



2019 **ANNUAL
MEETING**
& EXHIBIT

October 27-30
Toronto, Canada

Session 081: Economic Scenario Generation for Life, Pension and P&C Applications

[SOA Antitrust Compliance Guidelines](#)

[SOA Presentation Disclaimer](#)

Session 081: Economic Scenario Generation for Life, Pension and P&C Applications

Moderator: David Schraub, FSA, MAAA, CERA, AQ

Presenter: Daniel Finn, FCAS
Hal Pedersen, ASA



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The United States antitrust laws aim to protect consumers by preserving the free economy and prohibiting anti-competitive business practices; they promote competition. There are both state and federal antitrust laws, although state antitrust laws closely follow federal law. The Sherman Act, is the primary U.S. antitrust law pertaining to association activities. The Sherman Act prohibits every contract, combination or conspiracy that places an unreasonable restraint on trade. There are, however, some activities that are illegal under all circumstances, such as price fixing, market allocation and collusive bidding.

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- **-Do** leave a meeting where any anticompetitive pricing or market allocation discussion occurs.
- **-Do** alert SOA staff and/or legal counsel to any concerning discussions
- **-Do** consult with legal counsel before raising any matter or making a statement that may involve competitively sensitive information.

Adherence to these guidelines involves not only avoidance of antitrust violations, but avoidance of behavior which might be so construed. These guidelines only provide an overview of prohibited activities. SOA legal counsel reviews meeting agenda and materials as deemed appropriate and any discussion that departs from the formal agenda should be scrutinized carefully. Antitrust compliance is everyone's responsibility; however, please seek legal counsel if you have any questions or concerns.

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Hal Warren Pedersen



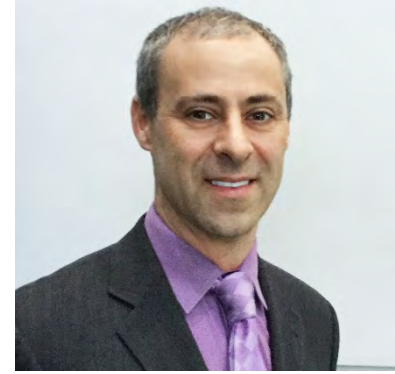
Hal W. Pedersen is one of the world's leading experts on economic scenario generation. His interest in this area began in the late 1980s with research on interest rate models. Dr. Pedersen was a Managing Director with Conning where he lead the Quantitative Finance team and was one of the principal architects of GEMS, Conning's award winning economic and capital market scenario generator. He is an Associate of the Society of Actuaries and has more than 20 years academic and industry experience in the application of financial economics to insurance. He was L.A.H. Warren professor of actuarial science at the University of Manitoba from 2003 through 2011 and served on the actuarial faculty at Georgia State University from 1996 through 2001. He is Vice-Chair of the Society of Actuaries Investment Section council.

Daniel Finn



Daniel Finn, FCAS, is a Managing Director at Conning, where he is the Head of North America for the Risk Solutions unit. In that role, he leads a team that is responsible for providing asset-liability and integrated risk management advisory services to life, health and property/casualty insurance company clients and pension clients. Mr. Finn also oversees the support and development of Conning's proprietary financial software models. Prior to joining Conning in 2001, Mr. Finn was a Vice President within Swiss Re Investors' asset-liability management unit. He has been involved in the asset-liability management field since 1997. Mr. Finn is a graduate of the University of Rochester with an MA in Mathematics and earned an MBA from Loyola College. He is a Fellow of the Casualty Actuarial Society (FCAS).

David Schraub



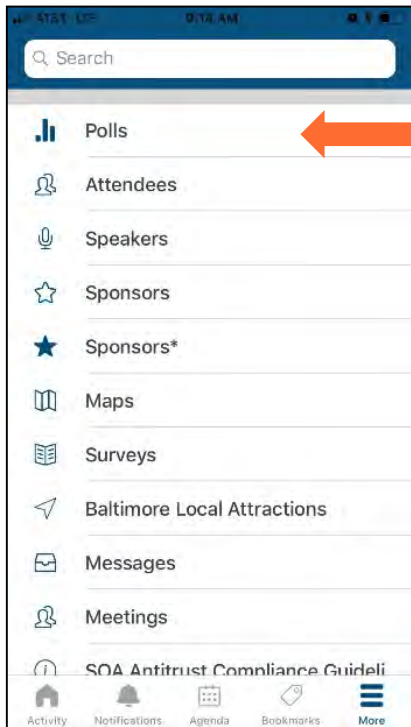
David Schraub is the Staff Fellow for the several sections at the Society of Actuaries (SOA) working to develop and support and directing volunteer activities. In addition, he provides risk expertise to the SOA's education (including both core and continuing education programs) and research functions. He also serves as a liaison between the SOA and other organizations in the risk arena and works to facilitate the intellectual capital development of actuaries in risk management. Prior to joining the SOA, David worked for life insurance companies and consulting companies in various risk positions, focusing on Solvency II, NAIC ORSA and risk reporting in general. David is a Fellow of the Society of Actuaries, a Chartered Enterprise Risk Analyst of the Society of Actuaries, an Actuaire Qualifie of the Institut des Actuaire (France) and a Member of the American Academy of Actuaries. He graduated from the École Nationale de la Statistique et de l'Administration Économique, one of the French Grandes Ecoles focused on economics, statistics and actuarial sciences.

