Alpha, Beta, and Now… Gamma

David Blanchett, CFA, CFP®
Head of Retirement Research
Morningstar Investment Management
Alpha, Beta, and Now... Gamma

David Blanchett, CFA, CFP®
Head of Retirement Research
Morningstar Investment Management

Paul Kaplan, Ph.D., CFA
Director of Research
Morningstar Canada

September 8, 2012

Morningstar Investment Management
Different Types of Gamma

- Total Wealth Asset Allocation
- Dynamic Withdrawal Strategy
- Annuity Allocation
- Asset Location and Withdrawal Sourcing
- Liability Relative Optimization
Total Wealth Allocation

Target Allocation (Market Portfolio)

Adding Guaranteed Income

The remaining non-annuity portfolio now has a 60% equity allocation; however, the total wealth allocation from an income perspective, after considering the SPIA, is still 45% equities.
Dynamic Withdrawal Strategy

Option 1: Static

Determine Withdrawal Amount at Retirement

(the “4% rule”)

Option 2: Dynamic

1. Determine Retirement Period Length
2. Determine Portfolio Equity Allocation
3. Determine w% for a given target PoF

Repeat Annually

For illustration only.
Annuity Allocation: What Do Retiree Fear Most?

- 61% Outliving my money in retirement
- 39% Death

Source: https://www.allianzlife.com/content/public/Literature/Documents/ent-1154.pdf
Asset Location and Withdrawal Sourcing

Inefficient

Bonds

Stocks

Taxable Account

401(k) Account

Efficient

Bonds

Stocks

401(k) Account

Taxable Account

For illustration only.
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**

Value of Liabilities vs Value of Assets

- Time

Portfolio Health / Funding Costs

- Value of Assets
- Value of Liabilities
- Portfolio Health

For illustration only.
Total Wealth Asset Allocation
Individual Portfolio Assignment

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 securities

For illustration only.
Life Cycle of Human Capital and Financial Capital

For illustration only.

For financial professional use only. See the last slides for important disclosures.
Targeting the Market Portfolio

Human Capital
- Stock: 30%
- Bond: 70%

Financial Capital
- Stock: 45%
- Bond: 55%

Market Portfolio
- Stock: 45%
- Bond: 55%

Total Economic Wealth

For illustration only.
Dynamic Withdrawal Strategy
Defining “Failure” for a Retiree

▶ You can achieve 99% of your goal and still “fail”
Change Is a Good Thing

**Good Returns**

- Annual Nominal Income vs. Retirement Year
- 4% Static Initial Withdrawal vs. Dynamic Withdrawal Strategy

**Bad Returns**

- Annual Nominal Income vs. Retirement Year
- 4% Static Initial Withdrawal vs. Dynamic Withdrawal Strategy
Dynamic Withdrawal Strategy

1. Determine Retirement Period Length
2. Determine Portfolio Equity Allocation
3. Determine w% for a given target PoF

For illustration only.
Annuities
Who Cares About Lifetime Income?
Inefficient Retirement Planning

Defined Benefit Plans

401(k) Plans

For illustration only.
Do You Feel Lucky?
Using Utility to Estimate Retiree Preferences

- Goal is to maximize the total income replaced during retirement.
- Excess income is good, but a shortfall is penalized more:
Asset Location and Withdrawal Sourcing
The Importance of Taxes

Annual Realized Return

<table>
<thead>
<tr>
<th>Annual Realized Return</th>
<th>Taxable Account</th>
<th>Traditional IRA</th>
</tr>
</thead>
<tbody>
<tr>
<td>3%</td>
<td>$162</td>
<td>$171</td>
</tr>
<tr>
<td>5%</td>
<td>$222</td>
<td>$255</td>
</tr>
<tr>
<td>7%</td>
<td>$304</td>
<td>$388</td>
</tr>
</tbody>
</table>

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.

For illustration only.
Liability Relative Optimization
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!
Surplus optimization considers both the amount and investment characteristics of the liability (funding ratio).
Different Efficient 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

For illustration only.
Return and Risk Impact

<table>
<thead>
<tr>
<th></th>
<th>Liability-Relative Optimization</th>
<th>Asset-Only Optimization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geometric Return</td>
<td>6.00%</td>
<td>6.00%</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>7.45%</td>
<td>6.71%</td>
</tr>
<tr>
<td>Surplus Geometric Return</td>
<td>3.74%</td>
<td>3.66%</td>
</tr>
<tr>
<td>Surplus Standard Deviation</td>
<td>6.79%</td>
<td>7.38%</td>
</tr>
</tbody>
</table>

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

For illustration only.
Conclusions
Why Does Gamma Matter?

For illustration purposes only. Please see slide 46 for important disclosures.
Source: “Alpha, Beta, and Now…Gamma” by David Blanchett and Paul D. Kaplan, Morningstar White Paper
Relationship Between Additional Income and Return Changes

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

Optimal social security benefit claiming can increase income by 9.15%, which creates “Gamma equivalent alpha” of +.74%
Gamma Conclusions

- Value is more than Alpha and Beta
- 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 potentially generate 29% more retirement income than a naïve approach based on our initial research and potentially 38% more income for a hypothetical retiree when adding social security
- This creates “Gamma equivalent alpha” of 1.82% or 2.15%, respectively
Methodology
Calculating Gamma

- Gamma is the utility-adjusted income generated by the Gamma-optimized portfolio, which we denote as II.
- We define II 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

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

where:
- \( I_t \) = 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 ($\rho$ and $\eta$) 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 ($\theta$) next by treating the path as unknown and evaluating expected utility.

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

$\Theta = \text{risk tolerance parameter} (.333)$
$M = \text{number of paths}$
$i = \text{which of } M \text{ paths is being referred to}$
$p_i = \text{the probability of path } i \text{ occurring which we set to } 1/M.$
Calculating Gamma

- We define \( Y \) as the constant value for \( II \) 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

\[
\text{Gamma(Strategy)} = \frac{Y(\text{Strategy}) - Y(\text{Benchmark})}{Y(\text{Benchmark})}
\]
Important Disclosures

➤ The information, data, analyses, and opinions presented herein do not constitute investment advice; are provided as of the date written and solely for informational purposes only and therefore are not an offer to buy or sell a security; and are not warranted to be correct, complete or accurate. Past performance is not indicative and not a guarantee of future results.

➤ 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.

➤ Indexes shown are unmanaged and not available for direct investment. Although index performance data is gathered from reliable sources, Ibbotson Associates cannot guarantee its accuracy, completeness or reliability. Except as otherwise required by law.
For Information and/or illustrative purposes only. Not for public distribution. ©2012 Morningstar. All rights reserved. Morningstar Investment Management is a division of Morningstar. Morningstar Investment Management includes Morningstar Associates, Ibbotson Associates, and Morningstar Investment Services; all registered investment advisors and wholly owned subsidiaries of Morningstar, Inc. The information contained in this presentation is the proprietary material of Ibbotson Associates. Reproduction, transcription or other use by any means, in whole or in part, without the prior written consent of Ibbotson Associates, is prohibited.

The Morningstar name and logo are registered marks of Morningstar, Inc. The Ibbotson name and logo are registered marks of Ibbotson Associates, Inc.