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# Alpha, Beta, and Now... Gamma

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## Defining Value: Better Outcomes with “Gamma”

### Alpha

the residual or skill component

- a zero sum game in the aggregate (after fees)

### Beta

the market/asset allocation exposures of a portfolio

- equity allocation of the portfolio and underlying asset class exposures

### Gamma

the additional value achieved from making more intelligent financial planning decisions.

- a non zero-sum game

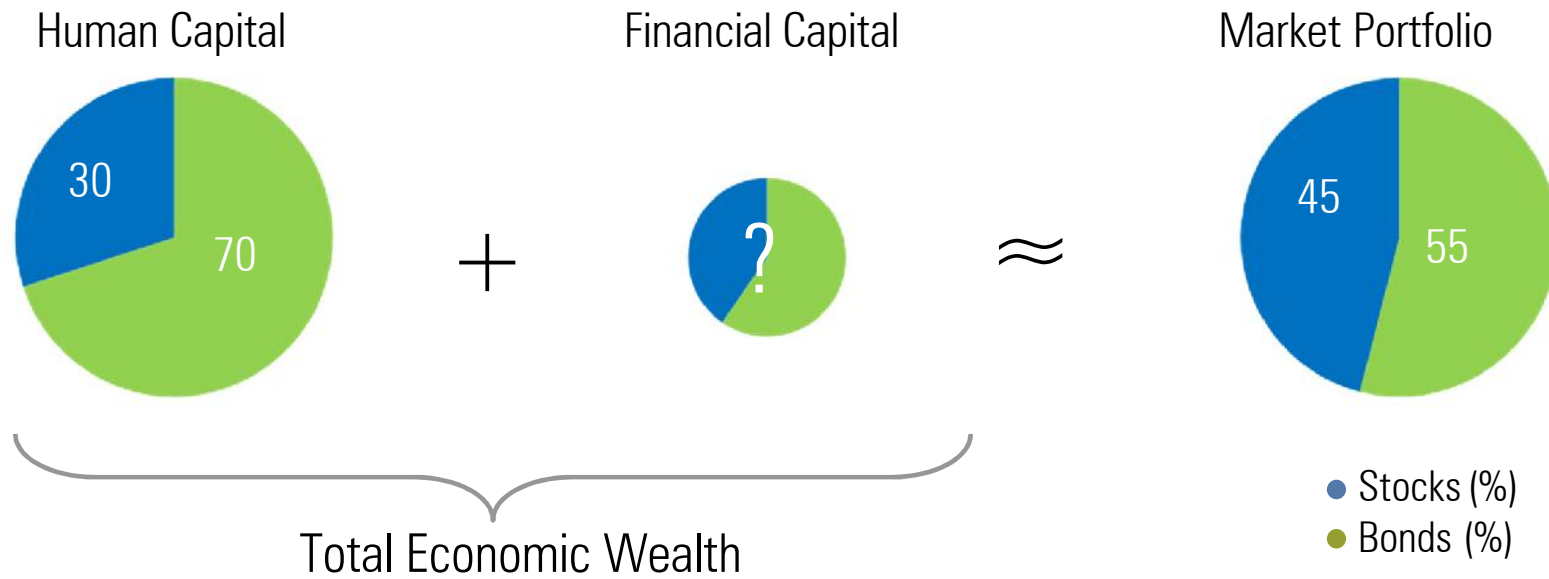
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## Different Types of Gamma

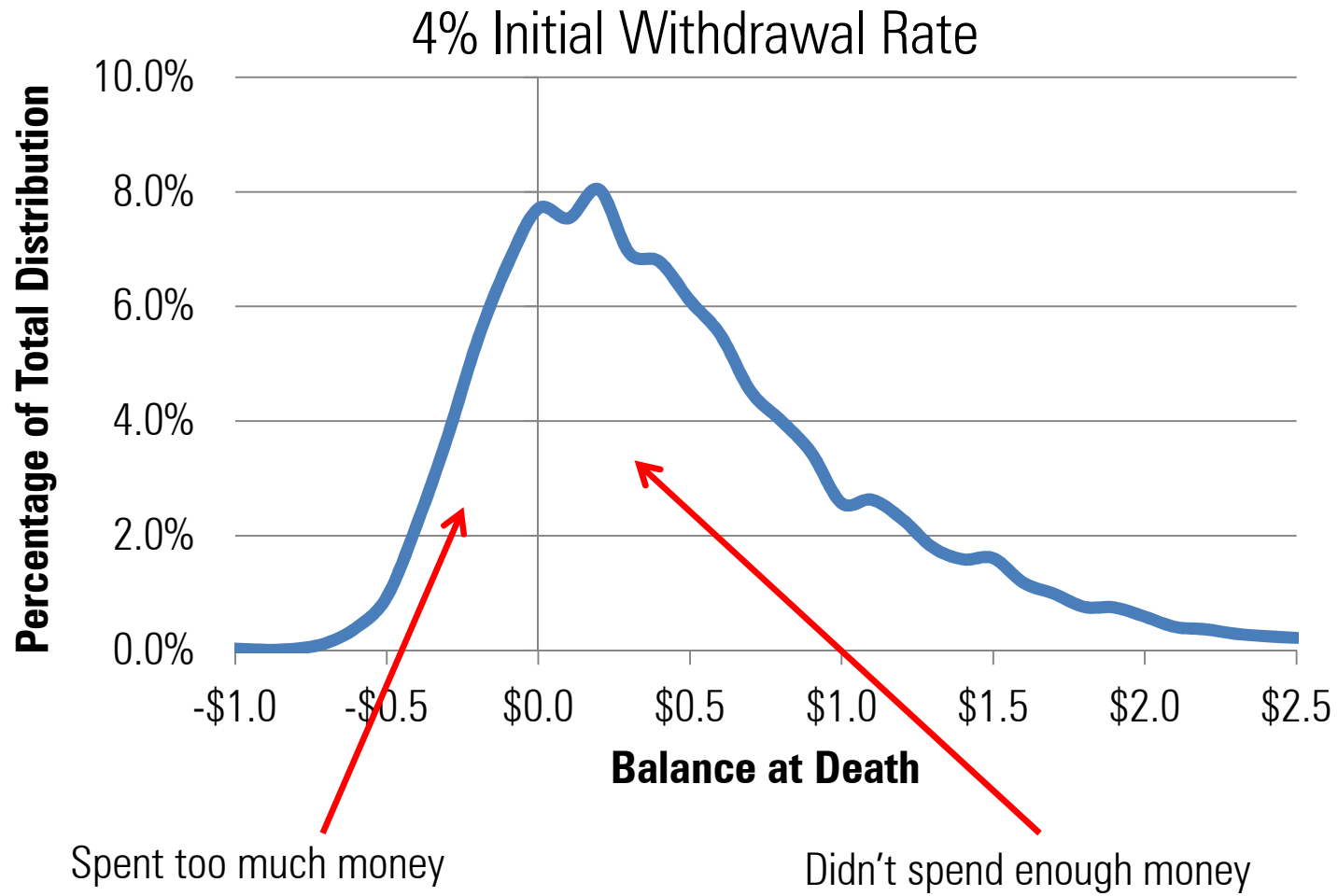
- ▶ **Total Wealth Asset Allocation:** Using human capital in conjunction with the market portfolio to determine the optimal equity allocation
- ▶ **Dynamic Withdrawal Strategy:** Updating the annual withdrawal amount annually based on the ongoing likelihood of portfolio survivability and mortality experience
- ▶ **Annuity Allocation:** Longevity risk is perhaps the greatest fear among the retirees. Annuities allow a retiree to hedge away this risk and can therefore improve the overall efficiency of a retiree's portfolio.
- ▶ **Asset Location and Withdrawal Sourcing:** where to place assets and where to withdrawal income in a tax efficient manner.
- ▶ **Liability Relative Optimization:** Asset allocation methodologies commonly ignore the funding risks associated with an investor's goals, by incorporating the liability into the portfolio optimization process it is possible to build portfolios that better hedge the risks faced by a retiree.

# Total Wealth Allocation



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# Dynamic Withdrawal Strategy

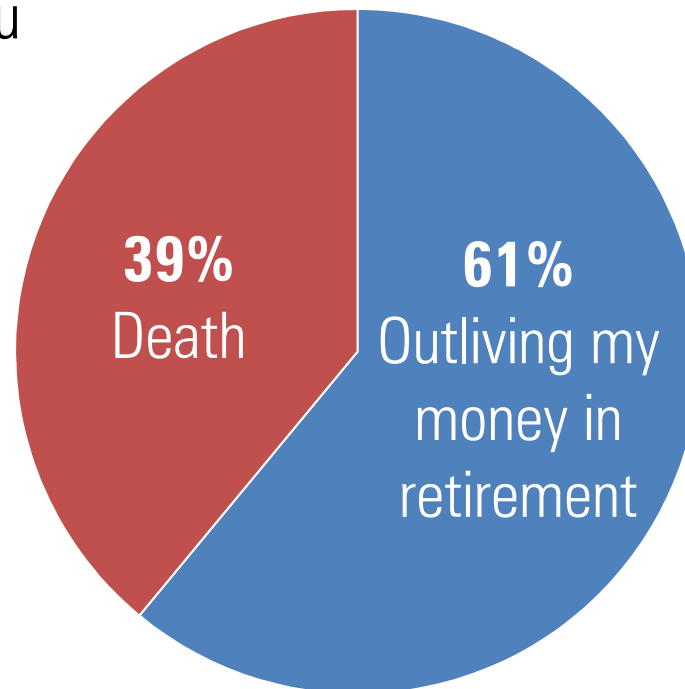


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## Annuity Allocation

What do you  
fear most?