Setting the stage



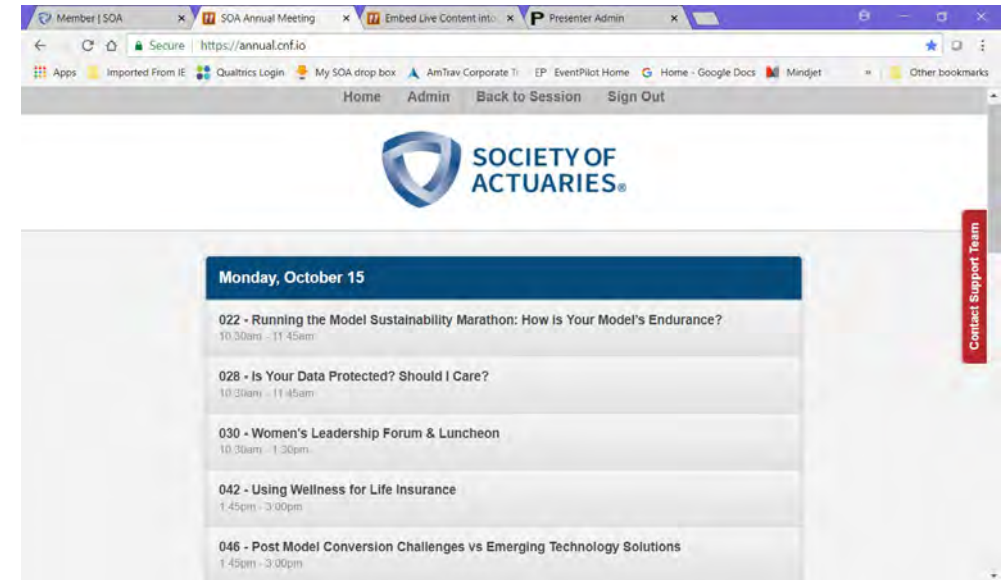
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Live Content Slide

When playing as a slideshow, this slide will display live content

Poll: How familiar are you with ESG

Live Content Slide

When playing as a slideshow, this slide will display live content

Poll: Line of business (check al that apply)

Live Content Slide

When playing as a slideshow, this slide will display live content

**Poll: What type of company are you
working for**

Real World v Risk Neutral Economic Scenario Generator

- Real World

- Real probability – Individual paths and statistical metrics are meaningful
- Match the real world
- Risk Premium; riskier asset earn more than less risky asset
- More subjective than Risk Neutral

- Risk Neutral

- ‘Pretend’ probability to match option pricing
- Replicate option pricing
- No Risk Premium; all assets earn risk free rate. This is the risk adjustment
- Mathematically it is an integration by substitution (u-substitution) on the probability measure

Real World v Risk Neutral Economic Scenario Generator

- Real World Usage

- Own Risk and Solvency Assessment (ORSA), Planning
- Statutory accounting
- Asset allocation
- Product pricing (except derivative-like products)
 - Variable Annuities, Fixed Index Annuities, Universal Life, Term
 - Riders

- Risk Neutral

- Option pricing
- Valuation of option-like products

Calibration issues

- Market & Historical Data
 - Calibration vs. subjective choice (do I believe interest rate will behave has they did historically or not)
 - Data quality
 - Historical period
- Models
 - What model should be used for a particular asset class? Desirable shape?
 - Tail or mid-distribution focus
 - Level of sophistication / parsimony principle
 - Validation of subjective statements
 - Fit for purpose & use case

AAA-SOA Economic Scenario Generator



Evolution

Late 90'

- C3P1 – Interest rate only
- Long Term Mean reversion to 6%-7%
- Limited computer power (First 200 scenarios, worst 50, worst 20)

Mid 00'

- C3P2 – Equity generator with stochastic volatility
- Correlation between indices
- Link to C3P1 (no correlation) for interest rate

Late 00'

- C3P3 – Refinements
- Constant LT target rate not appropriate
- Conservatism added to fit regulatory capital purposes
- Other functionalities (stratified scenario sampling tool based around the 20 y rate)

Model Development Underlying Principles

- Safe Harbor for smaller companies
- Risk Sensitive Capital Calculation
- Complexity v. Explicability

Thanks Mary Pat for sharing the historical context of the AAA-SOA ESG

Questions?





Economic Scenario Generation for Life, Pension and P&C applications

Society of Actuaries Annual Meeting
October 29, 2019

Regulatory Economic Scenario Generation (ESG)

Occasionally, ESGs get released as either Research or Regulations

- C3 — Phase I and II (SOA/AAA)
- Dynamo (CAS)
- Modeling of Economic Series Coordinated with Interest Rate Scenarios (CAS Research)

Typically designed for Specific Purpose

- Usually, capital calculations

Companies often apply them “off brand”

