GMO

FALL CONFERENCE

A Critical Moment: Seeking Prudence and Profit at a Market Extreme

October 2020

NEEDS-BASED ALLOCATION:
A NEW PARADIGM IN PORTFOLIO CONSTRUCTION

Martin Tarlie

GMO

AGENDA

- Definition of Needs-Based Allocation

- The underlying science on portfolio construction

- NEBO: our first application

MAIN TAKEAWAYS

1. Needs-Based Allocation is a new paradigm for portfolio construction.

2. It allows for better outcomes that balance long-term wealth accumulation and short-term safety.

3. We have an open architecture platform to express these ideas.

*"GMO is in a position to create a "**revolutionary retirement planning software platform built for proprietary asset management**."*

NEEDS-BASED ALLOCATION

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CHALLENGING THE STATUS QUO

Traditional portfolio construction tools are inadequate

A framework focused on the ***needs*** and ***circumstances*** of the investor

- Does your portfolio construction tool differentiate between your client's **time horizons**?

- Or consider your client's **needs**? Or how much they care about **falling short**?

- Are **risk tolerance** questionnaires or risk literacy tools obsolete?

NEEDS BASED ALLOCATION

Needs Based Allocation: Redefining risk

Risk = not having what you need, when you need it

- **Portfolio construction**
  - Risk = falling short of what you need when you need it
  - Risk ≠ volatility
  - Horizon matters

- **Flexible asset allocation**
  - Unbundles our AA insights by asset class, region, factor
  - Build institutional-level portfolios on a targeted, customized basis
  - Open architecture

A Case Study in Multiperiod Portfolio Optimization:
A Classic Problem Revisited

Martin B. Tarlie*

Investment Horizon and Portfolio Selection

Martin B. Tarlie*

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WHITE PAPER

April 2014

**Investing for Retirement:
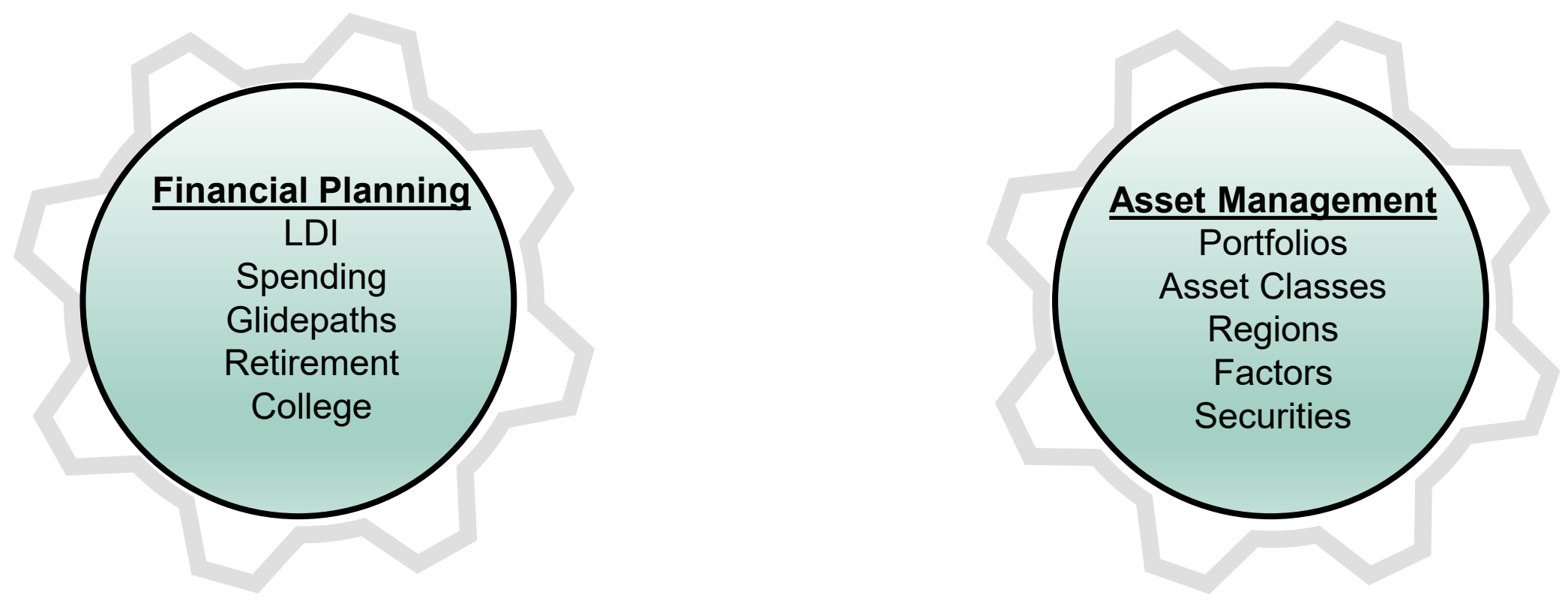The Defined Contribution Challenge**

Ben Inker and Martin Tarlie

The retirement landscape has changed. Defined benefit plans, the historical workhorse of the retirement system, had the advantage of access to corporate profitability. In the event that financial asset returns fell short of design expectations, this access mitigated the impact on workers' retirement. But, as defined benefit plans have given way to defined contribution (DC) plans, the burden being placed on financial returns in satisfying retirement needs has increased.

