Lifelong Retirement Income:
Cost of Excluding Variable Annuities

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Executive Summary:

This study compares the initial savings required to provide the same lifelong income for the retiree using two different income classes:

1. An investment portfolio with no income guarantees,

   The investment portfolio has no guarantees; as soon as the portfolio assets deplete, the income stream to the retiree stops.

2. A variable annuity portfolio with guaranteed minimum withdrawal benefits for life (VA-GMWBL)

   With VA-GMWBL, the income stream for the retiree is paid from his portfolio until it depletes. After that, payments continue seamlessly, but now, it is paid by the insurer for life. The plan may include the retiree's life only, or it may include retirees spouse as well.

   Throughout this paper "guaranteed" means the income guarantees provided by the insurer and backed by the strength of the insurer alone.

   For the purpose of this analysis, we assume that the variable annuity has a step-up feature. This feature allows a higher market value (contract value) to increase ("step-up") the Guaranteed Withdrawal Base (GWB). For the purpose of this article, the step-ups are reviewed and possibly triggered at each anniversary of the purchase date of the VA-GMWBL. This is called step-up trigger date. A step-up of the GWB creates a higher income for the retiree for the rest of his/her life.

Summary of Findings:

The aftcast of all years since 1900 shows that variable annuities with guaranteed minimum withdrawal benefits required a lower initial capital than holding an investment portfolio with no guarantees for the same income stream.

Introduction:

As baby boomers face the fear of outliving their savings, sales of VA-GMWBL increased considerably until the 2008 market crash. After that, many investors and advisors held back their purchases until some clarity developed in the markets. Many insurers pulled their VA guarantees off the market, or changed them to reduce their exposure to risk.

While some people consider VA-GMWBLs expensive, they do help reduce the fear of running out of income while preserving the hope of retaining assets for emergencies or for the estate.

There are three broad categories of financial risk factors during retirement: longevity risk (living too long), market risk (premature portfolio depletion) and purchasing power risk (inflation). Most VA-GMWBL products, when properly selected, eliminate the first two risk factors. They provide a guaranteed lifelong income regardless of what happens to the investment side of the contract.

It is the third risk factor – the inflation- where VA-GMWBLs have a shortfall. However, in this article we will focus on comparing the initial capital required for the same income stream. Therefore, the comparative initial capital requirement is independent of the inflation factor.

A VA-GMWBL has two balances to keep track of: The first one is the market value, which fluctuates just like any investment portfolio. This is called the Contract Value (CV). The second balance to keep track of is the GWB. It is used to calculate the income payments, which are a percentage of the GWB.

The day you buy the VA-GMWBL, both the CV and the GWB have the same value. Over time, the CV generally decreases because the withdrawals by the retiree (income) and the insurer (portfolio expenses and riders) are paid from it. Subsequently, even if the CV might go down to zero, the annual payments continue seamlessly for life, because of the guarantees provided by the insurance company.

Aftcast of an Investment Portfolio:

Let's first define the term "aftcasting": Aftcasting, as opposed to forecasting, is a method created by the author of this paper for analyzing retirement outcomes. It is based on actual market history. It includes the actual historical equity performance, inflation and interest rate data, as well as the actual historical sequencing of this entire data set, unlike simulators or economic scenario generators.

The sequence of returns is the largest determinant of the success of a retirement portfolio and its effect is missed by all man-made simulator models. That is because of the inherent flaw of simulator models: They can simulate the volatility of returns but not the sequence of returns. Aftcasting reflects the sequence of returns exactly as it happened in history.

Other determinants of success[1] in retirement portfolios are indicated in Table 1.

Table 1: Determinants of Success in Distribution Portfolios:

	Initial Withdrawal Rate		
	4%	6%	8%
Sequence of Returns	21%	21%	28%
Inflation	13%	20%	25%
Asset Selection	16%	18%	16%
Asset Allocation	17%	14%	10%
Portfolio Costs	21%	16%	14%
Others	12%	11%	7%

Equity proxy: S&P500

The first two items -the sequence of returns and the inflation- are factors that are outside the control of anyone. We call this the "luck factor". Especially at higher withdrawal rates, the luck factor is the most important factor in determining the success of a distribution portfolio.