- Strategic Asset Allocation
- Short-Term Planning
- Pricing

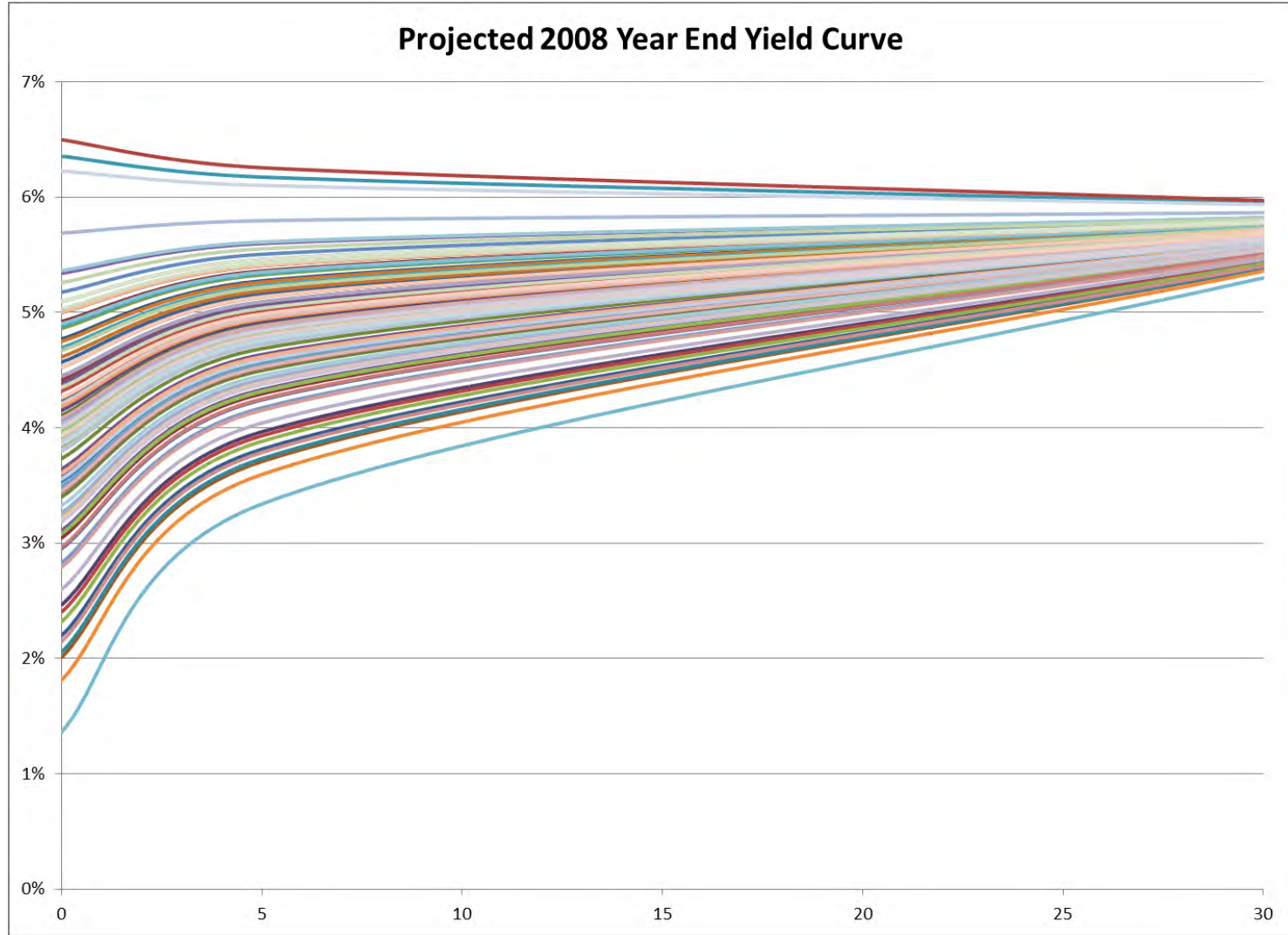
Issues — Simplicity

Most of these Models are fairly simple

- Limited Risk Drivers
- Limited Asset Classes

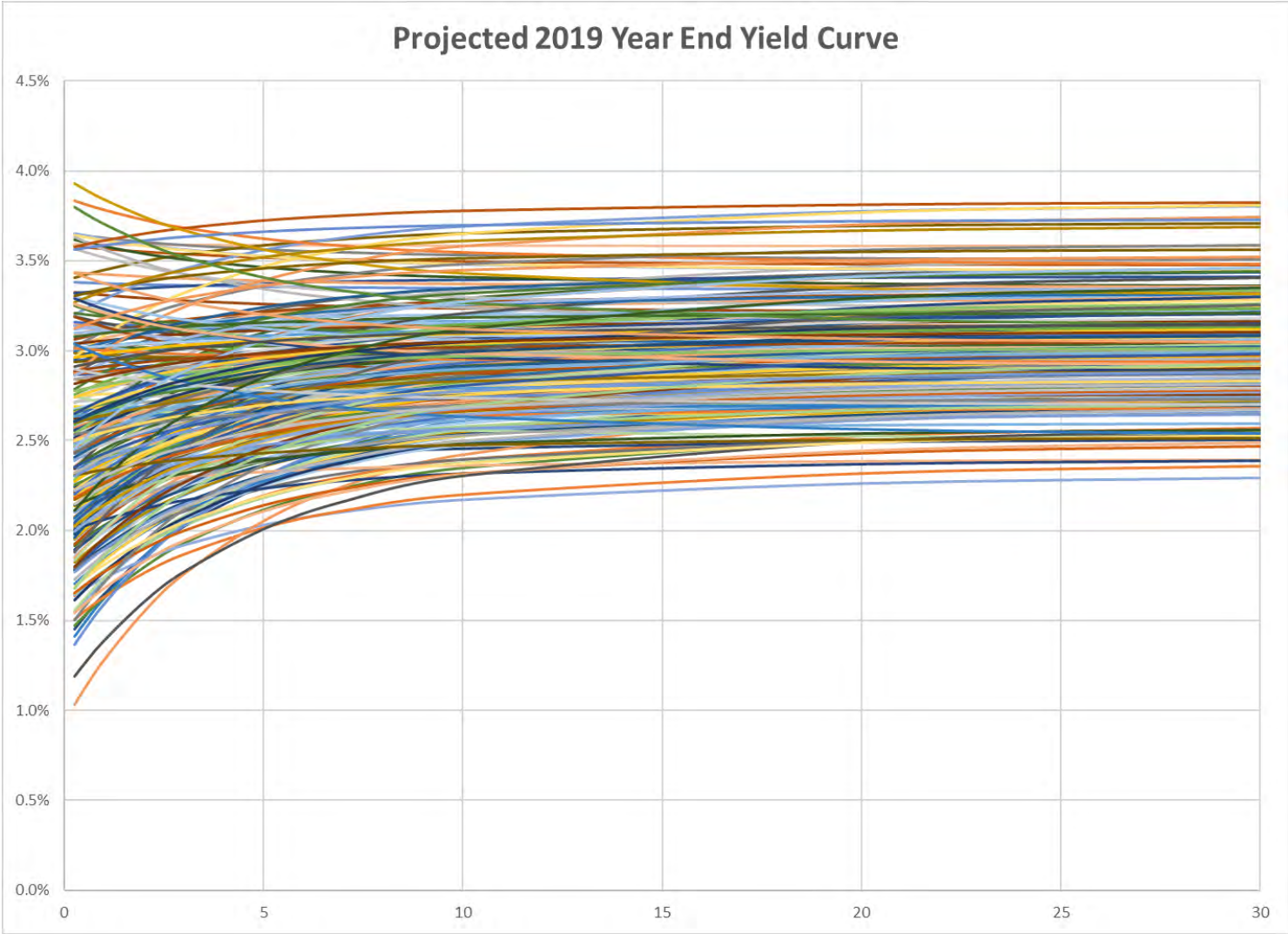
Consider Treasury Models