Source: <https://www.allianzlife.com/content/public/Literature/Documents/ent-1154.pdf>

# Asset Location and Withdrawal Sourcing

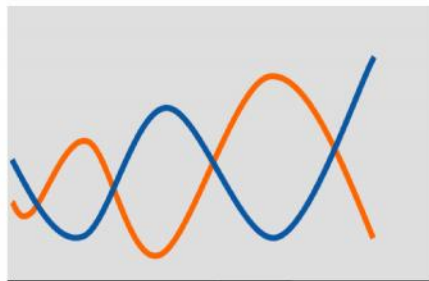
		Withdrawal Sequencing	
		Taxable Account First	Traditional IRA First
Asset Location	Stocks in Taxable Account	Tax Efficient	Moderately Efficient
	Stocks in Traditional IRA	Moderately Efficient	Tax Inefficient

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# Liability Relative Optimization

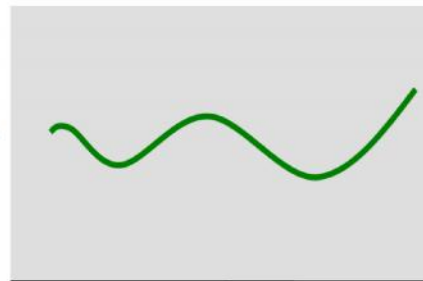
## Asset-only Approach

Value of Liabilities vs Value of Assets



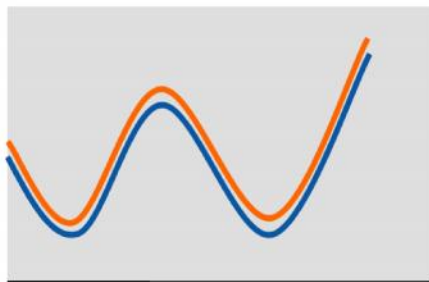
Time

Portfolio Health / Funding Costs



- Value of Assets
- Value of Liabilities
- Portfolio Health

## Liability-relative Approach



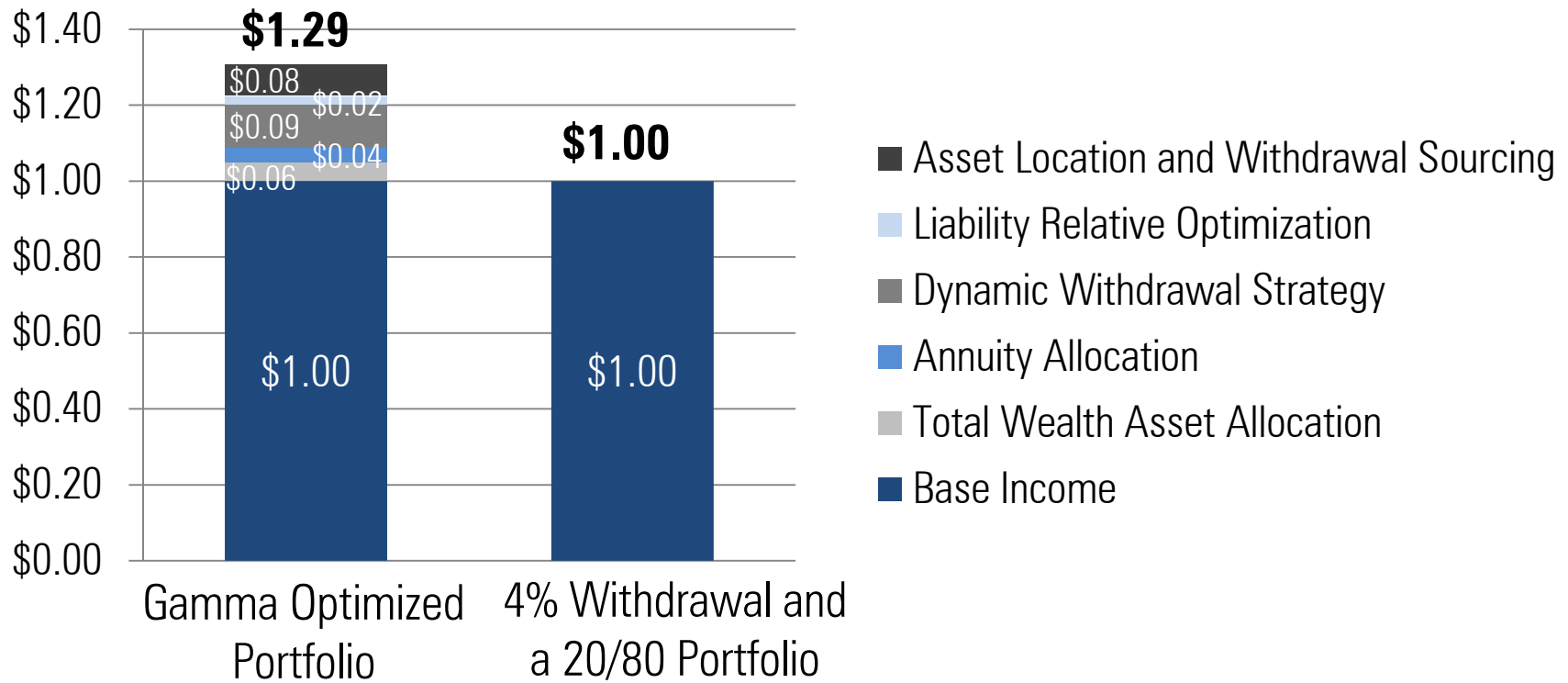
Time



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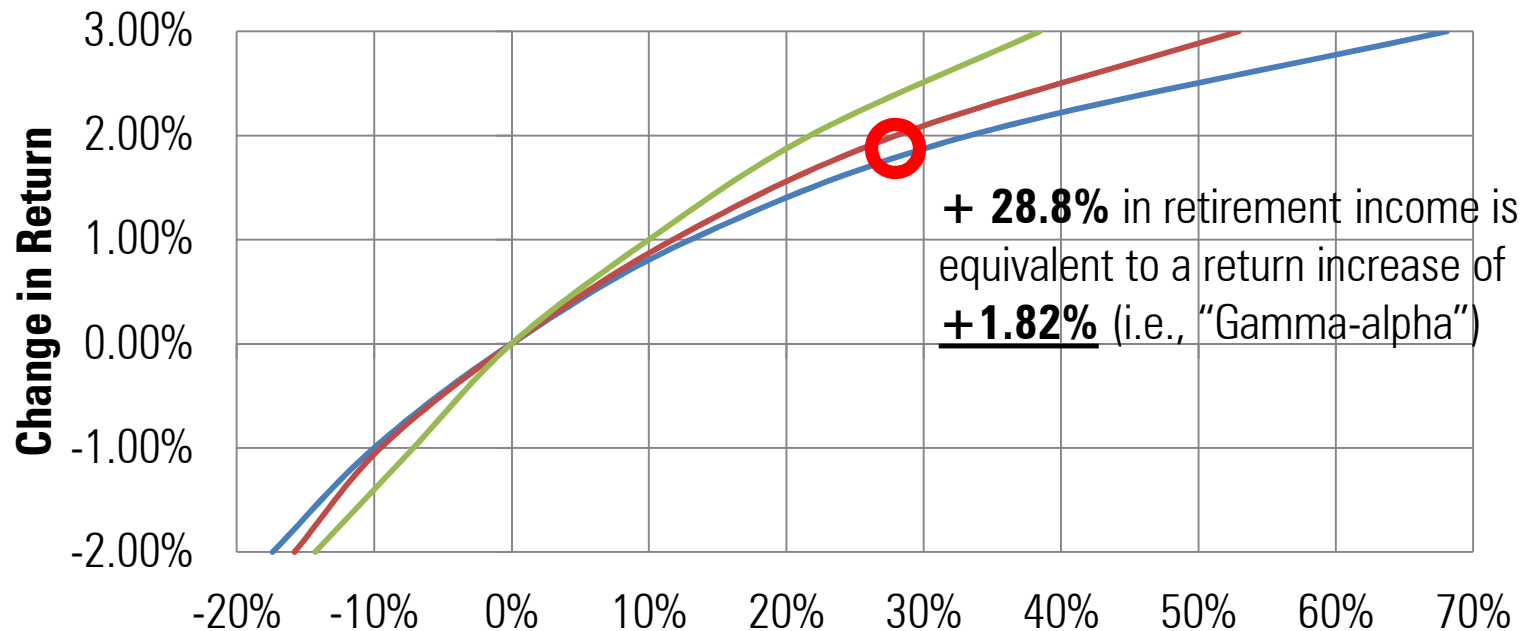