[1] Source: "Unveiling the Retirement Myth", Jim C. Otar, Chapter 31-"Determinants of Portfolio's Success", ISBN: 978-0968963425

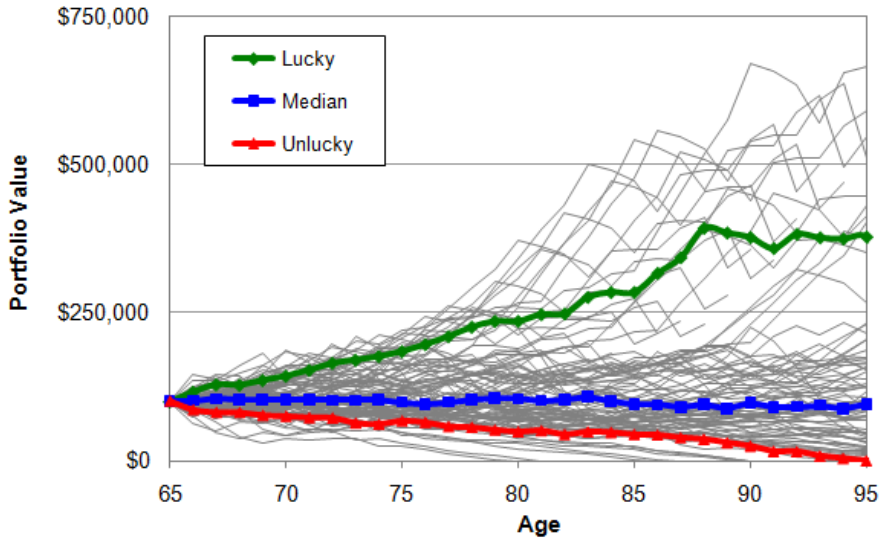
Aftcasting displays the outcome of all historical asset values of all portfolios since 1900 on the same chart, as if a person starts his plan in each of the years between the years 1900-1999. It gives a bird-eye view of all outcomes. It also provides the success statistics with significantly better historical accuracy than simulation models.

Let's work thorough an example: Bob, 65, is just retiring. He plans on withdrawing a fixed amount of $5,000 until age 95, a 30-year time horizon. His primary concern is sustainability of his income stream for life. In his investment portfolio he has $100,000 with an asset mix of 60% equities and 40% fixed income[2]. This investment portfolio has no guarantees; when the portfolio depletes, there is no further income.

The aftcast of this scenario is depicted in Figure 1. We define the bottom decile of all outcomes as the "unlucky" outcome, the top decile as the "lucky" outcome. The blue line indicates the median outcome where half of the scenarios are better and half are worse.

In this example, the probability of depletion –hence end of income- by age 95 is 11%.

Figure 1: The aftcast of fixed $5,000 annual withdrawals from an investment portfolio, starting capital of $100,000



[2] Equity proxy: Dow Jones Industrial Average since 1900, using currently prevailing dividend rates of 2%, total annual portfolio cost is 2.5% of the portfolio value, including management fees and all trading costs (this is a net alpha of negative 0.5%). Fixed income net returns (after all expenses), are historic 6-month CD rate plus 0.5%.

The Most Likely Outcome:

The next question we need to ask is this: when we compare the capital requirement for the guaranteed and non-guaranteed portfolios, i.e. pure investment portfolio versus VA-GMWBL, which outcome can we use? Do we compare the median outcomes? Or, do we compare the unlucky outcomes?

We need to compare the outcomes that are most likely to occur for the investor. For that, we need to look at the psychology of loss.

