Does a Variable Annuity Come with a License to Take On More Investment Risk?

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Presentation Outline.

- Most Variable Annuity (VA) policies contain guaranteed living benefit (GLB) riders which protect the account from negative investment returns and/or extreme longevity.
- I will focus in detail on the mechanics of one of these GLB products, namely a Guaranteed Minimum Income Benefit (GMIB).
- Using exclusive and unique data from LIMRA on the behavior of over 500,000 VA policyholders, I will compare their asset allocation choices with a theoretical optimum under a GMIB.

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Variable Annuities… …Major Types of G.L.B.

- Guaranteed Annuity Option (GAO); historicaly contained in all Variable Annuities.
- Guaranteed Minimum Accumulation Benefit (GMAB); very similar to a long-term equity put.
- Guarantee Minimum Withdrawal Benefit (GMWB) for Life; SWiP with complex put.
- Guarantee Minimum Income Benefit (GMIB); the focus of this presentation…

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Option to Annuitize: Type I

$$\frac{W}{a_x} \Rightarrow \text{Lifetime Income}$$

$$W := \text{Account Value}$$

$$a_x := \text{Annuity Factor}$$

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Option to Annuitize: Type II

$$\frac{W}{Max[g, a_x]} \Rightarrow \text{Lifetime Income}$$

$$W := \text{Account Value}$$

$$g := \text{Guaranteed Factor}$$

$$a_x := \text{Annuity Factor}$$

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Option to Annuitize: Type III

$$\frac{Max[G, W]}{a_x} \Rightarrow \text{Lifetime Income}$$

$$W := \text{Account Value}$$

$$G := \text{Guaranteed Base}$$

$$a_x := \text{Annuity Factor}$$

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Option to Annuitize: Type IV

$$Max\left[\frac{Max\ [G,W]}{f},\frac{W}{a_x}\right]\Rightarrow \text{L. I.}$$

W := Account Value

G := Guaranteed Base

f := Fixed Factor

a_x := Annuity Factor

Main Research Question:

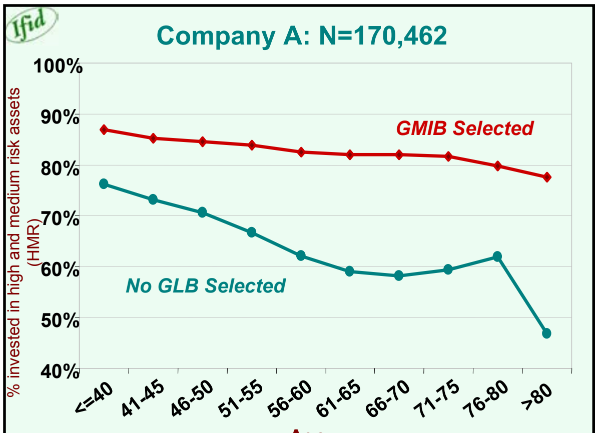
- How would you allocate your assets within a variable annuity if you had an option to annuitize in the form of a GMIB?
- Would you take-on greater investment risk because of the downside protection?
- Do VA + GMIB policyholders have greater equity exposure in practice?
- How does asset allocation vary with age?

Empirical Evidence (Many Thanks to LIMRA!)

- The next few slides display the actual asset allocations of over 500,000 VA policyholders with and without GMIB riders.
- We have focused on the impact of (i) age and (ii) distribution channel in determining the equity exposure within the VA.
- Notation: High & Medium Risk (HMR) contains equity-based sub accounts, versus Low Risk (LR) which includes bonds, money market & fixed accounts.