# More Income with Gamma Optimization



For illustration only. Source: "Alpha, Beta, ... and Now Gamma" by David Blanchett and Paul D. Kaplan, Morningstar White Paper

# Relationship Between Additional Income and Return Changes



## Median Change in Retirement Income

— 4% Initial Withdrawal    — 5% Initial Withdrawal    — 6% Initial Withdrawal

For illustration only. Source: "Alpha, Beta, ... and Now Gamma" by David Blanchett and Paul D. Kaplan, Morningstar White Paper

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Methodology

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## Calculating Gamma

- ▶ Gamma is the utility-adjusted income generated by the Gamma-optimized portfolio, which we denote as  $ZZ$ .
- ▶ We define  $ZZ$  as the constant payment amount that a retiree would accept such that his or her utility would equal the utility of the actual income path realized on a given simulation path

▶ This is given by

$$II = \left( \frac{\sum_{t=0}^T q_t (1 + \rho)^{-t} I_t^{\frac{\eta-1}{\eta}}}{\sum_{t=0}^T q_t (1 + \rho)^{-t}} \right)^{\frac{\eta}{\eta-1}}$$

$I_t$  = the level of income in year  $t$

$q_t$  = the probability of surviving to at least year  $t$

$T$  = the last year for which  $q_t > 0$

$\rho$  = the investor's subjective discount rate (5%)

$\eta$  = the investor's elasticity of substitution (EOS) preference parameter (.5)

## Calculating Gamma

- ▶ There are two preference parameters (  $\beta$  and  $\theta$  ) that describe how the investor feels about having income to consume at different points in time, with no reference to risk.
- ▶ Following the approach in Epstein and Zin (1989), we treat the elasticity of substitution as a parameter distinct from the risk tolerance parameter. We introduce the risk tolerance parameter (  $\gamma$  ) next by treating the path as unknown and evaluating expected utility.

$$EU = \sum_{i=1}^M p_i \frac{\theta}{\theta - 1} (II_i)^{\frac{\theta-1}{\theta}}$$

$\theta$  = risk tolerance parameter (.333)

$M$  = number of paths

$i$  = which of  $M$  paths is being referred to

$p_i$  = the probability of path  $i$  occurring which we set to  $1/M$ .

## Calculating Gamma

- ▶ We define  $Y$  as the constant value for  $\mathbb{I}$  that we yield this level of expected utility. This is given by

$$Y = \left[ \sum_{i=1}^M p_i (II_i)^{\frac{\theta-1}{\theta}} \right]^{\frac{\theta}{\theta-1}}$$

- ▶ We can now formally define the Gamma of a given strategy or set of decisions as

$$\text{Gamma}(\text{Strategy}) = \frac{Y(\text{Strategy}) - Y(\text{Benchmark})}{Y(\text{Benchmark})}$$

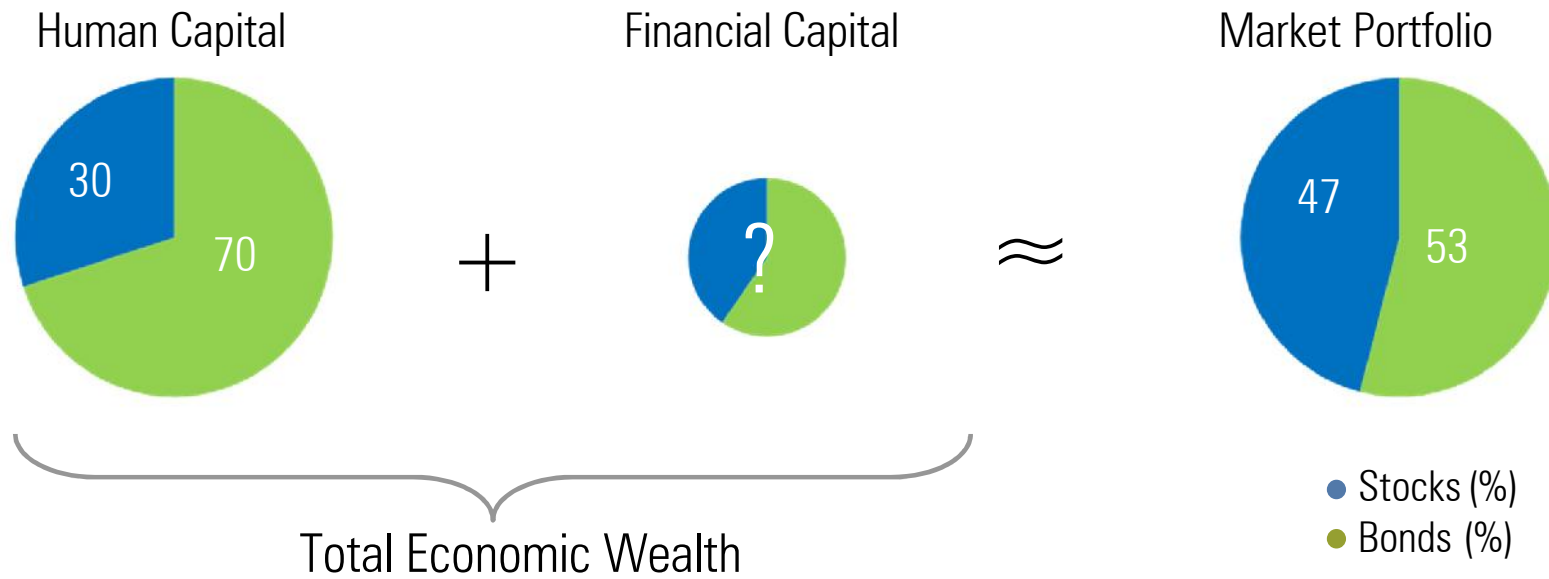
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# Total Wealth Asset Allocation

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# Targeting the Market Portfolio



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# Individual Portfolio Assignment



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## Financial Capital

Tradable assets such as stocks and bonds have traditionally been used when constructing an asset allocation

Incomplete without considering Human Capital

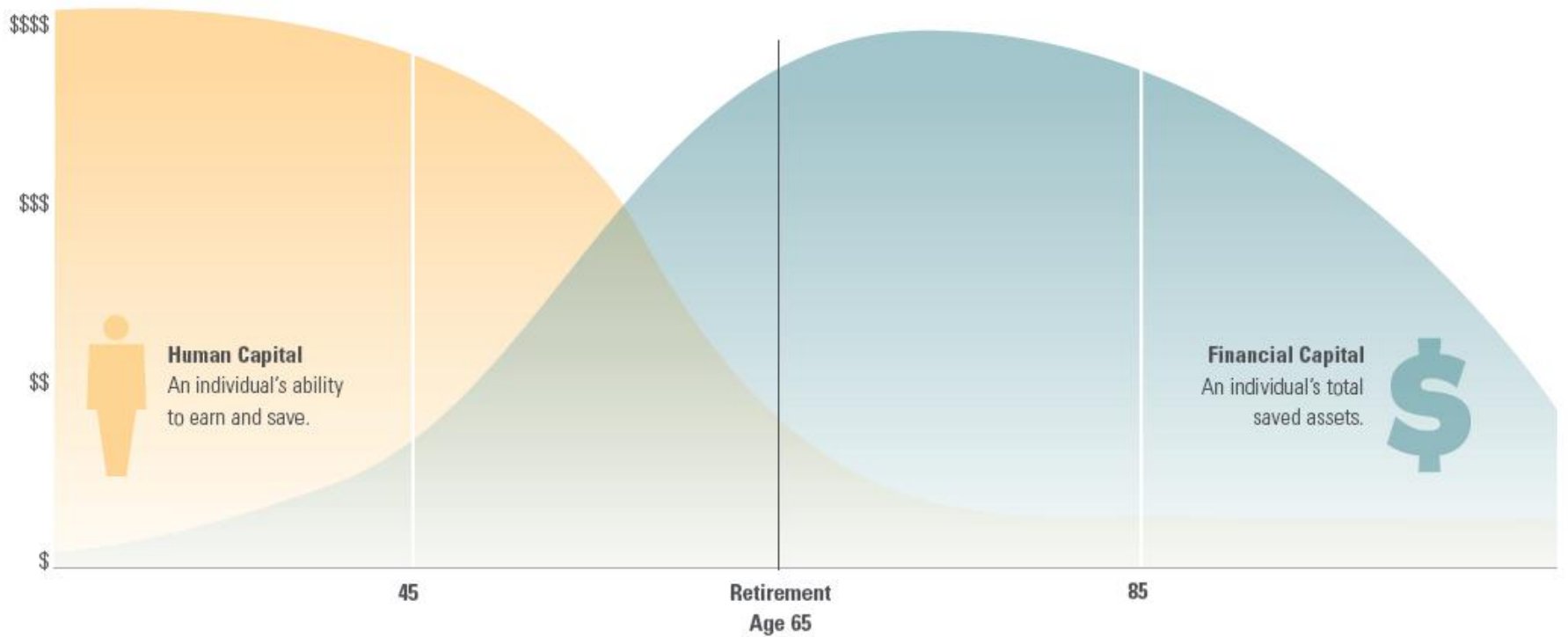
## Human Capital

An individual's ability to earn and save

Present value of all your expected future wages including pension and social security