The Psychology of Loss:

From the beginning of 1900 until the end of 2009, the compound annual return (CAR) of the DJIA (index only) was 4.7%. However, if you miss the best 39 months out of the entire 1317 months that markets were open for business, your CAR drops down to 0%. This is about 3% of the entire time period. Essentially, what made money for the investor is the extreme good markets that happened only 3% of the time. Conversely, what creates catastrophic losses happened only 3% of the time. These are the "black swan" events that create cataclysmic changes to outcomes where models based on random distributions fail to recognize[3].

The investor psychology can be compared to how we feel in extreme weather conditions. When it is really cold, the weatherman talks about the wind-chill effect. He might say something like "The temperature will be 20 degrees Fahrenheit, but the wind-chill factor will make you feel like minus 10!"

On the other hand, when it is really hot, the weatherman might say something like "The temperature will be 90 degrees Fahrenheit, but with the heat index, it will feel like 120!"

If you look at the extreme bullish trends that occurred during 3% of the time, the CAR was 381%. During such a time period, after observing this phenomenal increase for a while, the investor "feels" like he is missing the boat. Just before that trend turns around, he abandons his long-term asset allocation policy and becomes aggressive with his investments. This action creates conditions for **larger future losses**.

At the opposite end of the spectrum, during the most extreme bearish trends that occurred 3% of the time, the annual rate of loss was 86%. During such a time period, after observing this phenomenal loss, the investor "feels" like he is losing everything. Just before that trend turns around, he abandons his long-term asset allocation policy and sells everything. This action creates conditions for **smaller future gains**.

[3] The conventional investment wisdom, such as the efficient frontier, MPT, portfolio optimizations, correlation factors between asset classes, and many other concepts, are entirely based on the randomness of the market events and are ineffective during these extreme market events.

There are several studies that compare the average market returns versus the investor returns. DALBAR's 2010 update of its Quantitative Analysis of Investor Behavior (QAIB) study[4] found that while the S&P 500 has returned 8.35% over a 20 year period ending in 2008, the average equity investor earned just 1.87%. John Bogle[5] estimates the over a 25 year period ending in 2005, the average mutual fund investor earned 7.3% compared to the 12.3% for the benchmark.

The mathematics of loss[6] works against the investor during the distribution phase, because of the negative effects of sequence of returns and reverse dollar cost averaging. In addition to this, the psychology of loss diminishes these already-impaired returns. Based on these observations, we conclude:

> While a market index can have a statistically average return, the **average** return of investments of an **average** investor is the **bottom decile** of that same market index.
>
> Therefore, we need to use the bottom decile outcome (the unlucky outcome) as the basis of retirement planning calculations.

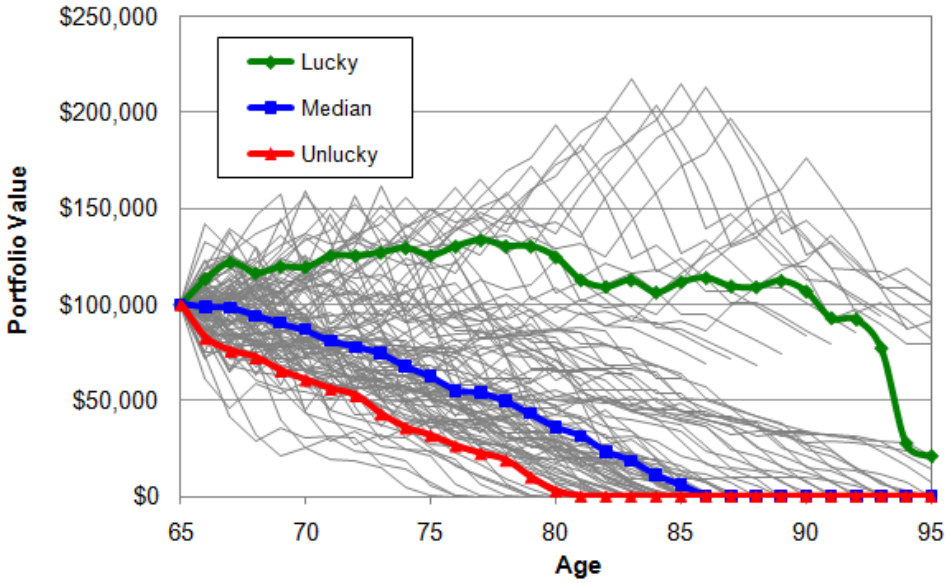
Aftcast of a VA-GMWBL:

Let's go back to our example: Instead of keeping his money in an investment portfolio, Bob purchases a VA-GMWBL. His asset mix is the same as before: 60% equity and 40% fixed income. The total costs of this contract – including management costs and portfolio costs, are 2.5% of the CV. The cost of the GMWBL rider is 1% of the GWB. The portfolio pays these costs until it depletes. When and if the portfolio runs out of money, these charges cease to exist and no further fees or charges are payable.

Figure 2 depicts the aftcast. The probability of depletion by age 95 is 31%. This is significantly larger than the investment portfolio without any guarantees. However, unlike the investment portfolio, the VA-GMWBL never runs out of income. Regardless of the presence or absence of any assets in the VA portfolio, the income is guaranteed.

[4] Dalbar's 2010 Quantitative Analysis of Investor Behavior (QAIB), Dalbar.com
[5] Bogle John, "The Little Book of Commonsense Investing" ISBN: 978-0470102107
[6] Otar Jim, "Unveiling the Retirement Myth", Chapter 8-"Mathematics of Loss", ISBN: 978-0968963425

Figure 2: The aftcast of VA-GMWBL portfolios, starting capital of $100,000



Earlier, we decided to use the unlucky outcome as the basis for our comparison of capital requirements in this paper. In the unlucky outcome, with a VA-GMWBL, the retiree receives the same dollar amount throughout his life as he started with at the beginning of his retirement. Going back to our example, Bob receives $5,000 each year for the rest of his life without any step-ups.

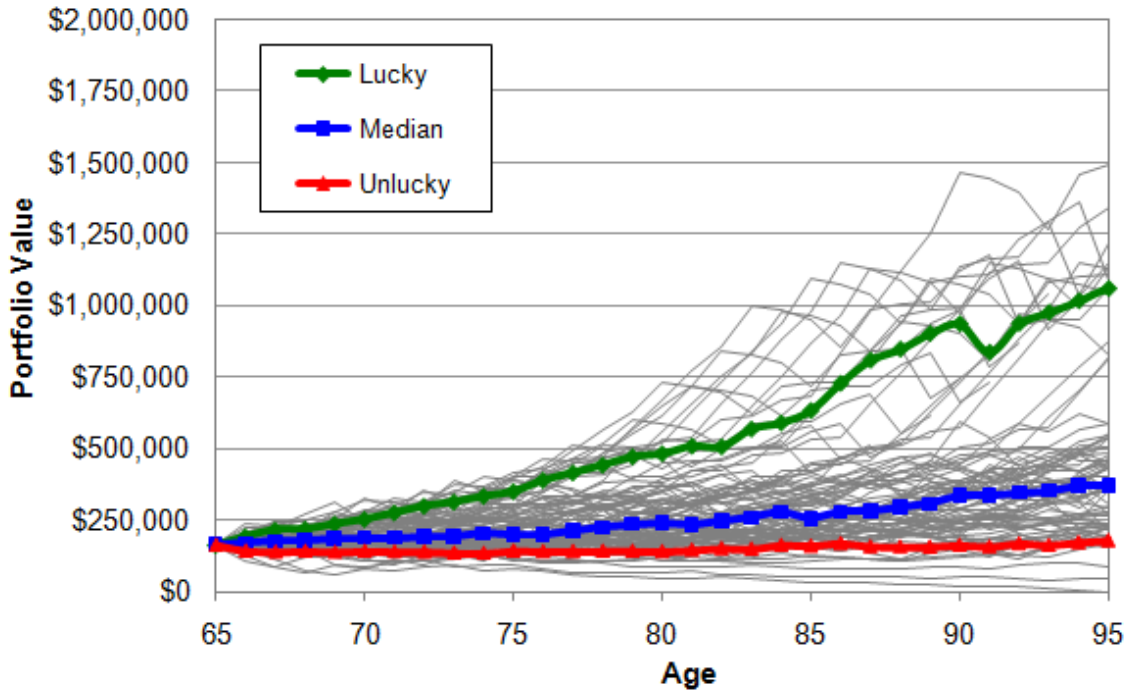
Now, using aftcasting, we can calculate how much initial capital Bob needs in an investment portfolio that will provide him with the same $5,000 annual income (with no increases) until age 95 with 100% certainty[7].

