

Retirement Income: Analyzed

Retirement Income Analytics Newsletter from The QWeMA Group

Question of the Month: *My client has a basic variable annuity (VA) with a 5% Guaranteed Living Withdrawal Benefit (GLWB). I am trying to figure-out how to allocate the money within the various sub-accounts, to maximize the value of the embedded guarantee. How can I use the RCLA and QSWiP functions in QVEL to analyze this decision?*

Answer: To get right into it, **Table #1** offers a quantitative perspective on the value, benefits and risk that come from allocating a VA + GLWB portfolio more or less aggressively. The underlying model on which these numbers are based assumes a generic 65 year-old retiree with a 50% chance of reaching age 86 – think life expectancy -- but with a 1 in 20 chance of reaching age 100. Think longevity risk.

Below is a screenshot of the **RCLA function in QVEL**. This function provides the fair value of a Ruin-Contingent Life Annuity-- a type of exotic option that pays annual income for life, once an underlying retirement portfolio is depleted (or 'ruined'). As you can see, this function requires pre and post ruin withdrawal values. In this case, the individual is withdrawing \$60,000 annually pre-ruin, $(GLWB\ Rate + Fees) \times InitialWealth$. Of note is the fact that the insurer retains the fees of \$10,000 and only the \$50,000 flows through to the individual. Post-ruin, however, the insurer continues to pay \$50,000 annually and because the account is ruined, fees are not deducted from the withdrawal; herein lies the value of a RCLA. The appropriate L, M and B parameters, refer to the Gompertz-Makeham law of mortality that the function uses to calculate survival probabilities; interested readers are referred to the October 2010 newsletter for further details.

	A	B	C	D	E	F
31						
32			Age	65		
33			Delay	0		
34			Wealth	\$1,000,000		
35			Pre-Ruin Withdrawal	\$60,000		
36			Post-Ruin Withdrawal	\$50,000		
37			Risk Free Rate	3.0%		
38			Expected Return	8.0%		
39			Volatility	20.0%		
40			L	0.00		
41			M	88.72		
42			B	10.00		
43			RCLA	\$59,562		
44						

Table #1 displays a variety of portfolio summary statistics for ten different asset allocations, which range in aggressiveness from 100% stocks all the way to 0% stocks. The remainder of the portfolio not invested in risky stocks, is allocated to short-term bonds. For those readers who want to follow-along with their spreadsheets at home, I have *assumed* that the generic stock-fund earns an average of 8% per year after all management fees deducted, but with a volatility (risk factor) of 20%. In contrast, the medium-term bond-fund earns a 3% return net of fees, with no volatility or uncertainty.

I admit that these parameter assumptions are somewhat idealistic, but my intention is to illustrate the impact of asset allocation as opposed to providing an economic forecast. That said, these figures are probably not that off, anyway. What is important to recognize is that the portfolio return, volatility and growth rate (columns #3, #4 and #5) are an increasing function of your stock exposure. This is actually quite obvious, when you think about it.

Note that the growth rate can be thought-of as a median return, and is different from an expected return which is a bit higher. For those of you to whom this means something, I am referring to the geometric mean versus the arithmetic mean.

Moving on, now consider a generic GLWB with a \$1,000,000 premium that offers a basic 5% for life, starting immediately. Each year the portfolio guarantees and generates an income of \$50,000 regardless of how the underlying sub-accounts perform. Essentially, the VA + GLWB consists of two components. The first part is a straightforward *investment*, while the other is an embedded *exotic put option*, which provides the downside protection. The put option guarantees that if the VA account value declines and ever hits zero, the contract converts into a lifetime income annuity. A typical fee for this rider's privilege is an additional 1% per year. So far, so good.

The question here is, what is the value of this guarantee and more importantly how does it depend on the asset allocation? And, would you rather be more or less aggressive?

To answer this, the sixth column in the table provides the most interesting and relevant take-away. It displays the model value of the portfolio insurance. Notice how the insurance value ranges from approximately \$59,560 when the portfolio is allocated to 100% stocks, down to a minimum of \$32,200 when the portfolio has 30% stocks, and then on to the highest value of \$62,000 when the portfolio consists of 100% bonds. Notice the counter-intuitive U-shaped pattern of the value of protection, which is displayed in **Figure #1** as well.