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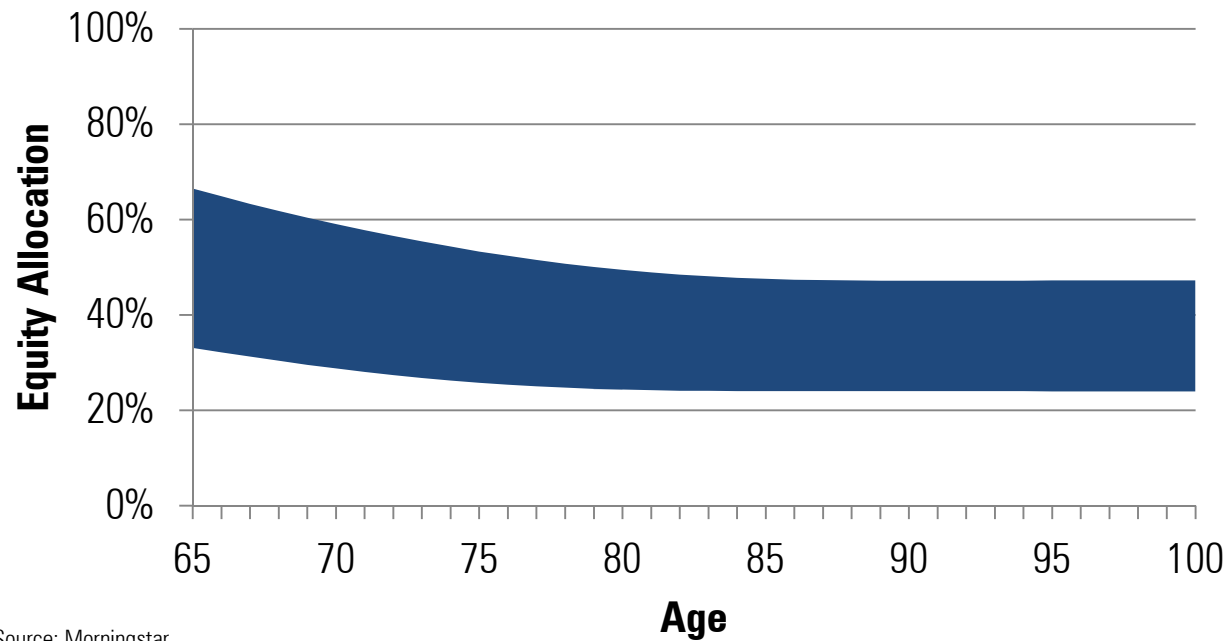
# Life Cycle of Human Capital and Financial Capital



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## Bounded Portfolio Equity Allocation

- ▶ Allocations are bounded by Morningstar Aggressive and Conservative glidepaths



Source: Morningstar

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# Dynamic Withdrawal Strategy

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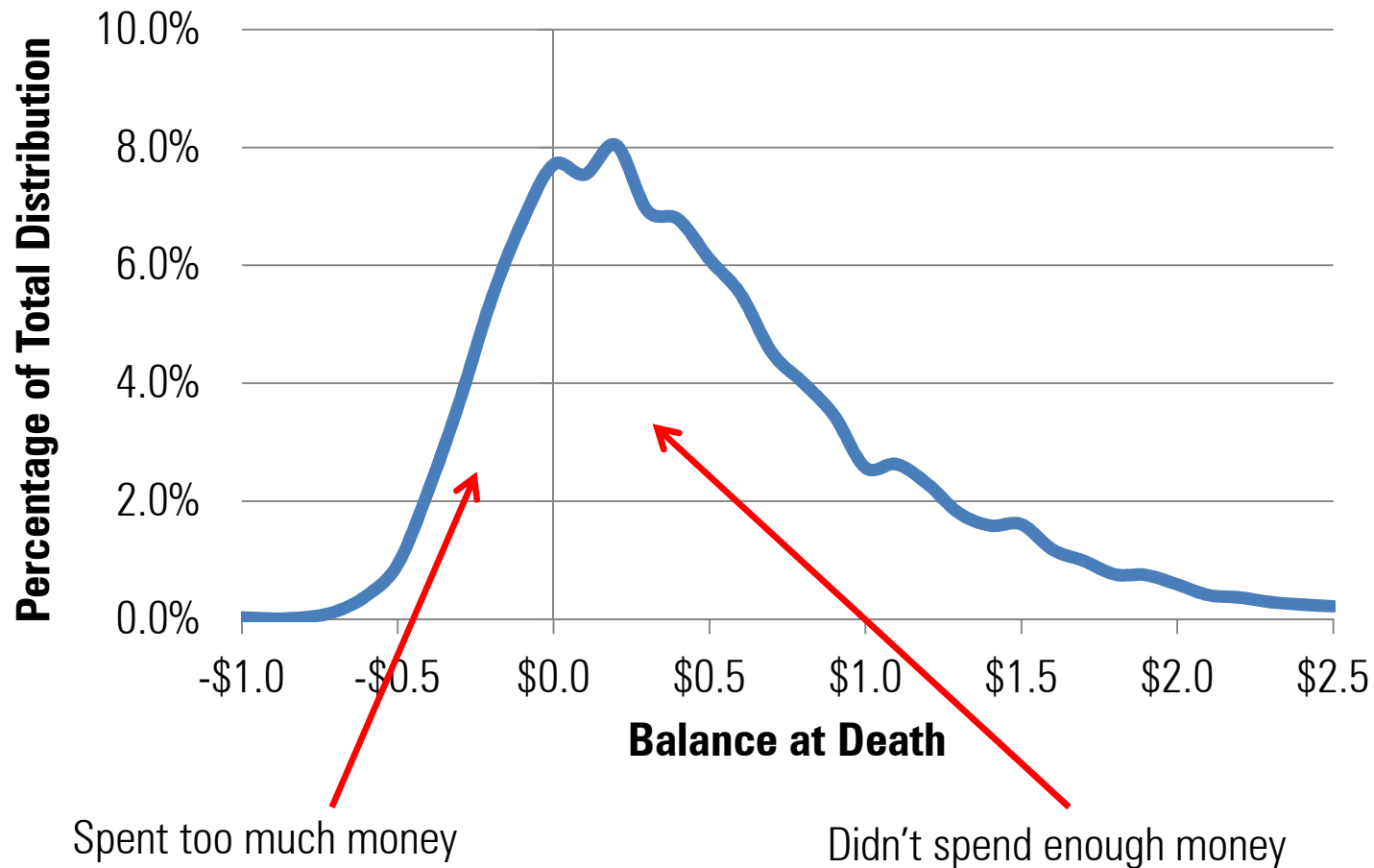
## Different Ways to Generate Income from a Portfolio

The strategy tested in most withdrawal research

- ▶ **Constant Dollar:** fixed amount, increased annually by inflation, based on the initial balance
- ▶ **Endowment Approach:** fixed percentage of portfolio value
- ▶ **RMD Method:** 1 divided by the remaining retirement duration (life expectancy)
- ▶ **Dynamically Updated Based on Survivorship Experience:** based on maintaining a constant probability of failure over the estimated remaining retirement duration, based on actual survivorship experience

What financial planners help retirees with and what retirees are actually likely to do

## Distribution of Balance at Death with "4% in 30 years"



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## Better Outcomes

- ▶ Dynamically updating the available income can both increase total lifetime income and improve portfolio survivability
- ▶ The more frequently a withdrawal strategy is updated/reviewed the easier it is to make adjustments to help ensure on-going survivability and sustainability of the retiree's portfolio
- ▶ Potential "failure", to some extent, can be inevitable for some scenarios if a retiree wants to maximize lifetime income (i.e., maximize lifetime happiness)