By trial and error, we calculate that Bob would need $163,000 initial capital in an investment portfolio that has no guarantees (See Figure 3). The difference of assets required between this $163,000 and the $100,000 for the VA-GMWBL is the cost of self-insuring this lifelong income stream.

Even though the VA-GMWBL portfolio had a larger probability of depletion, its guarantee meant that about 39% less initial capital was required to provide the same lifelong income.

[7] The term "certainty" refers to market history since 1900. Future outcomes will be different.

Figure 3: The aftcast of an investment portfolio, providing $5,000 annually for 30 years, starting capital of $163,000



One might argue that the investment portfolio can potentially create a significantly larger estate value. This is true. This would be a valid argument for an accumulation portfolio. However, in a distribution portfolio, the prime objective is ensuring a lifelong income. Only after this is achieved, can other objectives such as estate be considered. Following this criteria, for the unlucky retiree, it is irrelevant how much the **assets** are left at the **end**. What matters is how much assets you need at the **beginning** to provide the lifelong **income**.

Time Horizon:

We continue with the same analysis to include various time horizons. Table 2 summarizes the outcome. The breakeven time horizon is 14 years. If you know for sure that the retiree and his/her spouse will die within 14 years of starting withdrawals, then you do not need the income guarantees of a VA-GMWBL for the same income stream.

A different picture emerges when the breakeven age is observed from the vantage point of the insurer. If the withdrawals of the average pool starts at age 65, then the insurer is exposed to the liability of having to provide payments only after 14 years, at age 79. If the average life expectancy of that same pool is age 86, then this liability window of 7 years (86 minus 79) must be at least matched by the rider fees collected for 14 years from the unlucky retiree, which amounts to about 14% of the GWB. This is the trillion dollar question that must be answered without resorting to some Gaussian, random distribution simulation model: Keeping in mind, that all accounts can suffer in a bad market at the same time, do current rider fees collected over 14 years cover this liability for 7 years? Will the next bear market be as kind to insurers as the one that occured in 2008-2009?

Table 2: Comparison of initial capital required for a fixed $5,000 income stream from an investment portfolio and VA-GMWBL, asset mix 60/40, for various time horizons,

	Initial Capital Required	
Time Horizon	**VA-GMWBL**	**Investment Portfolio**
14 years	$100,000	$100,000
20 years	$100,000	$131,000
30 years	$100,000	$163,000
40 years	$100,000	$181,000

Asset Allocation:

Next, we analyse the effect of asset allocation. Table 3 summarizes the comparison of various asset mixes for a 30-year time horizon

Table 3: Comparison of initial capital required for a fixed $5,000 income stream from an investment portfolio and VA-GMWBL, 30-year time horizon, for various asset mixes

Asset Mix (Equity/Fixed Income)	Initial Capital Required	
	VA-GMWBL	Investment Portfolio
30/70	$100,000	$124,000
40/60	$100,000	$134,000
60/40	$100,000	$163,000
70/30	$100,000	$185,000

Figures on Table 3 indicate clearly that a retiree cannot asset-allocate his way out of an unlucky outcome. He needs to export and pool the risk.