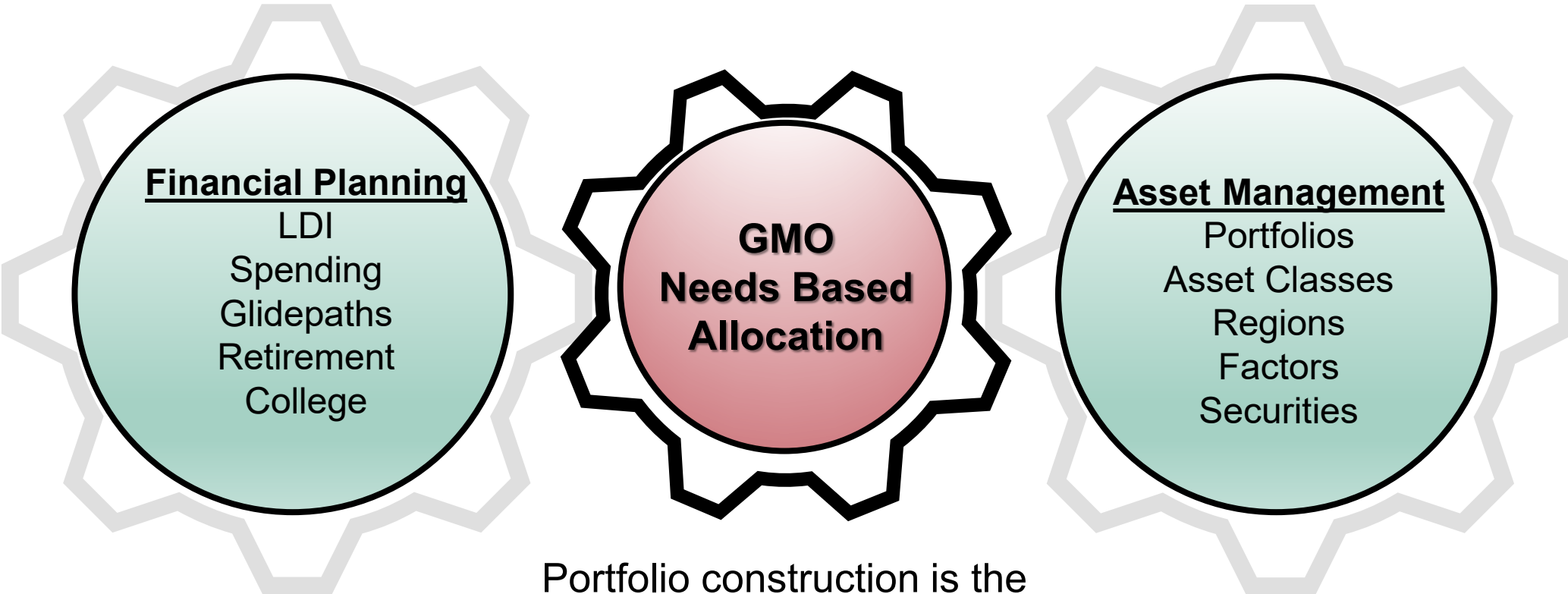# FINANCIAL PLANNING & ASSET MANAGEMENT

Currently…the left hand doesn't talk to the right hand

Financial Planning
LDI
Spending
Glidepaths
Retirement
College

Asset Management
Portfolios
Asset Classes
Regions
Factors
Securities

FINANCIAL PLANNING & ASSET MANAGEMENT

Needs Based Allocation melds financial planning and asset management

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Needs Based
Allocation**

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Portfolio construction is the "crucial moment of action."

If you don't get it right, then nothing else matters.

THE UNDERLYING SCIENCE ON PORTFOLIO CONSTRUCTION
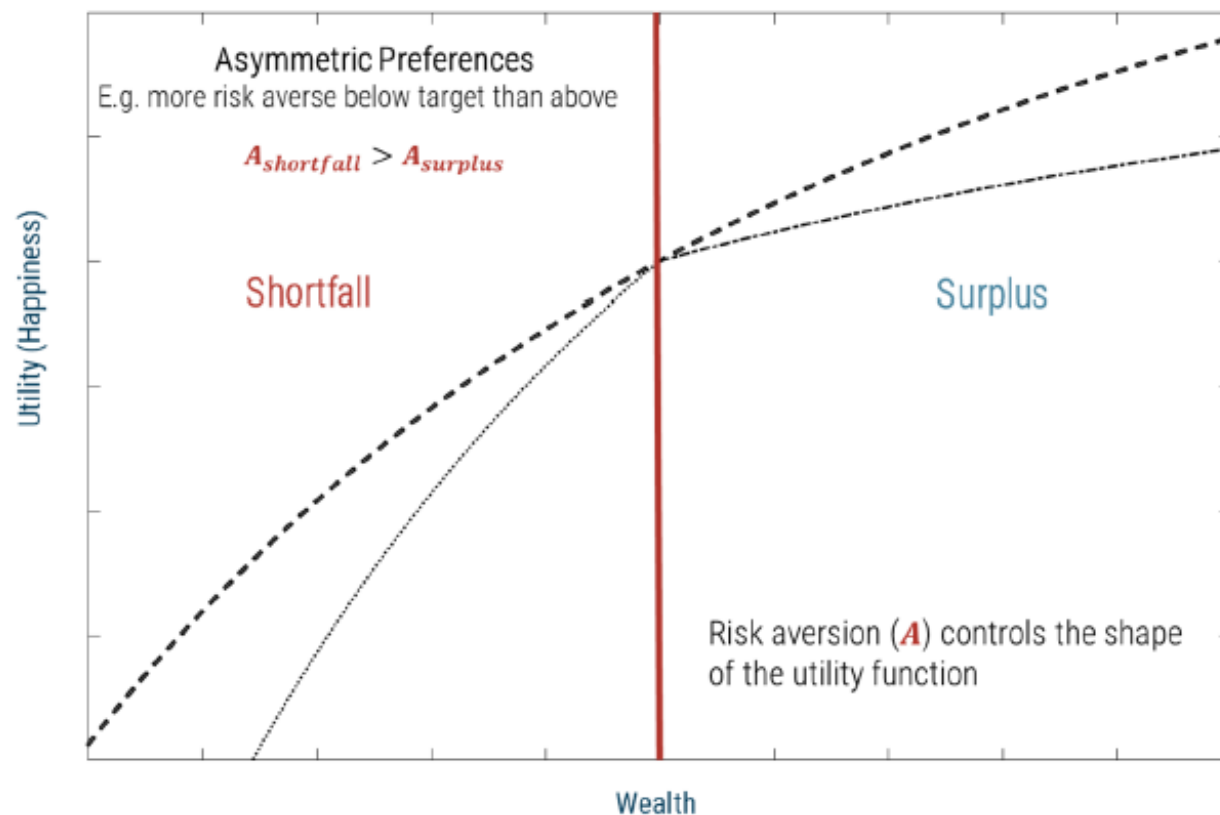
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PORTFOLIO CONSTRUCTION

- Revolutionary framework embodied in an objective function that captures the ideas that:

    - Risk = not having what you need when you need it.

    - Shortfall matters more than surplus.

- How you model your assets matters.