## “4%” for All Ages

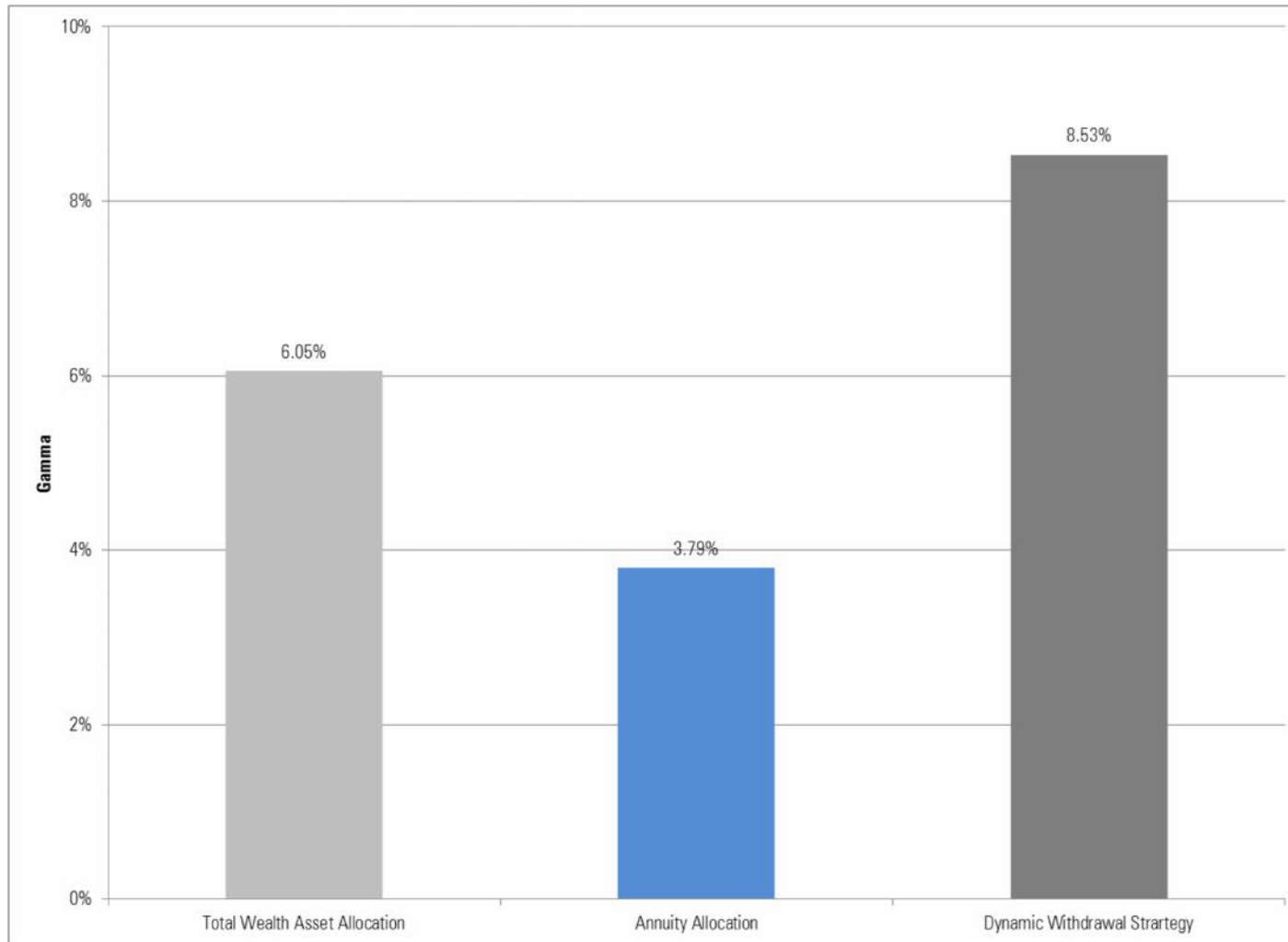
- ▶ 4% can be a great *starting* place for a ~65 year old couple
- ▶ It is not necessarily valid for older/single retirees

		Equity Allocation				
		20%	30%	40%	50%	60%
Number of Years Remaining	5	20.0%	19.9%	19.9%	19.8%	19.9%
	10	10.4%	10.4%	10.5%	10.4%	10.5%
	15	7.2%	7.3%	7.4%	7.4%	7.5%
	20	5.7%	5.8%	5.9%	6.0%	6.0%
	25	4.8%	4.9%	5.0%	5.1%	5.2%
	30	4.2%	4.4%	4.5%	4.6%	4.7%
	35	3.8%	3.9%	4.1%	4.2%	4.3%
	40	3.5%	3.6%	3.8%	3.9%	4.0%

For illustration only. Source: “Alpha, Beta, ... and Now Gamma” by David Blanchett and Paul D. Kaplan, Morningstar White Paper



## Gamma of Dynamic Withdrawal Strategy



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Annuities

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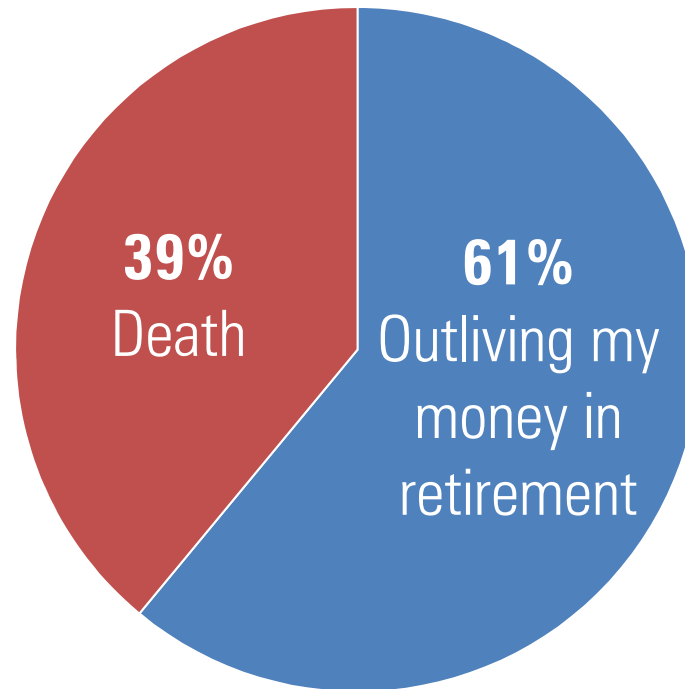
## Inefficient Retirement Planning

- ▶ Defined benefit plans allow for longevity risk pooling
- ▶ DC participants have to deal with longevity risk on an individual basis, which is inefficient from a lifetime income maximization perspective
- ▶ Annuities represent one possible solution



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## Defining the Goal: Which Do You Fear the Most?



Source: <https://www.allianzlife.com/content/public/Literature/Documents/ent-1154.pdf>

## Do You Feel Lucky?



# Incorporating Guaranteed Income

## Lifetime Financial Advice

Human Capital, Asset Allocation,  
and Insurance

Roger G. Ibbotson, Moshe A. Milevsky,  
Peng Chen, CFA and Kevin X. Zhu



CFA Institute Research Foundation  
monograph presenting research on  
lifetime finance

## Human Capital, Asset Allocation, and Life Insurance

Peng Chen, CFA, Roger G. Ibbotson, Moshe A. Milevsky,  
and Kevin X. Zhu

Financial planners and advisors increasingly recognize that human capital must be taken into account when building optimal portfolios for individual investors. But human capital is not simply another pre-retirement asset class; it carries a unique mortality risk in the form of the loss of future income and wages in the event of the wage earner's death. Life insurance hedges this mortality risk, so human capital affects both optimal asset allocation and demand for life insurance. Yet, historically, asset allocation and life insurance decisions have been analyzed separately. This article develops a unified framework based on human capital that enables individual investors to make these decisions jointly.

Academics and practitioners increasingly recognize that the risk and return characteristics of human capital, such as wages and salary profiles, should be taken into account when building portfolios for individual investors. Martin (2001) pointed out the importance of including the magnitude of human capital, its volatility, and its correlation with other assets in asset allocation decisions from the perspective of personal risk management. The employees of Enron Corporation and WorldCom suffered extreme examples of this risk. Their labor income and their financial investments in the companies perished on diversification, and they were heavily affected by their companies' collapses.

A unique aspect of an investor's human capital is mortality risk—that is, the family's loss of human capital in the event of the wage earner's death. Life insurance has long been used to hedge against mortality risk. Typically, the greater the value of the human capital, the more life insurance the family demands. Intuitively, therefore, human capital affects not only optimal asset allocation but also optimal life insurance demand. These two impor-

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tant financial decisions are generally analyzed separately, however, in theory and practice. We found few references to either the risk/insurance literature or the investment/finance literature to the importance of considering these decisions jointly within the context of the life-cycle model of consumption and investment. In other words, popular investment and financial planning advice about how much life insurance one should carry is seldom framed in terms of the riskiness of one's human capital. And optimal asset allocation, which has only lately started to be framed in terms of the risk characteristics of human capital, is rarely integrated with life insurance decisions.

Motivated by the need to integrate these two decisions, we merged these traditionally distinct lines of thought together in one framework. We argue that these two decisions must be determined jointly because they serve as risk substitutes when viewed from the perspective of an individual investor's portfolio. Life insurance is a perfect hedge for human capital in the event of death because zero life insurance and human capital have a negative 100 percent correlation with each other in the "after" (postmortality) state versus "dead" (premortality) state. If insurance pays off at the end of the year, human capital drops to zero, and vice versa. Thus, the combination of the two provides great diversification to an investor's total portfolio. Figure 1 illustrates the types of decisions the investor faces, together with the variables that affect the decisions.