Dynamo 1-Year Treasury Projections



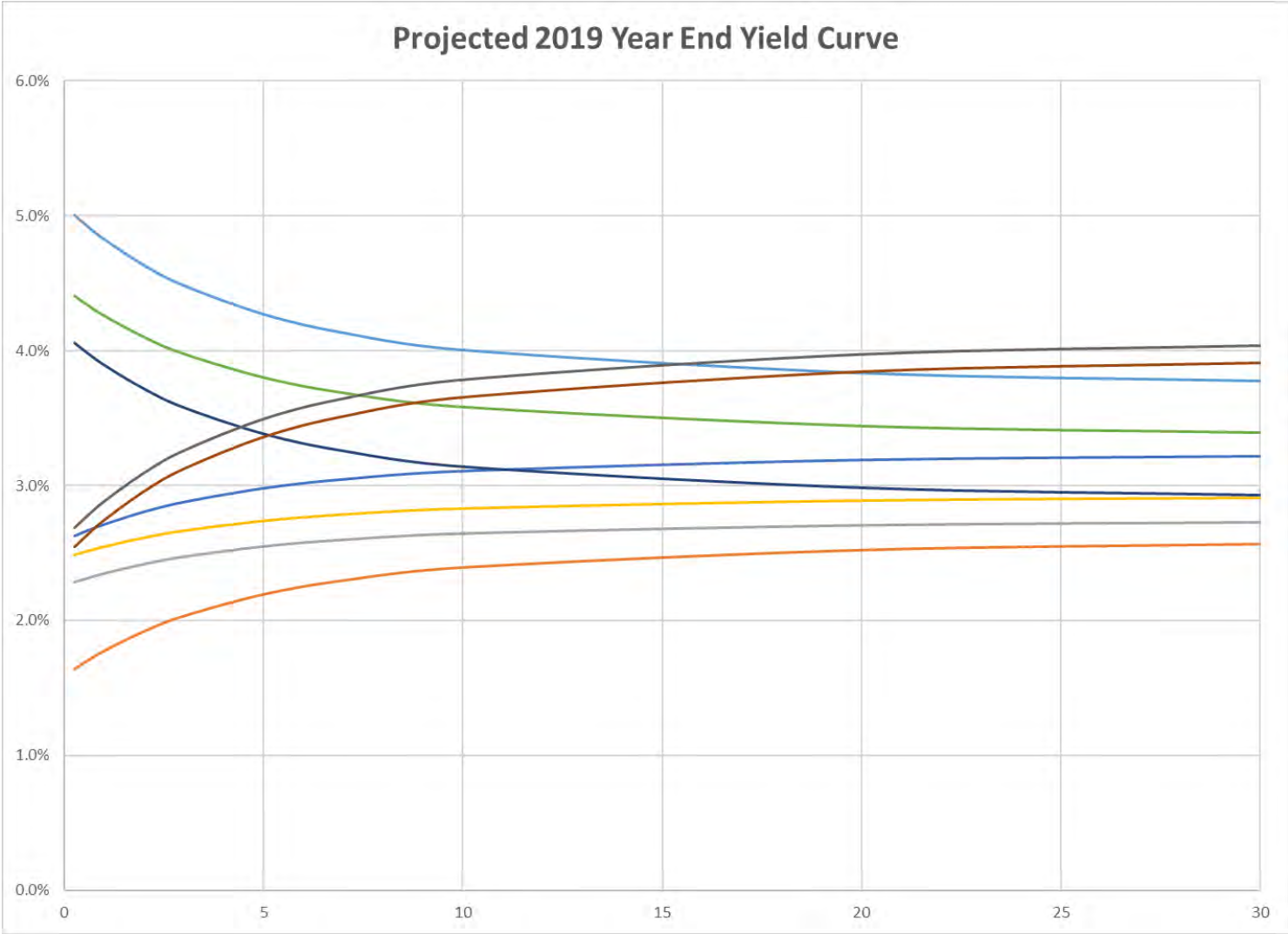
Prepared by Conning, Inc. Source: Dynamo Public Access DFA Model scenarios.

Academy Treasury Projections



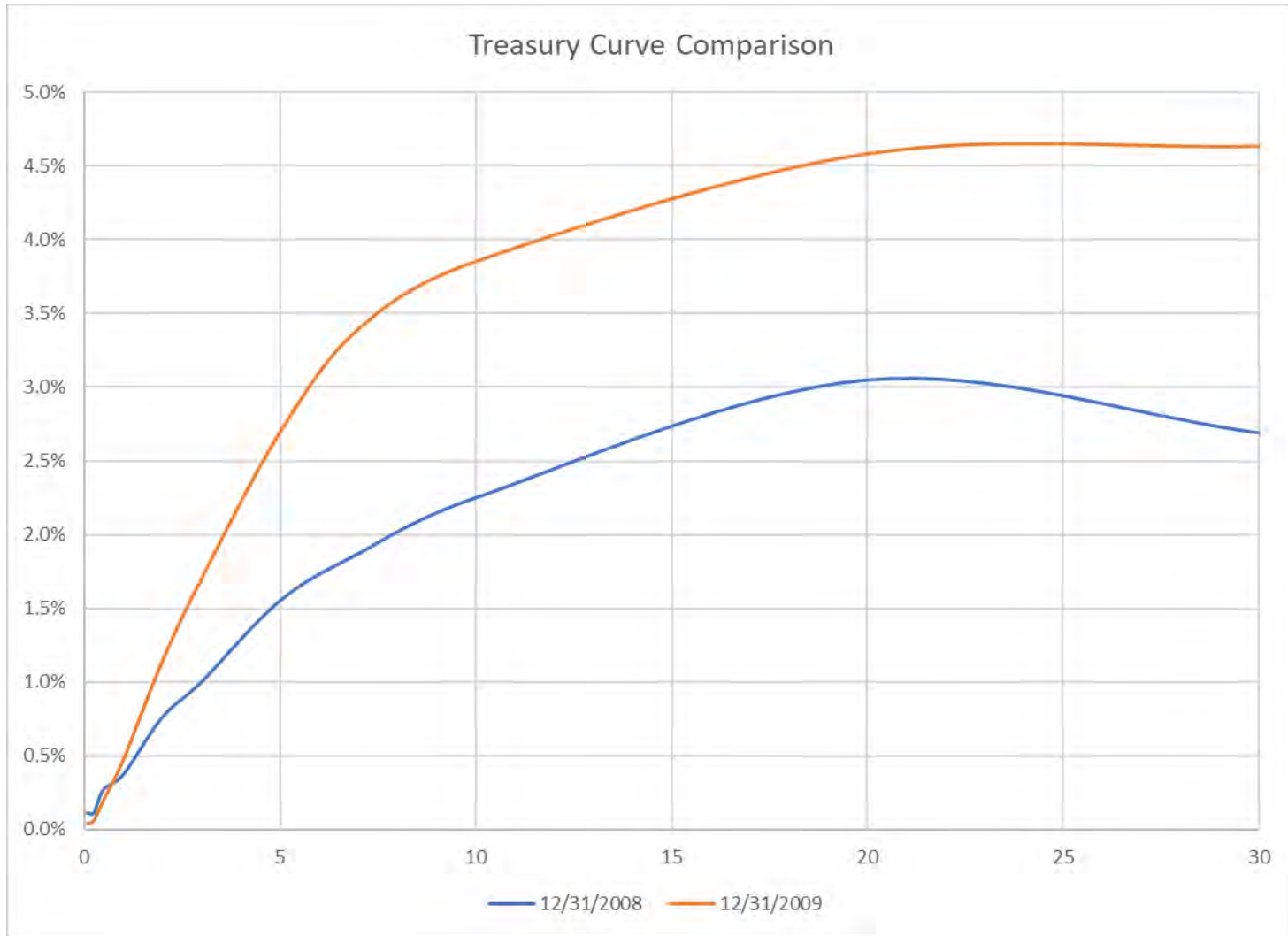
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Academy Treasury Projections