Alpha:

Very few portfolio managers can beat the index over the long term. Alpha quantifies this excess return over and above the benchmark index.

Table 4 summarizes the comparison for various alpha values of a 60/40 asset mix. The breakeven long-term alpha is 6.4% for a 30-year time horizon. This means the equity portion of the portfolio needs to outperform the market by 6.4% each and every year for 30-years, to provide the same income stream as from a VA-GMWBL with guaranteed withdrawals. For a 20-year time horizon, the breakeven alpha is 3.9%, which is still a very high number.

This indicates, even if you have excellent managers who provide higher alpha, it is still unlikely that it can replace the protection of the VA-GMWBL.

Table 4: Comparison of initial capital required for a fixed $5,000 income stream from an investment portfolio and VA-GMWBL, 60/40 asset mix, for various alpha values

Long-Term Alpha		Initial Capital Required: VA-GMWBL	Initial Capital Required: Investment Portfolio
30-YEAR TIME HORIZON:			
-2%	**(average fund manager)**	$100,000	$185,000
-0.5%	**(used in this paper)**	$100,000	$163,000
0%	**(index)**	$100,000	$159,000
2%	**(excellent fund manager)**	$100,000	$136,000
4%		$100,000	$117,000
6.4%		$100,000	$100,000
20-YEAR TIME HORIZON:			
-2%	**(average fund manager)**	$100,000	$144,000
-0.5%	**(used in this paper)**	$100,000	$131,000
0%	**(index)**	$100,000	$127,000
2%	**(excellent fund manager)**	$100,000	$111,000
3.9%		$100,000	$100,000

Rollup of Income Prior to Withdrawals:

Many VA-GMWBLs also offer a "rollup of income" feature if there are no withdrawals from the account. For example: if you buy a VA-GMWBL at age 55 and take no withdrawals until age 65, during that ten year time period, the GWB typically increases (rolls up) by 5% annually, regardless of the portfolio performance.

If $100,000 is invested in a VA-GMWBL and no withdrawals are taken for 5 years, then the annual income starting 5 years later is $6,250 until death in the unlucky case. If the rollup period is 10 years then annual income is $7,500.

Table 5 summarizes the outcome of various rollup and withdrawal time horizons.

Table 5: Comparison of initial capital required for unlucky income stream from an investment portfolio and VA-GMWBL, asset mix 60/40, for various rollup and subsequent withdrawal time horizons

Rollup Time Horizon	Subsequent Withdrawal Time Horizon	Unlucky Annual Income	Initial Capital Required	
			VA-GMWBL	Investment Portfolio
0 years	20 years	$5,000	$100,000	$131,000
5 years		$6,250	$100,000	$137,000
10 years		$7,500	$100,000	$136,000
0 years	30 years	$5,000	$100,000	$163,000
5 years		$6,250	$100,000	$165,000
10 years		$7,500	$100,000	$162,000

Conclusion:

If the primary objective is to ensure a lifelong income stream for the retiree, a typical VA-GMWBL requires substantially lower initial capital than a naked investment portfolio. Pooling the longevity risk through VA-GMWBL is a significantly more capital-efficient retirement income solution. This is true for any withdrawal time horizon over 14 years, any asset allocation, and any apparent genius of the fund manager.

Especially after the large losses that many retirees and near-retirees experienced during the 2008 credit crisis, their battered retirement assets might be more efficiently used in VA-GMWBL type of instruments.

However, one must be mindful of the default risk and care should be taken in selecting providers of such instruments.

Figures presented in this paper reflect a typical VA-GMBWL. However, there is a wide spectrum of plans offered by insurers. Different products will produce different results.

About Aftcast.com

Aftcast.com provides research in the area of retirement income products to its clients. The research is based on non-Gaussian philosophy using actual market history. Aftcasting helps clients to better understand the behavior and impact of retirement income products under various, non-simulated, historical market environments. It provides the intelligence to its clients to make more informed decisions to manage and market their existing and planned retirement income products.

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