The unified model we discuss is intended to provide practical guidelines for optimal asset

Award-winning paper on the integration  
of human capital and asset allocation

## Allocation to Deferred Variable Annuities with GMWB for Life

James X. Xiong, Ph.D., CFA®  
Thomas Idzorek, CFA®  
Peng Chen, Ph.D., CFA®

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a Morningstar company

Research paper focused on a  
methodology reflecting the features of  
variable annuities with GMWB for life

# Determining Asset Allocations with Annuities

Collect Inputs



Determine Product Allocations



Determine Asset Allocations



**Human Capital**



**Financial Capital  
and Current Savings**



**Life Insurance**



● **Traditional**  
● **Product(s)**



**Traditional  
Funds, ETFs**



**Product**

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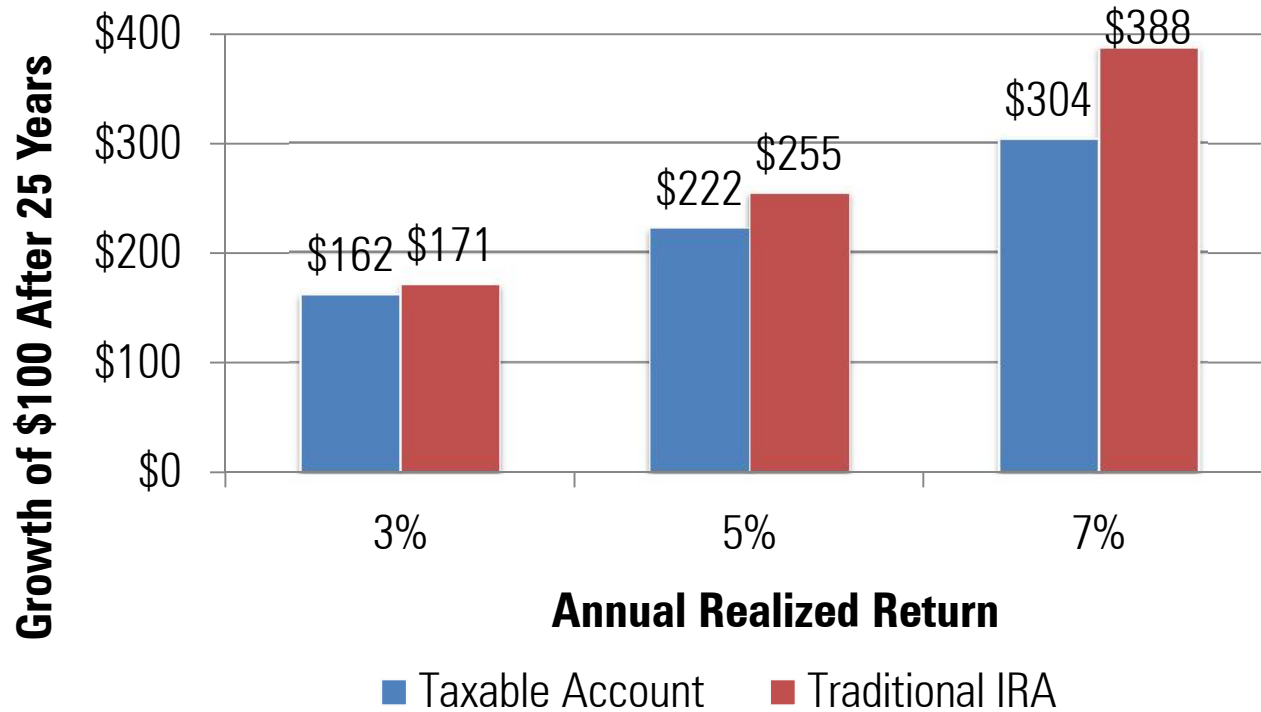
# Asset Location and Withdrawal Sourcing

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# The Importance of Taxes



Analysis assumes a 35% tax rate, where taxes are paid annually in the Taxable Account, but not until the end of the period in the Traditional IRA

# Asset Location and Withdrawal Sourcing

		Withdrawal Sequencing	
		Taxable Account First	Traditional IRA First
Asset Location	Stocks in Taxable Account	Tax Efficient	Moderately Efficient
	Stocks in Traditional IRA	Moderately Efficient	Tax Inefficient

For illustration only.

# Impact of Asset Location and Withdrawal Sequencing

		Additional Income Generated		
		Asset Location Portfolio Efficiency		
		Efficient	1/n	Inefficient
Income Order	401k First	0.71%	-4.06%	-10.86%
	Split	3.83%	0.00%	-3.75%
	Taxable First	8.23%	6.82%	4.95%

		Equivalent Return Impact		
		Asset Location Portfolio Efficiency		
		Efficient	1/n	Inefficient
Income Order	401k First	0.07%	-0.24%	-0.78%
	Split	0.21%	0.00%	-0.25%
	Taxable First	0.43%	0.36%	0.25%

For illustration only. Source: "Alpha, Beta, ... and Now Gamma" by David Blanchett and Paul D. Kaplan, Morningstar White Paper

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# Liability Relative Optimization

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## What is Portfolio Risk?

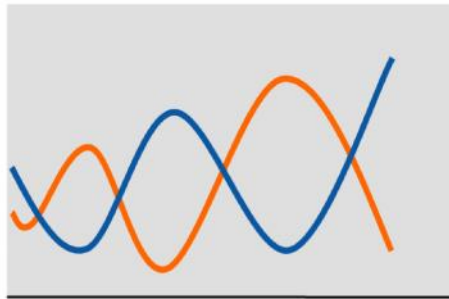
What is the TRUE risk for a portfolio that exists to fund (pay for) a liability?

- ▶ It is NOT the standard deviation of the asset portfolio
- ▶ It is NOT the performance of your asset portfolio relative to the asset portfolios of your peers
- ▶ The TRUE risk is that it won't be able to pay for the liability!