Herein lies the essence of the value of a GLWB and why it is thoroughly related to asset allocation. If you as the policyholder allocate 100% of your account to risky stocks that are expected to earn 8% per year, but are quite risky to the tune of 20% swings, the \$59,500 value of protection is high because of the risk the portfolio will be exhausted by a very *mean sequence of investment returns*, early on during retirement. In contrast, when the portfolio is allocated 100% to bonds earning a meager 3% per year, there is absolutely no way the variable annuity policy can sustain withdrawals of \$50,000 -- plus a 1% rider fee, to boot -- every single year, and still grow. This very safe portfolio will slowly but surely decay towards zero in about 20 years, and then convert into a life annuity if you are still alive. The \$62,000 cost of insurance is in actual fact the cost of a deferred life annuity. It is pure longevity insurance.

At once extreme the company faces colossal market risk, at the other extreme they face longevity risk. They want you to be somewhere in the middle.

What is all of this saying?

As you can see, the asset allocation that minimizes the value of the protection and hence the risk to the insurance company is somewhere around half stocks and half bonds. No you can understand why the insurance company doesn't want you to have 100% stocks, nor will they ever push you towards 100% bonds. The 50% to 40% stocks is the sweet spot for the insurance company, but not for you the policyholder! You benefit from the extremes.

	A	B	C	D
1			Time	15
2			Delay	0
3			Wealth	\$1,000,000
4			Withdrawal	\$60,000
5			Expected Return	8.0%
6			Volatility	20.0%
7			Percentile	75%
8			QSWiP	\$2,093,382

Above is a screenshot of the **QSWiP function in QVEL**. This function calculates the percentile value of the SWiP (Systematic Withdrawal Plan) account given that it grows at an expected return with a pre-specified volatility while at the same time drawing down at a fixed rate. In this case, percentile value is defined as the value of the account below which 75% of observations fall. In other words, the individual has a 75% chance of holding an account value of less than or equal to approximately \$2.1 million dollars at the age of 80 given the parameters presented in the screenshot.

As you can see from the final two columns in **Table #1**, that display the projected value of the accounts, a portfolio that has no stocks is not likely to grow and the range of values you can expect at age 80 is approximately \$431 thousand. In contrast, the range of values for the all stock portfolio is between \$2.1 million and \$281 thousand. So, if it is growth that you seek, stocks are the best asset class.

Bottom line: If you are purchasing a VA with a GLWB in order to insure your retirement, you might as well give the company something to ensure. The higher the amount of risk you take, as proxied by more equity, the greater the value of the guarantee. For those people – and the many compliance attorneys – who are concerned that 100% equity is unsuitable for 70 year-old Aunt Dorothy, I remind you that nobody ever told you to place 100% of investable assets inside a variable annuity. De-risk the unprotected portfolio, and take on as much risk allowable in the insured one. So, if you have \$500,000 in a VA and \$500,000 in mutual funds and you want a 50/50 stock/bond allocation in totality, then allocate the VA entirely to stocks and mutual funds entirely to bonds (tax considerations aside.)

Your asset allocation is a comprehensive metric of your personal balance sheet, and should not be monitored silo by silo. Professor Harry Markowitz – the founder of modern portfolio theory – never, ever said that you should diversify every single account or policy you own. There is nothing wrong with silo concentration if you are globally diversified.

This month's newsletter is written by Moshe A. Milevsky.

Table #1: Optimizing the Asset Allocation under a Basic 5% Lifetime Income Guarantee

Asset Allocation to...		Portfolio	Portfolio	Portfolio	Value of	Projected Value of Account: Age 80	
Stocks	Bonds	Net-Return	Volatility	Growth Rate	Protection	75th Percentile	25th Percentile
100%	0%	8.0%	20.0%	6.0%	\$ 59,562	\$ 2,093,382	\$ 281,333
90%	10%	7.5%	18.0%	5.9%	\$ 53,395	\$ 1,911,750	\$ 322,297
80%	20%	7.0%	16.0%	5.7%	\$ 47,723	\$ 1,727,740	\$ 358,641
70%	30%	6.5%	14.0%	5.5%	\$ 42,622	\$ 1,544,249	\$ 389,657
60%	40%	6.0%	12.0%	5.3%	\$ 38,211	\$ 1,363,530	\$ 414,524
50%	50%	5.5%	10.0%	5.0%	\$ 34,692	\$ 1,187,635	\$ 432,429
40%	60%	5.0%	8.0%	4.7%	\$ 32,433	\$ 1,018,752	\$ 442,656
30%	70%	4.5%	6.0%	4.3%	\$ 32,203	\$ 859,641	\$ 444,665
20%	80%	4.0%	4.0%	3.9%	\$ 35,735	\$ 713,776	\$ 437,205
10%	90%	3.5%	2.0%	3.5%	\$ 45,752	\$ 587,056	\$ 414,933
0%	100%	3.0%	0.0%	3.0%	\$ 62,060	\$ 431,734	\$ 431,734

Figure #1