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MBS Impact

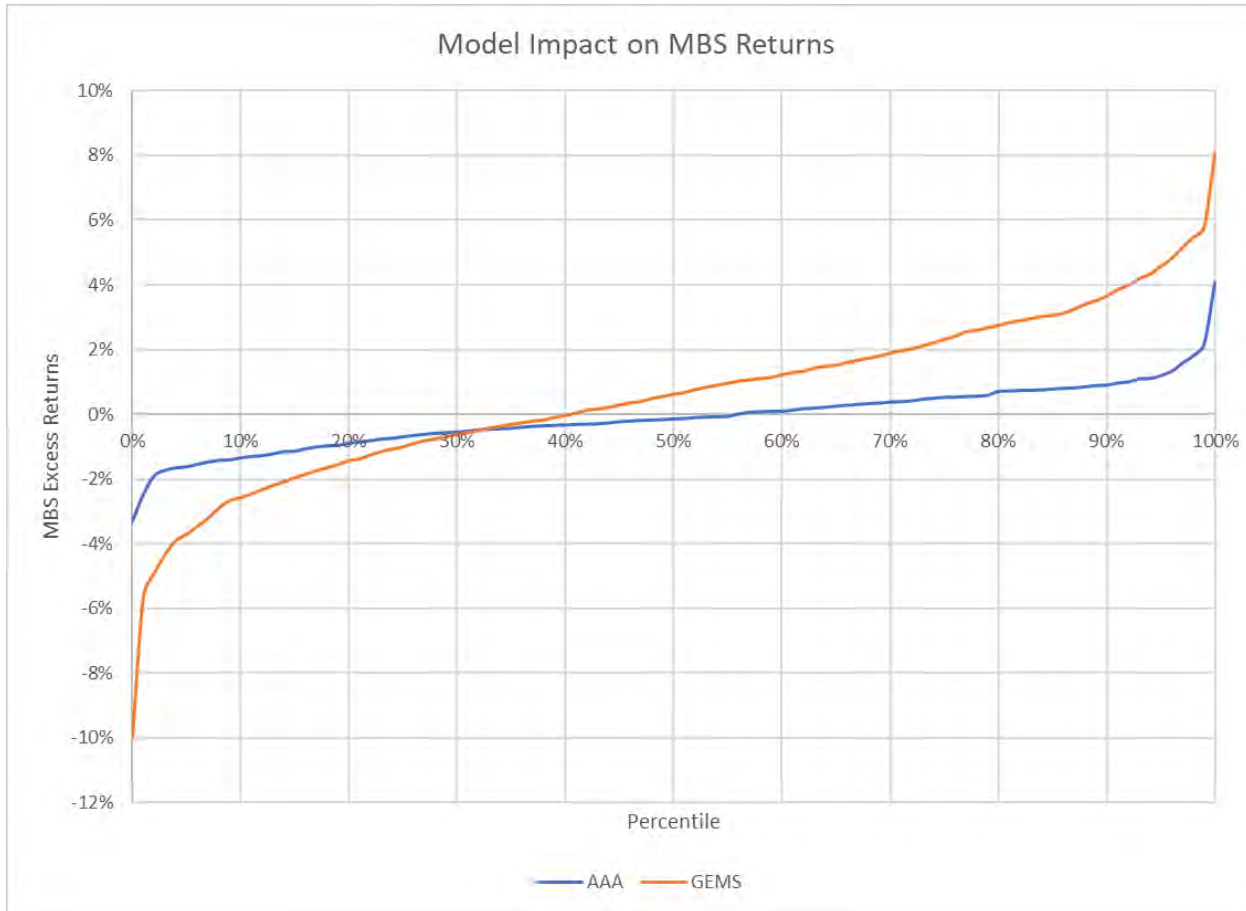


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MBS Impact

Today's commercial models add a third factor

Allows for much bigger departures for MBS returns



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Issues – Arbitrage Opportunities