# Improving Portfolio Health

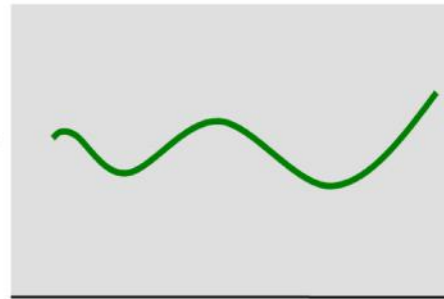
## Asset-only Approach

Value of Liabilities vs Value of Assets



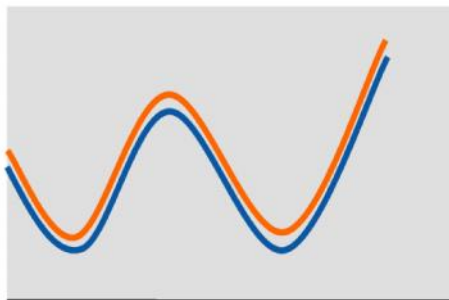
Time

Portfolio Health / Funding Costs

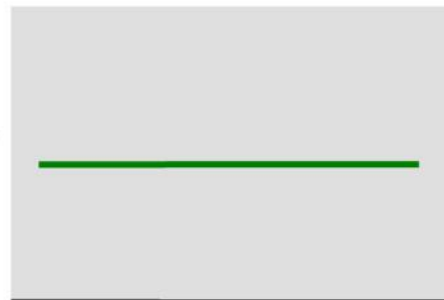


- Value of Assets
- Value of Liabilities
- Portfolio Health

## Liability-relative Approach



Time



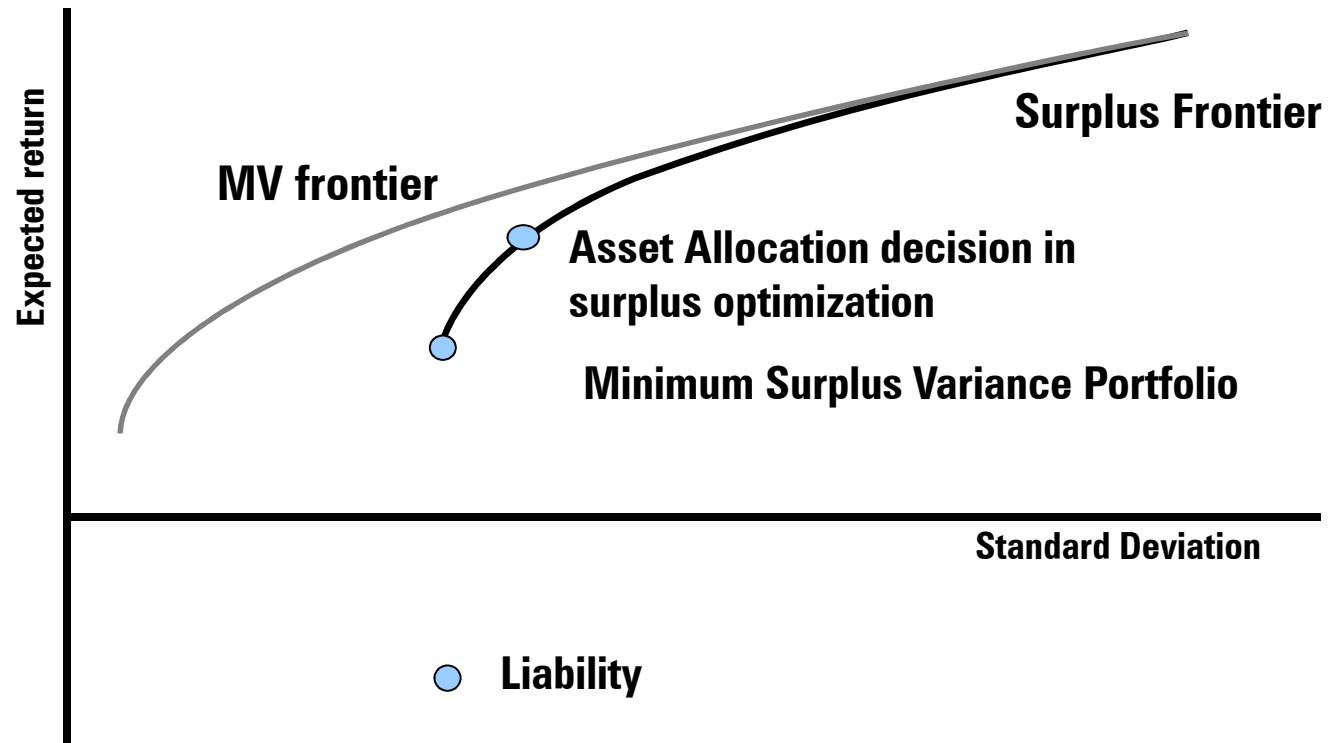
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## What is Surplus Optimization?

- ▶ Surplus optimization is a special case (or extension) of traditional mean-variance optimization in which the optimizer is *constrained* to hold a combination of assets representing the liability short
- ▶ Surplus optimization is one element of a broader approach called liability-relative investing or asset-liability management (ALM), which can include 1) duration matching (a.k.a. immunization), 2) convexity matching, and 3) cash flow matching
- ▶ Surplus optimization focuses on the entire portfolio – assets and liabilities – not just the assets of a portfolio

# Surplus Optimization



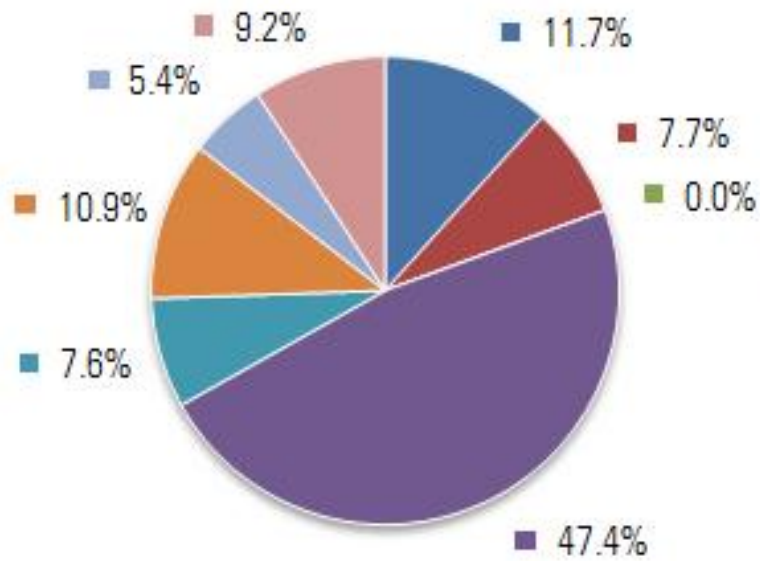
Surplus optimization considers both the amount and the investment characteristics of the liability (funding ratio).

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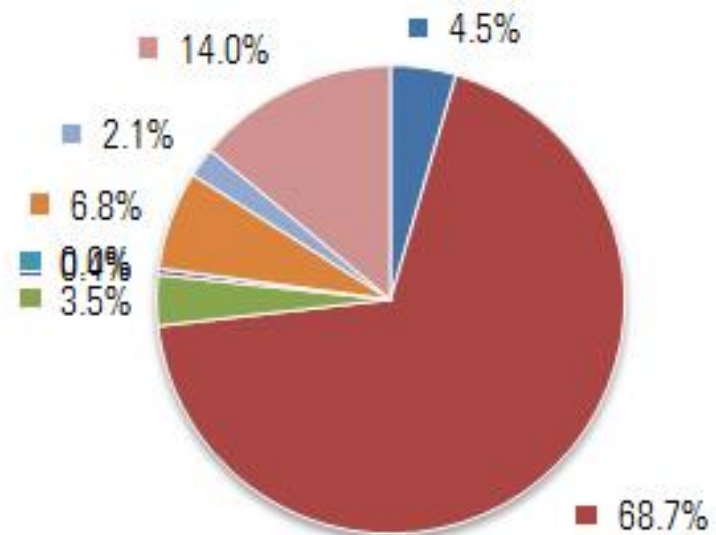


# Different Portfolios

## Liability-Relative Optimization



## Asset-Only Optimization



- Cash
- US Bond
- Non US Bond
- US TIPS
- US Large Cap Stock
- US Small Cap Stock
- Non US Large Cap Stock
- Emerging Markets Stock

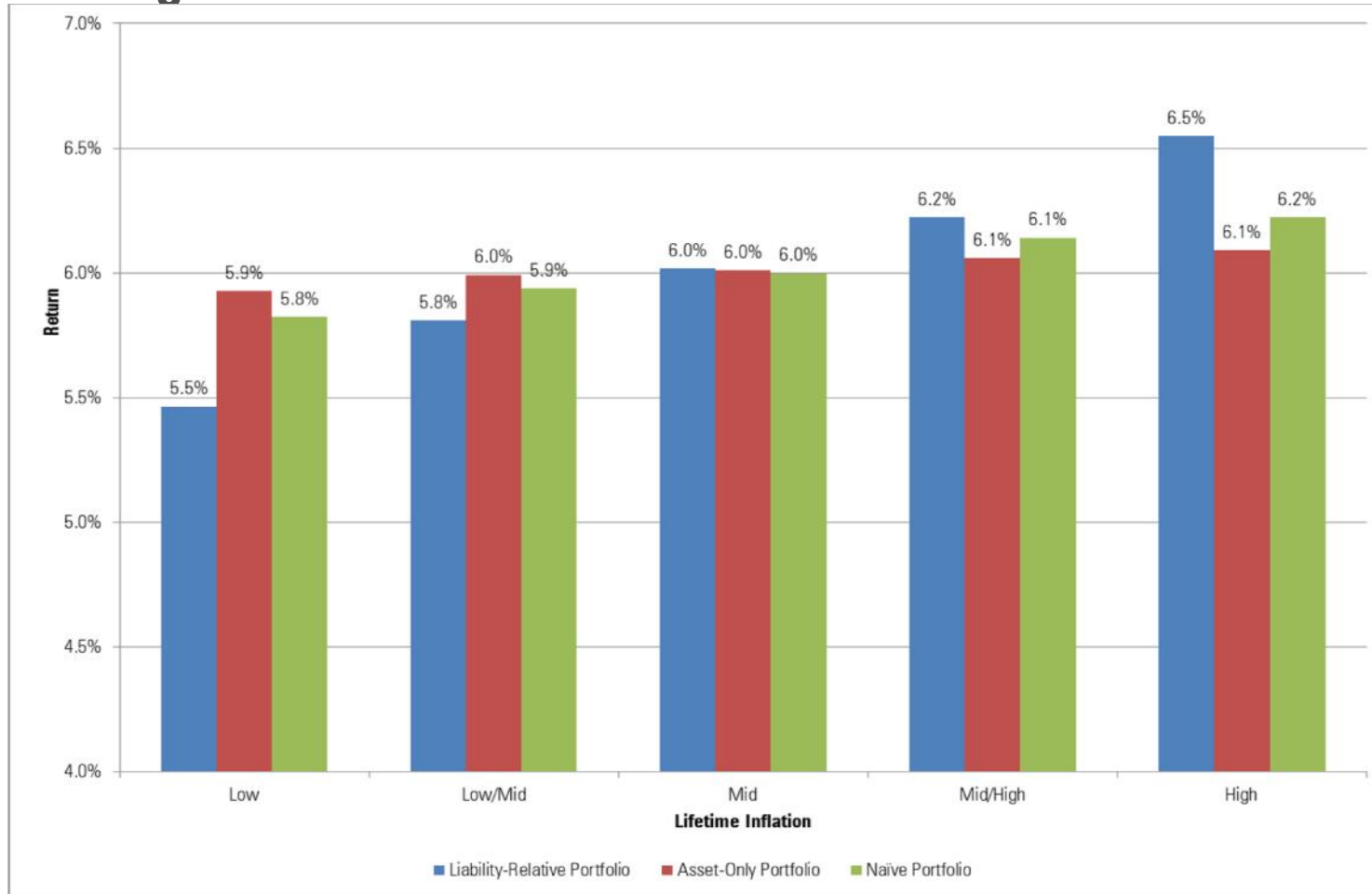
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## Return and Risk Impact