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PORTFOLIO CONSTRUCTION

Risk = not have what you need when you need it*

ASYMMETRIC PREFERENCES

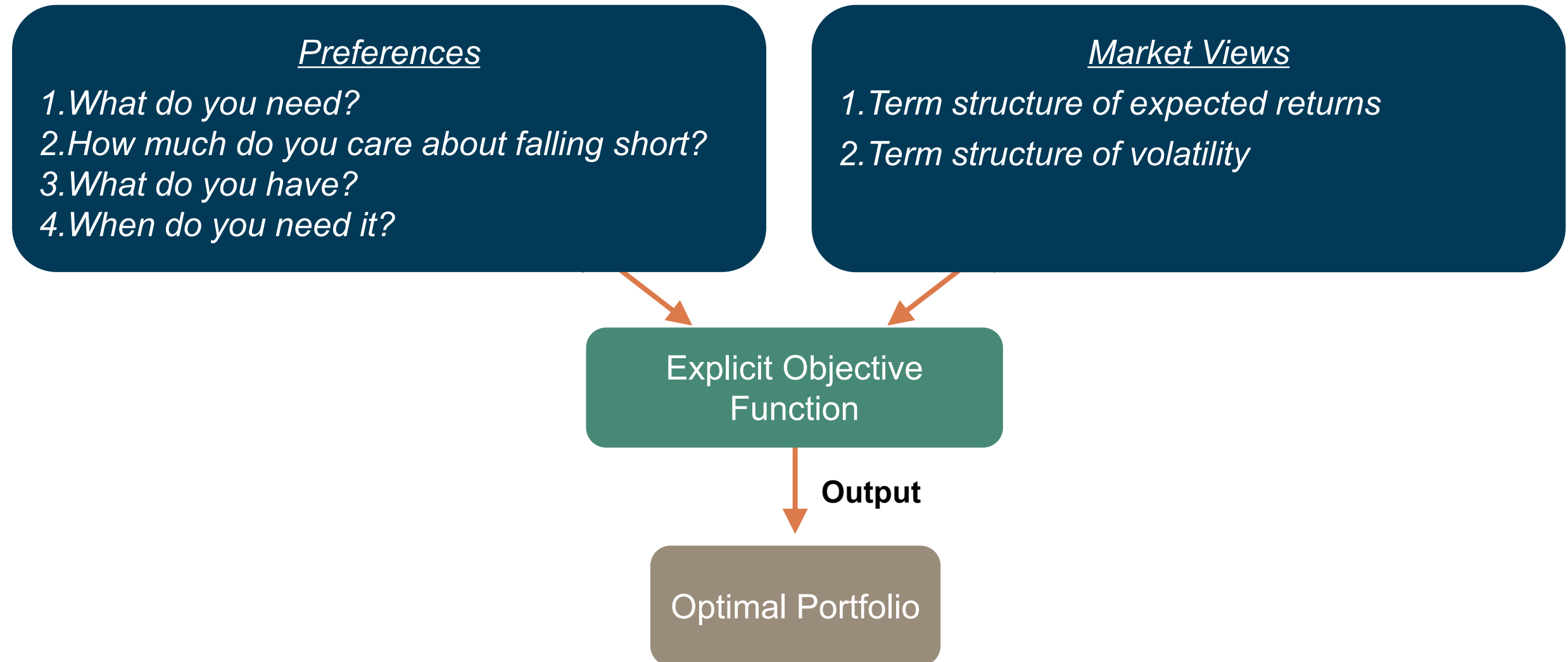

How much do you care about falling short?

- Risk is falling short of target, not volatility.

- Both probability and magnitude matter.

- Expected shortfall incorporates investment horizons, whereas mean variance is myopic.**

THE HEART OF THE FRAMEWORK

A revolutionary new objective function

Preferences

1. What do you need?
2. How much do you care about falling short?
3. What do you have?
4. When do you need it?

Market Views

1. Term structure of expected returns
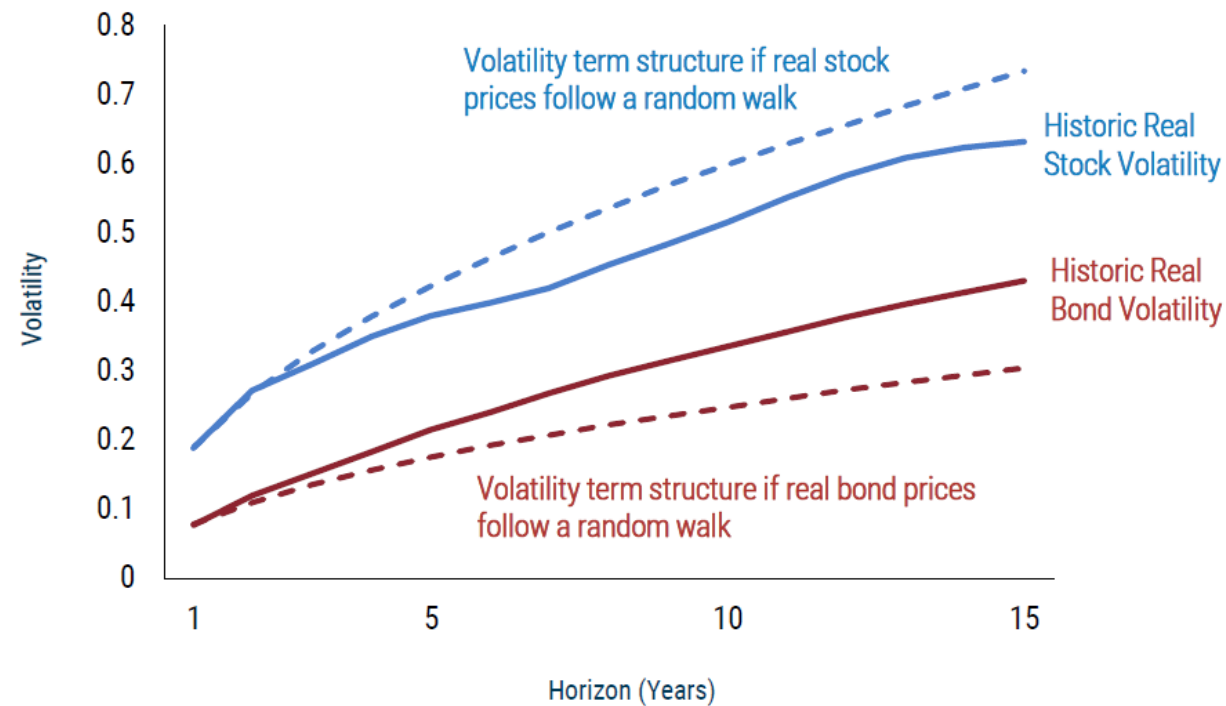2. Term structure of volatility

Explicit Objective Function

Output

Optimal Portfolio

PORTFOLIO CONSTRUCTION

How you model your assets really matters

VOLATILITY TERM STRUCTURE

- Traditional Monte Carlo simulations are missing key elements like mean reversion, the term structure of volatility, etc.