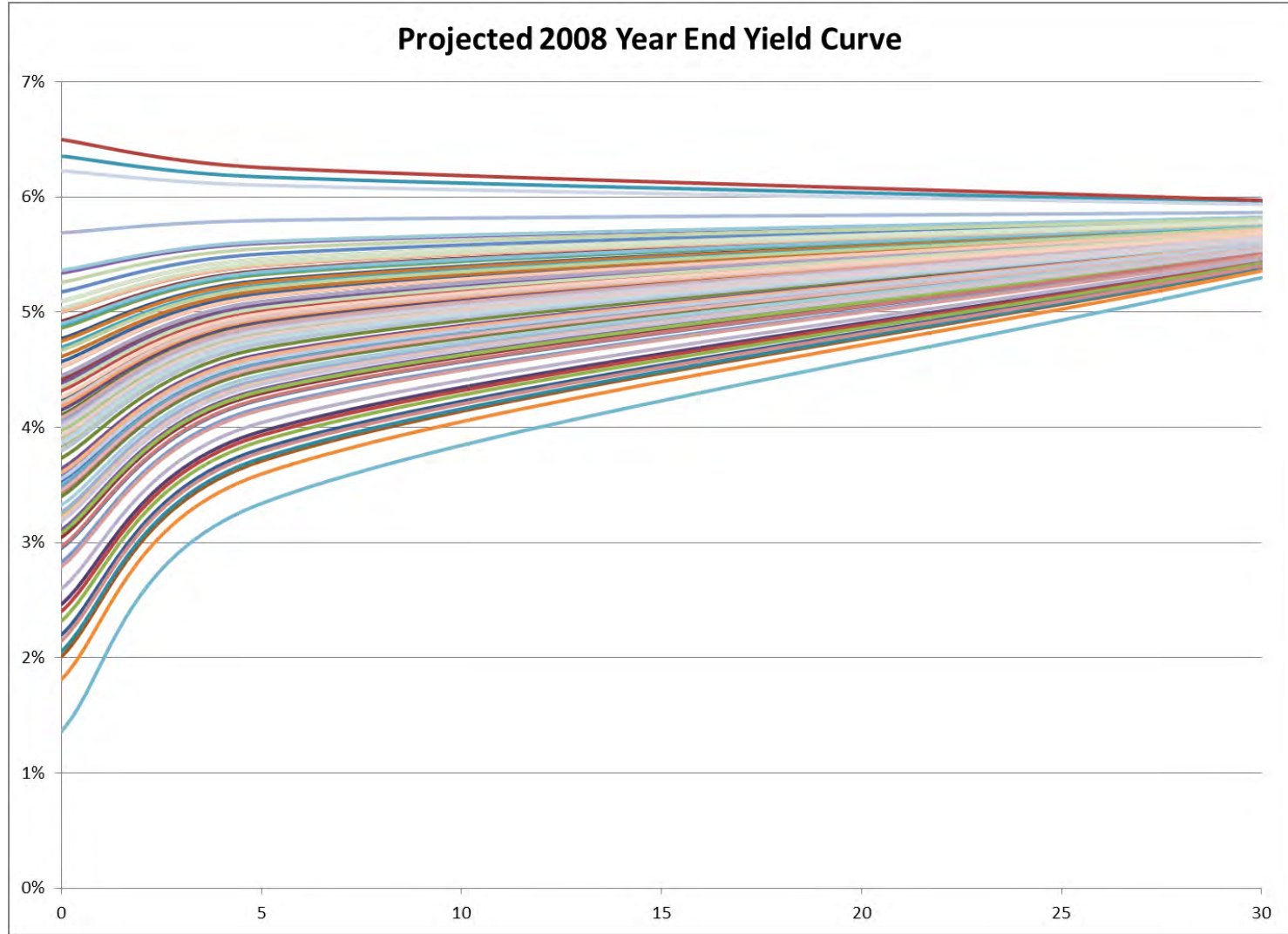
Most of these Models focus on reasonability

- Range of outcomes
- Desired relationships

Offers much more freedom than arbitrage-free models

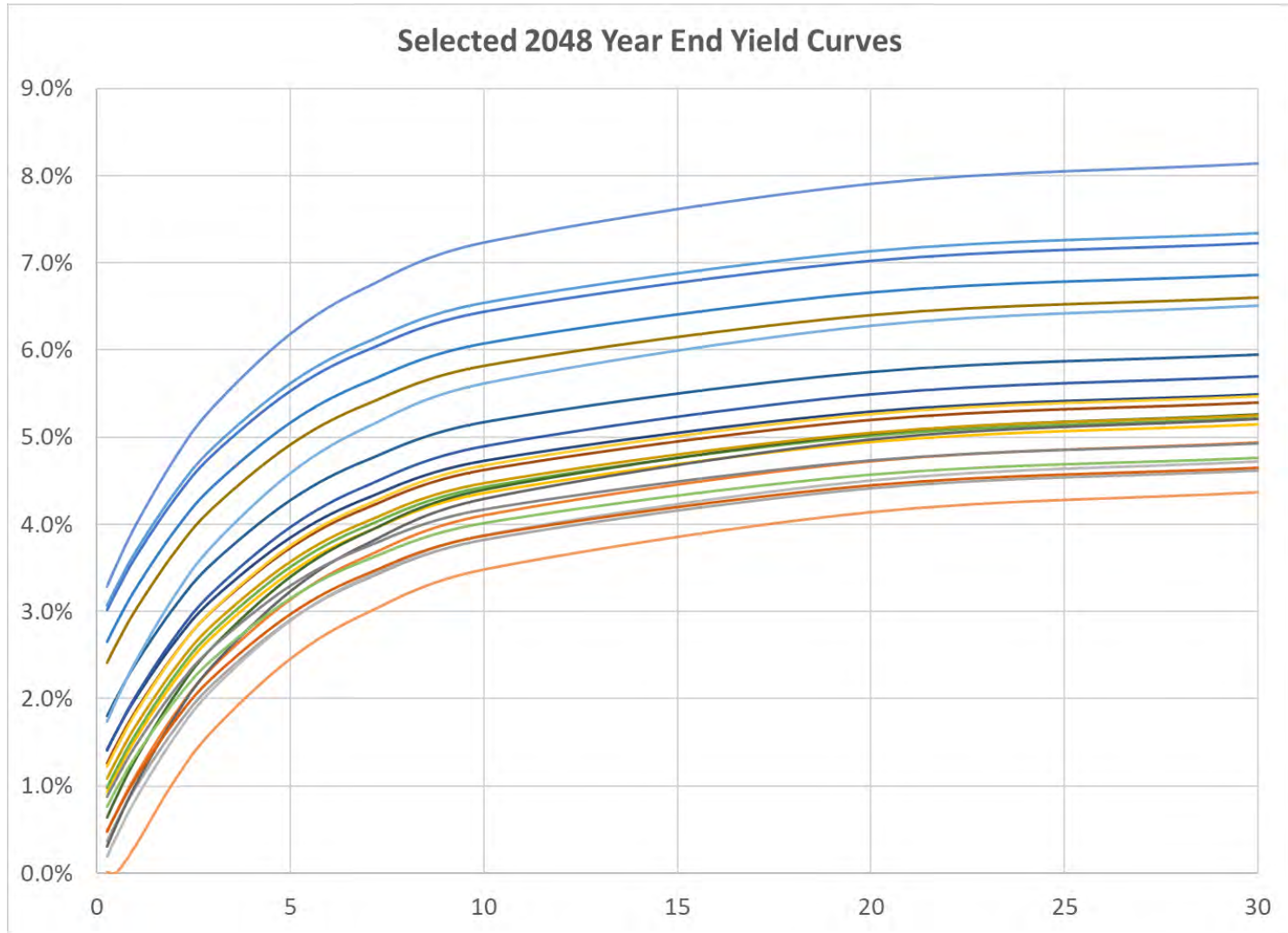
- However, this can have unintended consequences
- Consider yield curve slope