	<b>Liability- Relative Optimization</b>	<b>Asset-Only Optimization</b>
<b>Geometric Return</b>	6.00%	6.00%
<b>Standard Deviation</b>	7.45%	6.71%
<b>Surplus Geometric Return</b>	3.74%	3.66%
<b>Surplus Standard Deviation</b>	6.79%	7.38%

For illustration only. Source: "Alpha, Beta, ... and Now Gamma" by David Blanchett and Paul D. Kaplan, Morningstar White Paper

## Average Annual Returns for the Inflation Quintiles



For illustration only. Source: "Alpha, Beta, ... and Now Gamma" by David Blanchett and Paul D. Kaplan, Morningstar White Paper

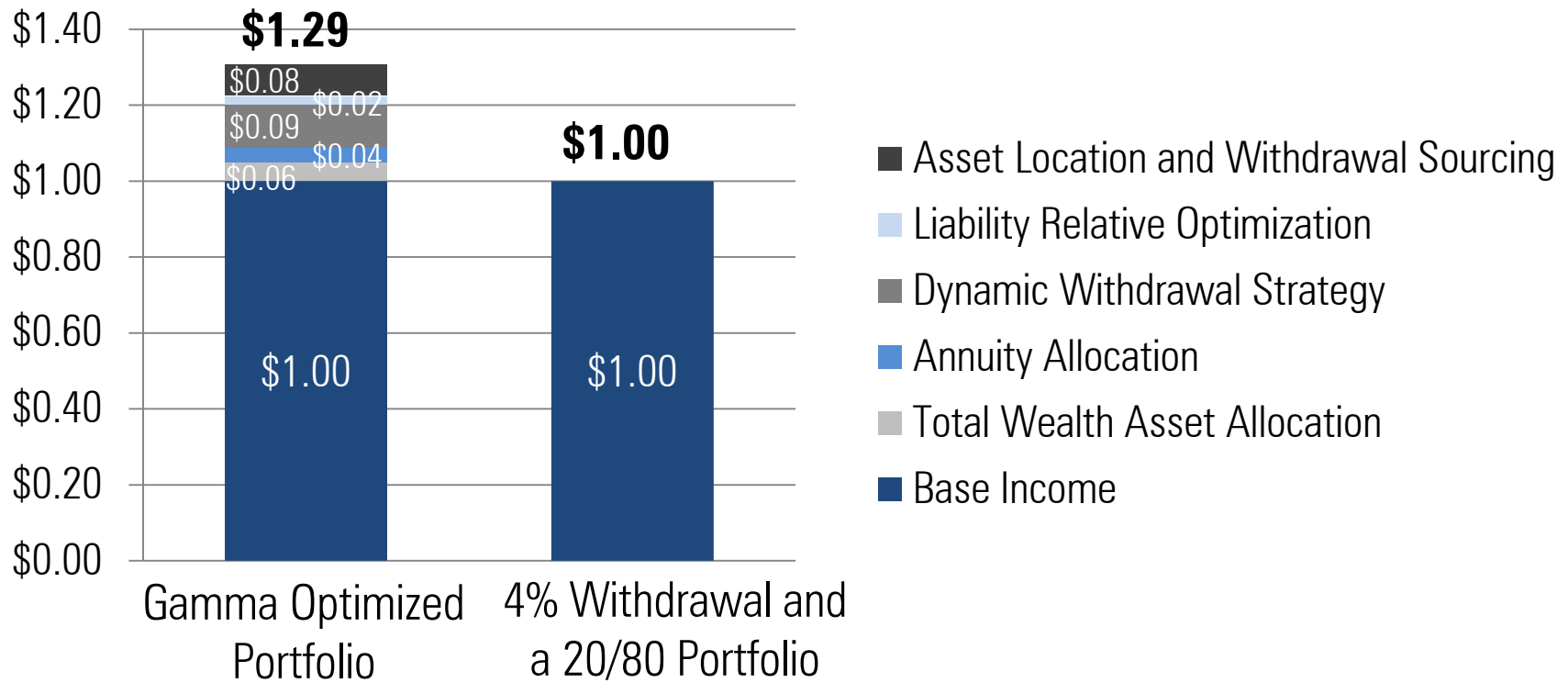
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Conclusions

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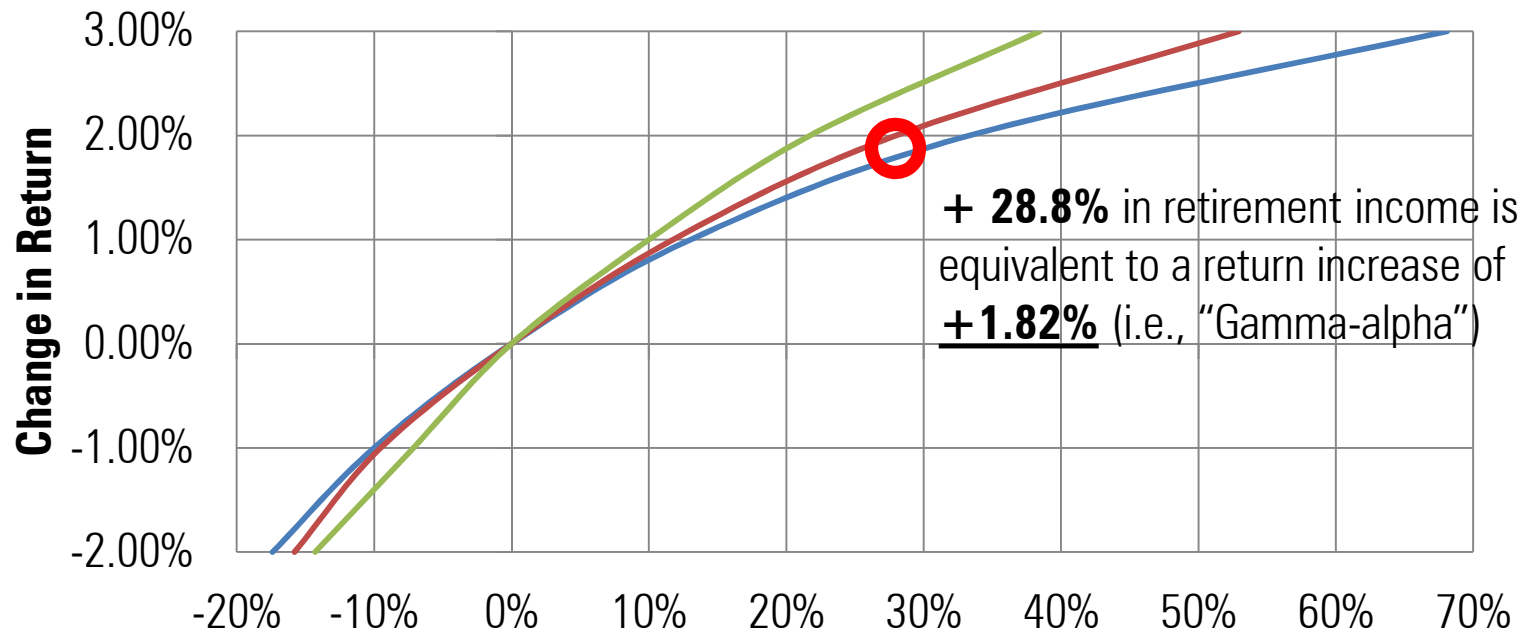


# More Income with Gamma Optimization



For illustration only. Source: "Alpha, Beta, ... and Now Gamma" by David Blanchett and Paul D. Kaplan, Morningstar White Paper

# Relationship Between Additional Income and Return Changes



+ **28.8%** in retirement income is equivalent to a return increase of **+1.82%** (i.e., "Gamma-alpha")

## Median Change in Retirement Income

— 4% Initial Withdrawal    — 5% Initial Withdrawal    — 6% Initial Withdrawal

For illustration only. Source: "Generating More Retirement Income with "Gamma" Portfolio Optimization" by David Blanchett, Morningstar White Paper

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## Conclusions

- ▶ Creating retirement income from a portfolio is complicated
- ▶ There are a number different risks that need to be considered when building an “optimal” retirement income portfolio
- ▶ An optimized retirement income plan (i.e., Gamma optimized) can generate 29% more retirement income than a naïve approach

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- ▶ Some of the author's calculations are based upon Monte Carlo simulations. Monte Carlo is an analytical method used to simulate random returns of uncertain variables to obtain a range of possible outcomes. Such probabilistic simulation does not analyze specific security holdings, but instead analyzes the identified asset classes. The simulation generated is not a guarantee or projection of future results, but rather, a tool to identify a range of potential outcomes that could potentially be realized. The Monte Carlo simulation is hypothetical in nature and for illustrative purposes only. Results noted may vary with each use and over time.
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