- Bonds become relatively more "risky" as horizon increases … because of inflation.

- Ignoring this effect leads to bond heavy portfolios.

NOT ALL SHORTFALL OPTIMIZATIONS ARE CREATED EQUAL

Both probability and magnitude matter. Missing by $1 is not the same as missing by $1,000,000

- Expected shortfall accounts for probability *and* magnitude of shortfall

$$\Phi \sim -P(W < W^*) + E\left[\left(\frac{W}{W^*}\right)^{1-A_\phi}\right] P\left(W < W^* e^{-(1-A_\phi)Var(\ln W)^2}\right)$$

$\underbrace{\qquad\qquad}_{\text{Probability of shortfall}}$ $\underbrace{\qquad\qquad\qquad\qquad}_{\text{Captures magnitude of shortfall}}$

- This objective function nests the pure probability of shortfall objective

$$\lim_{A_\phi \to -\infty} \Phi \sim -P(W < W^*)$$

A miss is NOT as good as a mile

EXPECTED SHORTFALL

Objective function resembles price of a European put option

Objective function depends on "mean", "variance", and preferences

- Key point

Expected log wealth   Variance of log wealth

$$\Phi\left(\overbrace{E[\ln\ W]}, \overbrace{Var(\ln W)}\ ;\ \textcolor{red}{W^*, A_\phi}\right)$$

Depend on how you invest   **Investor preferences**

- The explicit formula for expected shortfall utility is

$$\Phi = \frac{1-A_\phi}{|1-A_\phi|}\left\{-N(z_1) + e^{(1-A_\phi)(E[\ln W]-\ln\ W^*)+\frac{1}{2}(1-A_\phi)^2 Var(\ln W)}\ N\big(z_2(A_\phi)\big)\right\}$$

- Definitions
  - $N(\cdot)$ = standard cumulative normal
  - $z_1 = \frac{\ln\ W^* - E[\ln W]}{\sqrt{Var(\ln W)}}, \quad z_2(A_\phi) = z_1 - (1-A_\phi)\sqrt{Var(\ln W)}$

- Resembles price of a European put option for stock price = strike price = 1
  - $P = -N(-d_1) + e^{-rt}N(-d_2)$
  - But results from straightforward evaluation of the expectation integral, there are no replicating portfolios or no arbitrage assumptions

WHY DOES THIS MATTER?

Better outcomes

- Case study

  - Risk of ruin: What is the probability of running out of money?

  - A person retires at age 65 with $1 million and spends a fixed amount every year (e.g. $50,000).

  - Use US historical returns from 1926 – 2018.

- Sequence of returns risk*

  - If you're withdrawing money (e.g. retiree), better to have good returns followed by bad.

* See 2019 GMO Client Conference Workshop

THREE HORSES

COMMON GLIDEPATH
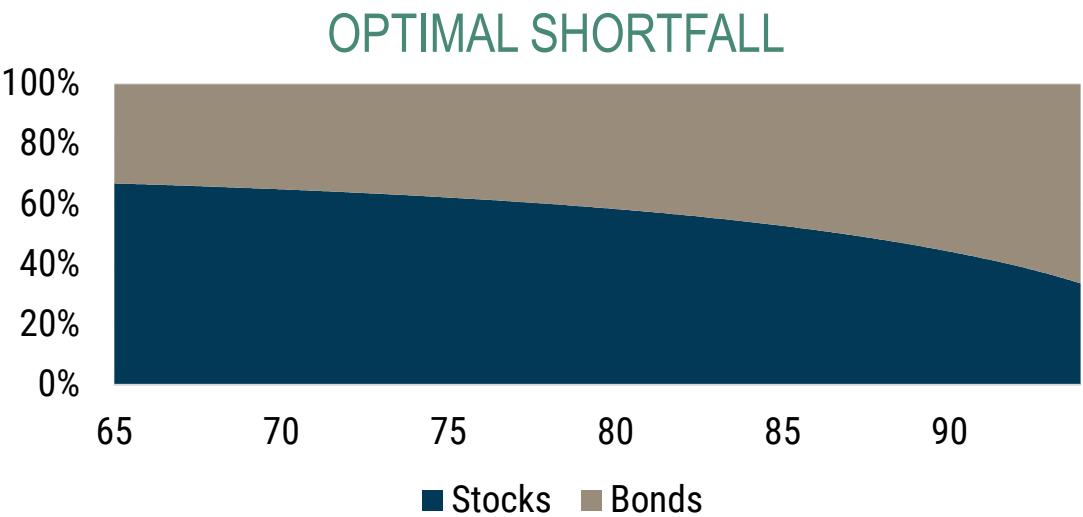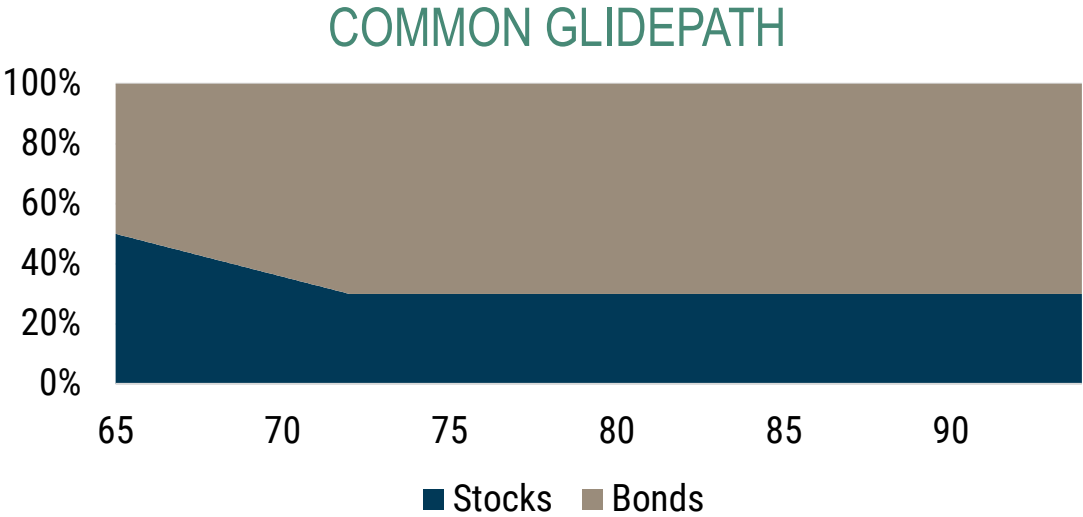
OPTIMAL SHORTFALL