Issues – Arbitrage Opportunities



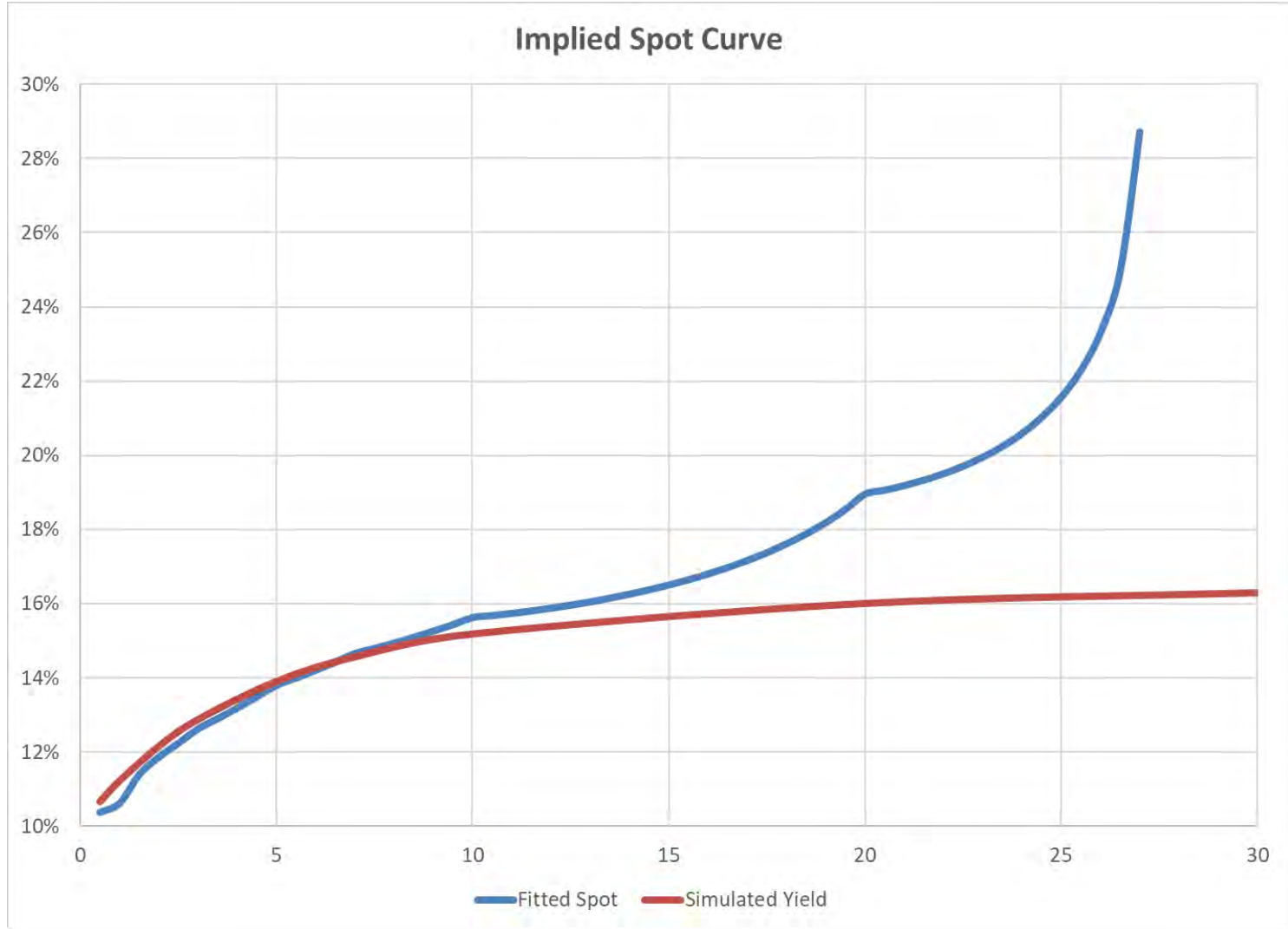
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Issues – Arbitrage Opportunities



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Issues – Arbitrage Opportunities