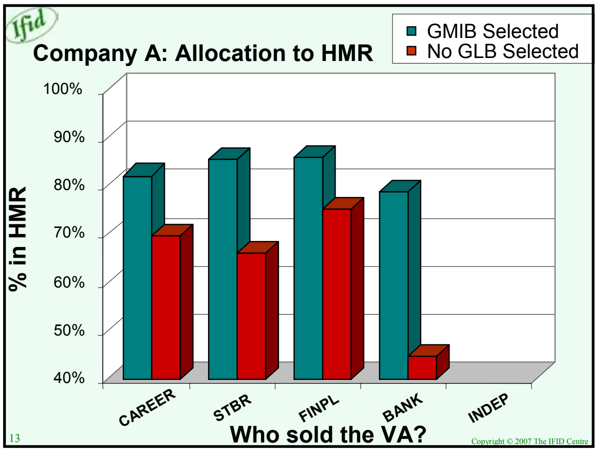
Fund / Sub-account Classification: Use Morningstar

- **HMR**: Small-cap, Mid-cap, Large-cap, International, High Yield and Real Estate: **Risky**
- **LR**: Bond, Money Market, Fixed Account: **Safe**



Company A: Allocation to HMR Assets

AGE	% in HMR		Additional HMR Exposure
	GMIB only	no GLB	
<=40	86.9%	76.3%	10.6%
41-45	85.3%	73.1%	12.2%
46-50	84.6%	70.6%	14.0%
51-55	83.8%	66.7%	17.1%
56-60	82.4%	62.2%	20.3%
61-65	82.0%	59.0%	23.0%
66-70	82.1%	58.3%	23.8%
71-75	81.6%	59.3%	22.2%
76-80	79.7%	61.9%	17.8%
>80	77.5%	46.7%	30.8%
Total # of Policies	104,377	66,085	



Pooled Regression Results:

Dependent Variable = HMR% in VA

Variable	With GMIB		Without GLB	
	Estimate	t-value	Estimate	t-value
Male	+0.0123	*16.4*	+0.0256	*18.24*
Age	-0.0015	*-43.09*	-0.0041	*-76.1*
IRA	-0.0044	*-5.59*	-0.0098	*-6.37*
STBR	+0.0112	*2.6*	+0.0296	*7.27*
BANK	-0.0576	*-13.02*	-0.1433	*-34.42*

N = 368K (with GMIB), 272K (w/o GMIB), Adj. R-sq = 0.15

Takeaway…

- We find that policyholders increase their risk exposure by up to 20 to 25 percentage points. This is not limited only to younger investors.
- There is a strong distribution channel effect, which might relate to clientele as opposed to the sales process.
- Remember that in many cases there are asset allocation restrictions (i.e. model portfolios) when the GMIB rider is selected. In other words, some of this effect might not be completely voluntary.

Theoretical Model…

- In the fine tradition of dynamic portfolio choice I will now derive an optimal asset allocation in the presence of a GMIB.
- Think of this as a normative theory of how you <u>should</u> change your asset allocation if you are suddenly granted a put option.
- This is more complicated than you think!

The Model

$$\gamma \Leftrightarrow \max_{\alpha} E[u(W)] \Leftrightarrow \alpha^{*}$$

$$\gamma \Leftrightarrow \max_{\alpha} E[u(\max[W,K])] \Leftrightarrow \alpha^{**}$$

Option Strike Price =

Annuitized Value of Guaranteed Income

Model Results:

Age 55, Annuity Factor at age 70 = $20

% in HMR w/o GLB	Implied Risk Aversion	% in HMR with GMIB	Certainty Equivalent (CE) with GMIB	C.E. w/o GLB
30%	6.67	40% ~ 50%	$200	$200
40%	5.00	70% ~ 100%	$220	$205
50%	4.00	100%	$240	$210

Ok, so are the actual asset allocations we observe, justified?

- In theory yes, but…
- Remember, we did NOT model any particular company's GMIB. Our analysis is generic.
- That said, at higher ages it is hard to justify an extra 15 percentage points of equity risk.
- The (i) assumed lapse rates, (ii) mortality table set-backs, and (iii) pricing, play an enormous role.
- In practice, if the strike price of the embedded option is (very) out-of-the money, the optimal allocation to HMR (equity) might not change.

Final Takeaway Points:

- The VA+GLB industry is growing in importance. It can be measured in hundreds of billions of dollars and should not be ignored by traditional investment-focused analysts.
- The embedded put options are extremely complicated. Generalizations regarding value and optimal behavior are quite difficult.
- One thing is for certain, VA policyholders are taking on more equity-market risk, which I believe is partially – although perhaps not fully -- justified by rational asset allocation models.