%	11.8%	15.0%
First 30 years	5.2%	7.6%	3.5%	3.8%	4.1%	5.5%	7.4%	9.6%	10.9%	11.1%	15.9%
First 50 years	6.1%	7.6%	3.0%	4.7%	4.9%	5.7%	7.5%	9.2%	9.7%	10.5%	13.0%

After 20 years, the DR scenario is between the 10th and 25th percentile of SR scenarios based total equity returns. It is between the 25th and 50th percentile after 50 years.



Questions?

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