Portfolios only depend on horizon

VALUATION-SENSITIVE OPTIMAL SHORTFALL
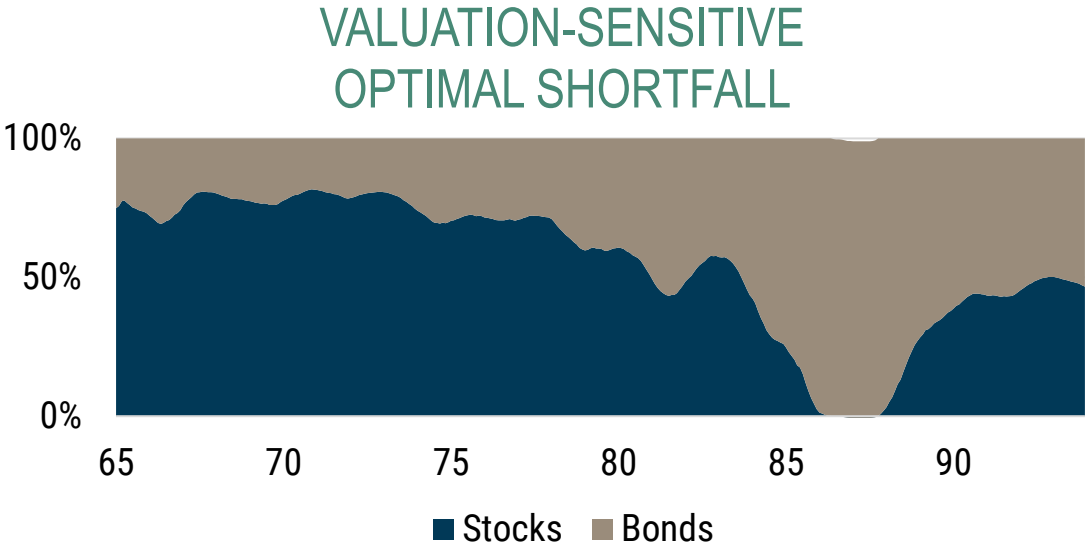
Portfolios depend on horizon *and* asset valuation

PROBABILITY OF RUIN – SEQUENCE OF RETURNS

Probability that wealth falls below zero at any point in time

Withdrawal Rate*	Common Glidepath	Optimal Shortfall	Valuation Sensitive Optimal Shorfall
Historical Backtest**			
3%	0%	0%	0%
4%	5.9%	3.1%	0.7%
5%	49%	25%	18%
Simulations**			
3%	0.9%	0.7%	0.3%
4%	7.2%	3.6%	2.0%
5%	25%	15%	10%

Asking the right question
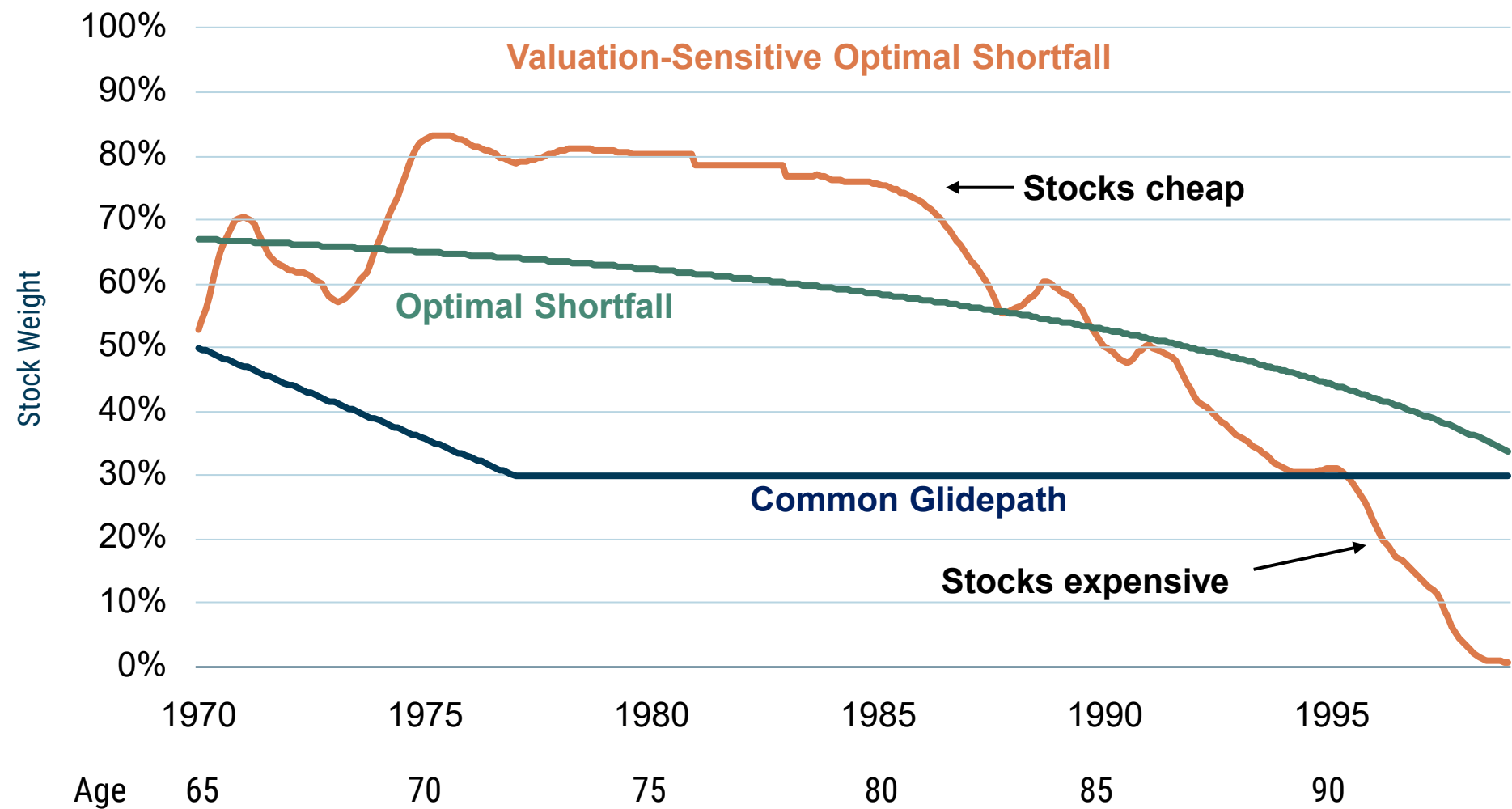
- Cuts your probability of ruin in half

Moving your assets
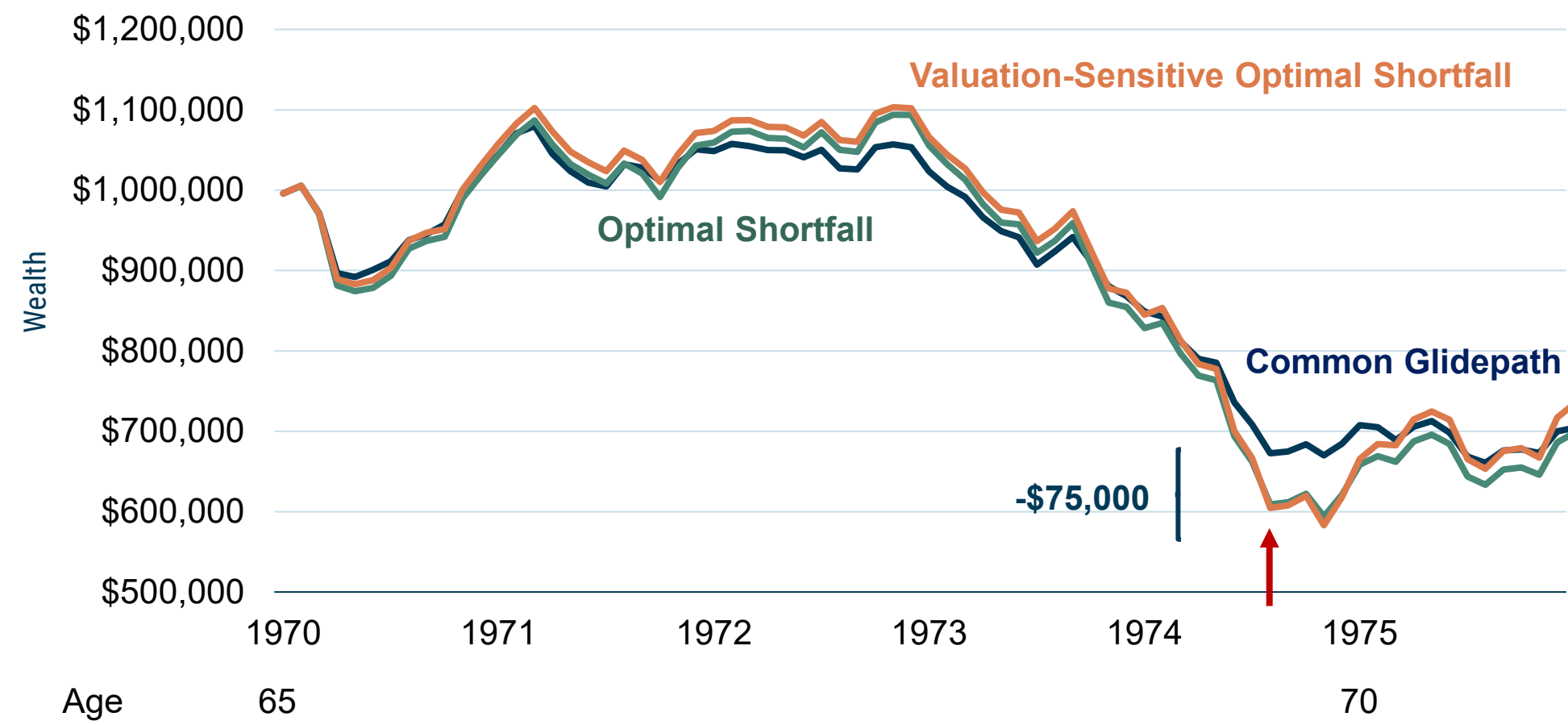
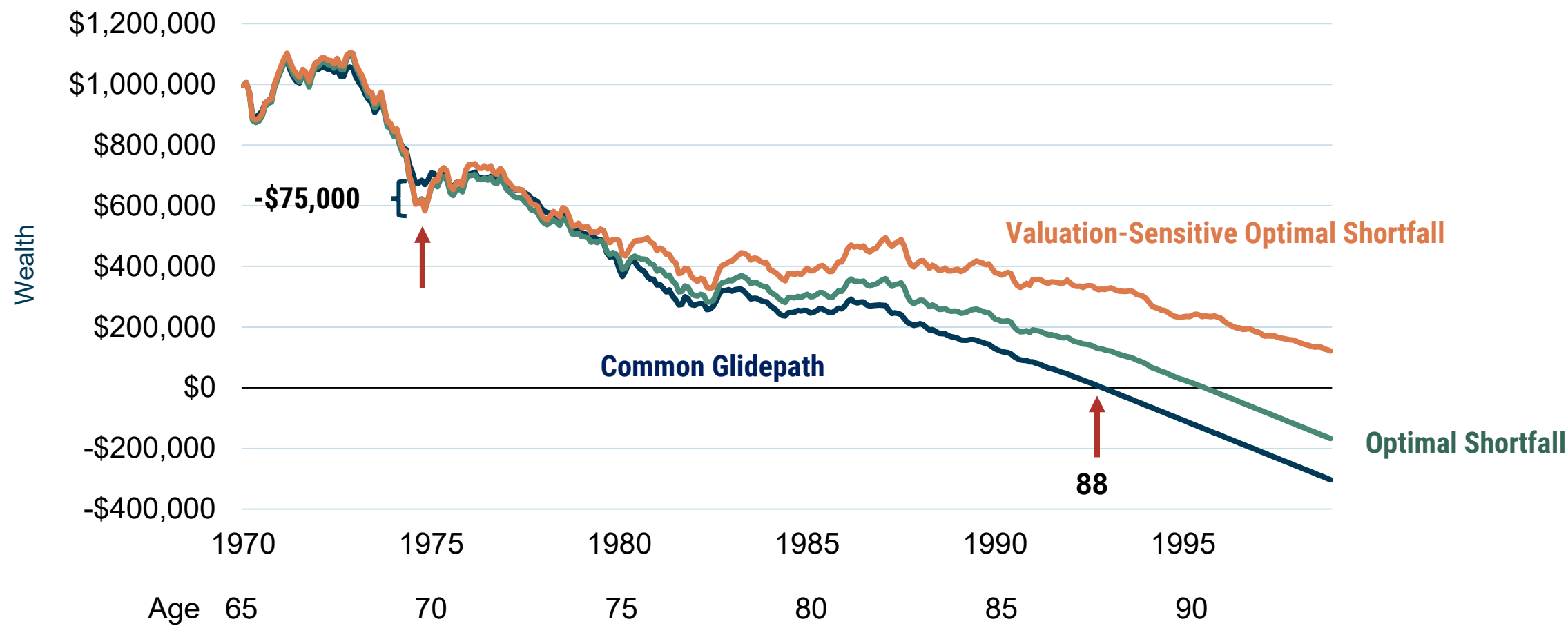- Cuts your probability of ruin by another third

THREE HORSES

BEGINNING OF THE RACE

Spending = $50,000 per year (adjusted for inflation)

AND THE WINNER IS...

Spending = $50,000 per year (adjusted for inflation)

NEBO: OUR FIRST APPLICATION

FINANCIAL PLANNING & ASSET MANAGEMENT

Needs-Based Allocation melds financial planning and asset management

Redefine risk as falling short – not volatility

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Portfolio Construction

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Customized plan balancing long term wealth accumulation with sensitivity to short term losses

Flexible, open architecture for advisors to customize models, implementation, inputs
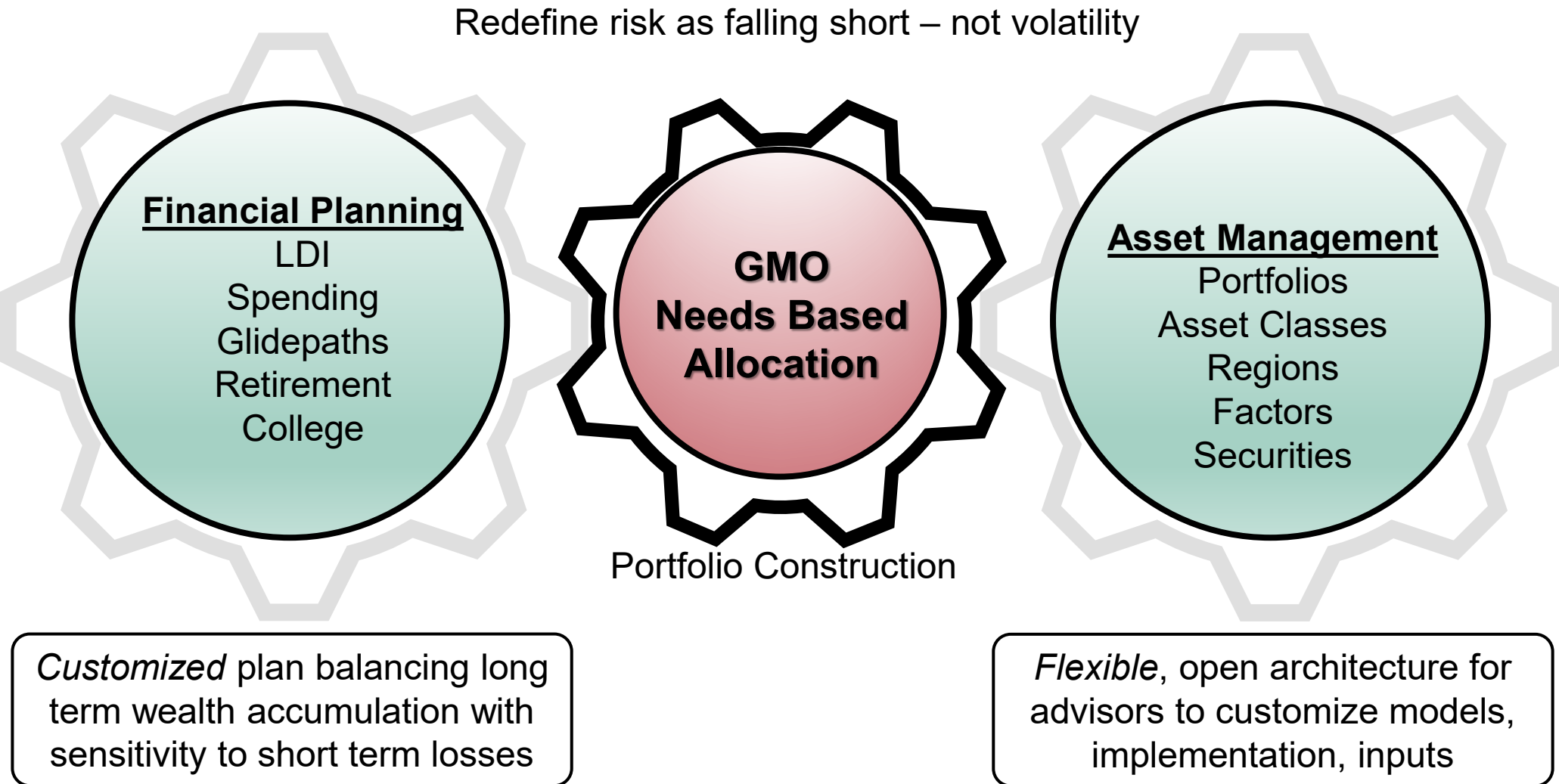
SO FAR, PEOPLE LOVE IT!

Financial advisor testimonials on an early stage prototype

- [My] clients would "lap it up," referring to both the **focus on shortfall and the customization.**

- A key feature that resonated is the **ability to illustrate tradeoffs.**

- Would love a **Monte Carlo tool that also incorporates mean reversion.**
[I] cannot find this capability elsewhere and have been looking forever.

- … **the majesty of this groundbreaking technology** that solves so many problems, including one that **I** feared we might never solve.

OUR VALUE PROPOSITION

Better outcomes that balance short-term safety & long-term wealth

REVOLUTIONARY PORTFOLIO CONSTRUCTION ENGINE

- **Redefines risk as falling short – not volatility.**
- Classical portfolio theory asks the wrong question!
- Advisors don't have tools to address the real risk … until now.

WORLD CLASS ASSET ALLOCATION

- **Target 50-100 bps of multi-period, sequence-based alpha.**
- Candid, academically-rigorous.
- Institutional-level portfolios at asset class, region, & factor levels.

CUSTOMIZABLE FRAMEWORK

- **Build custom portfolios that fully integrate into your workflow.**
- Custom glidepaths for each of your clients.
- Enhanced CIO: investment insights, support your research.

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NEBO DEMO

DEMO – GLIDEPATH SELECTOR

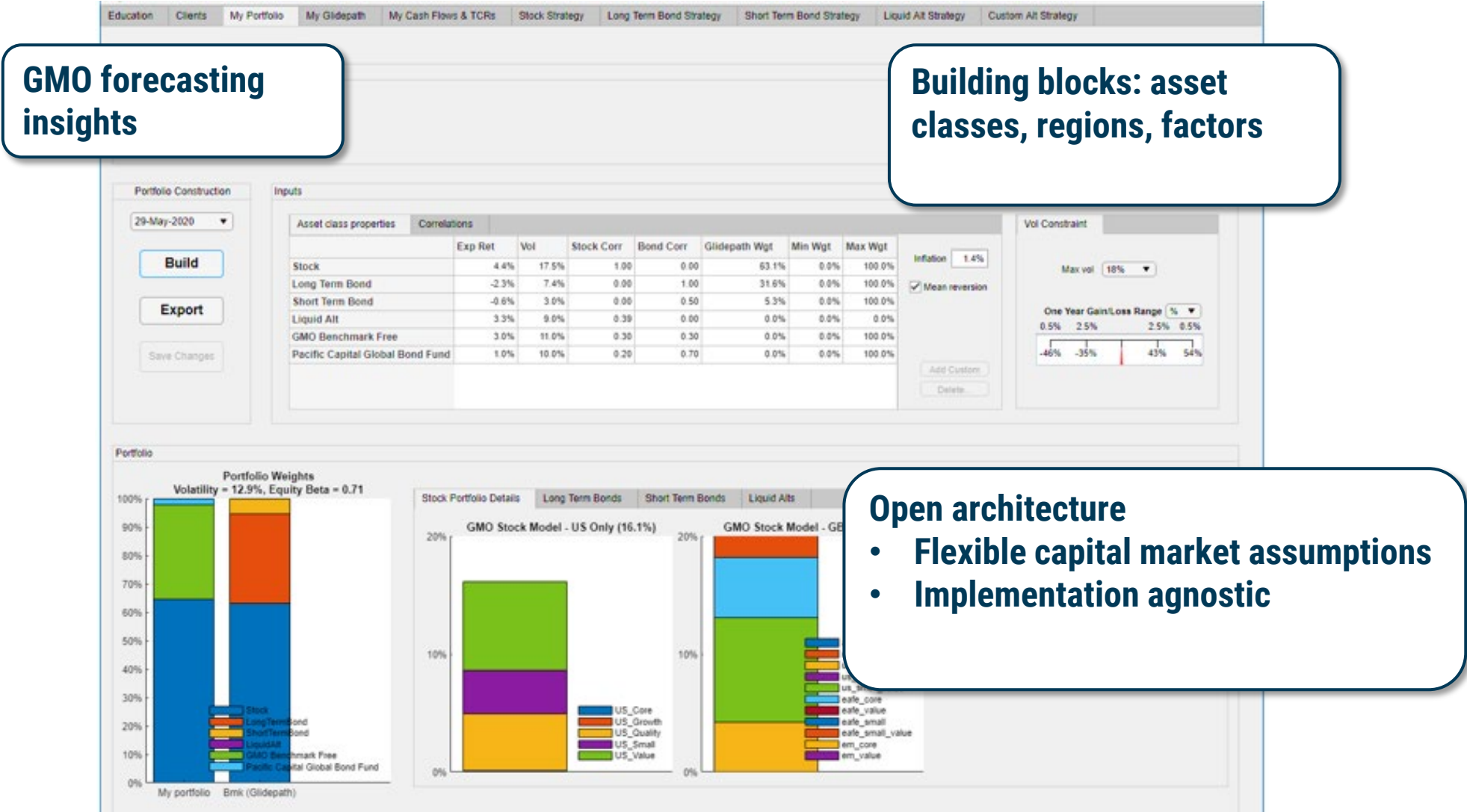*A tool to better balance short-term safety vs. long-term wealth creation*

Asset owner's needs and circumstances

Custom glidepaths for each individual

Next generation Monte Carlo simulations

DEMO – MY PORTFOLIO BUILDER

Build customizable, institutional-level portfolios at asset class, region, & factor levels

GMO forecasting insights

Building blocks: asset classes, regions, factors

Open architecture
- **Flexible capital market assumptions**
- **Implementation agnostic**

MAIN TAKEAWAYS

1. Needs Based Allocation is a new paradigm for portfolio construction

2. Better outcomes that balance short-term safety & long-term wealth

    1. Meaningfully reduce your probability of ruin

    2. Target 50-100 bps of multi-period, sequence-based alpha

3. We have an open architecture platform to express these ideas

    1. Testing is already underway, great feedback throughout

    2. We are looking for additional testers, you can help us shape this!