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Issues – Risk vs. Reward

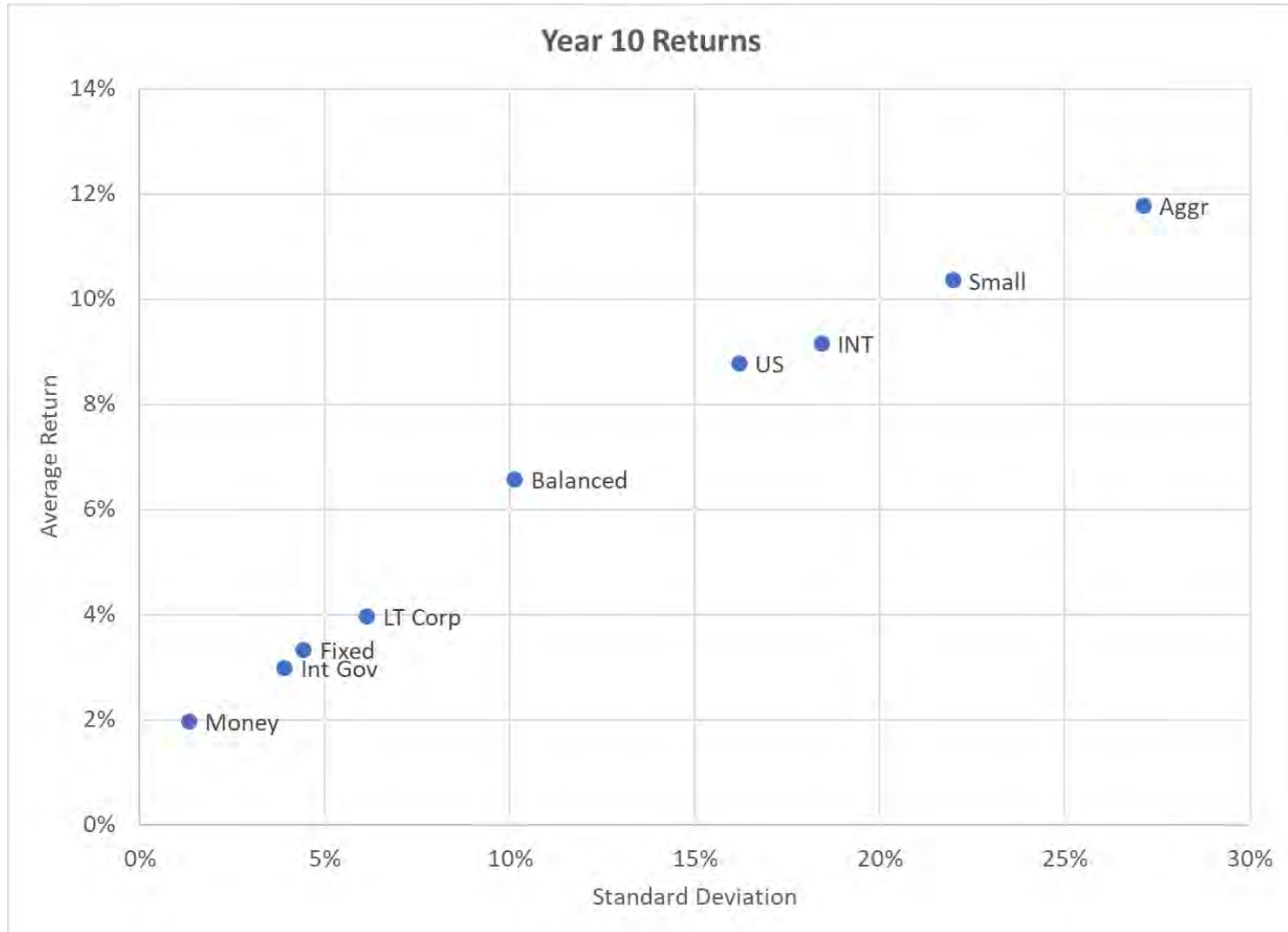
For Asset Allocation, there are two Key Considerations

- Risk vs. Reward between Asset Classes
- Correlation between Asset Classes

Usually considered in model construction

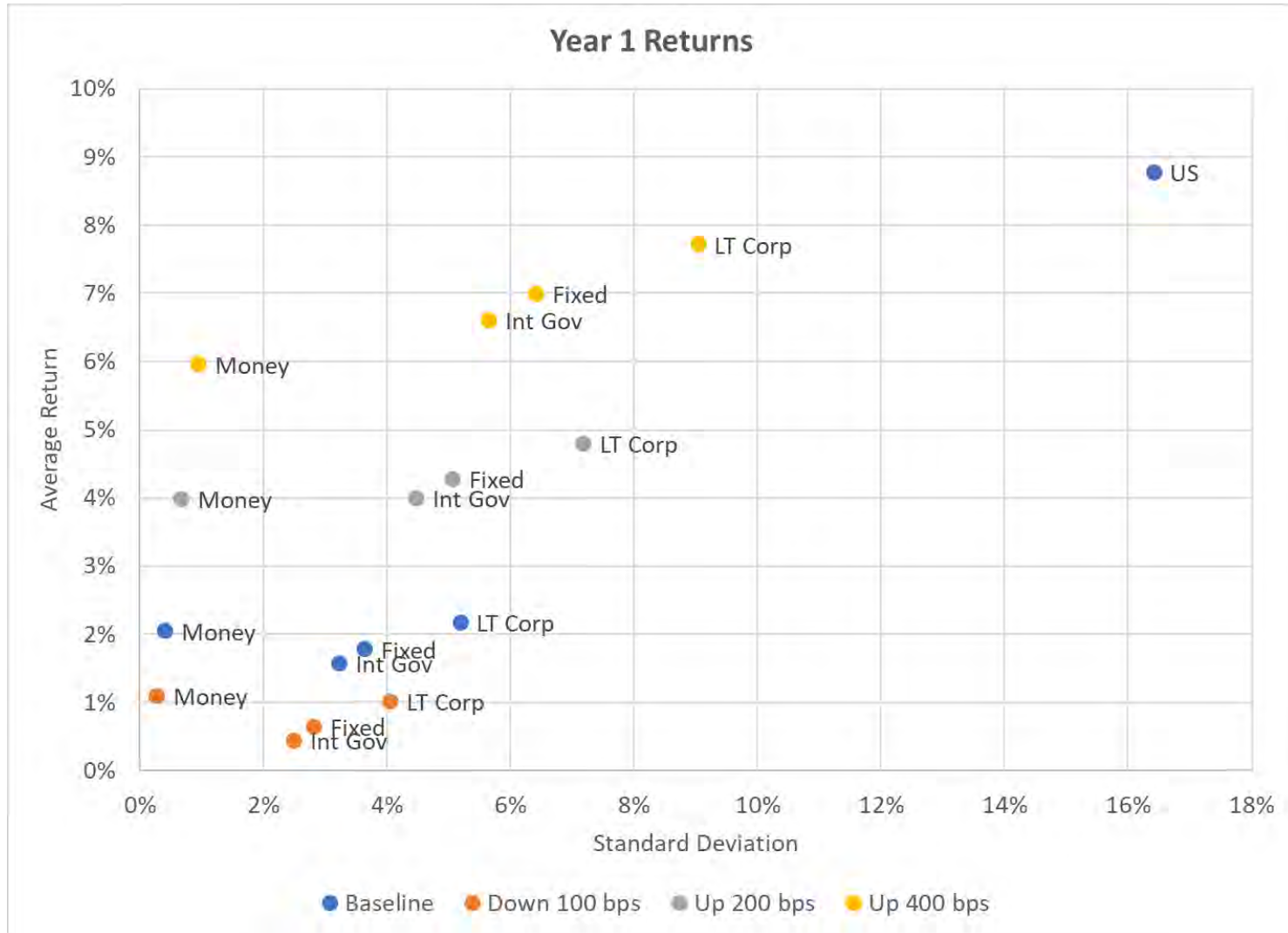
- But, usually not the primary consideration

Issues – Risk vs. Reward



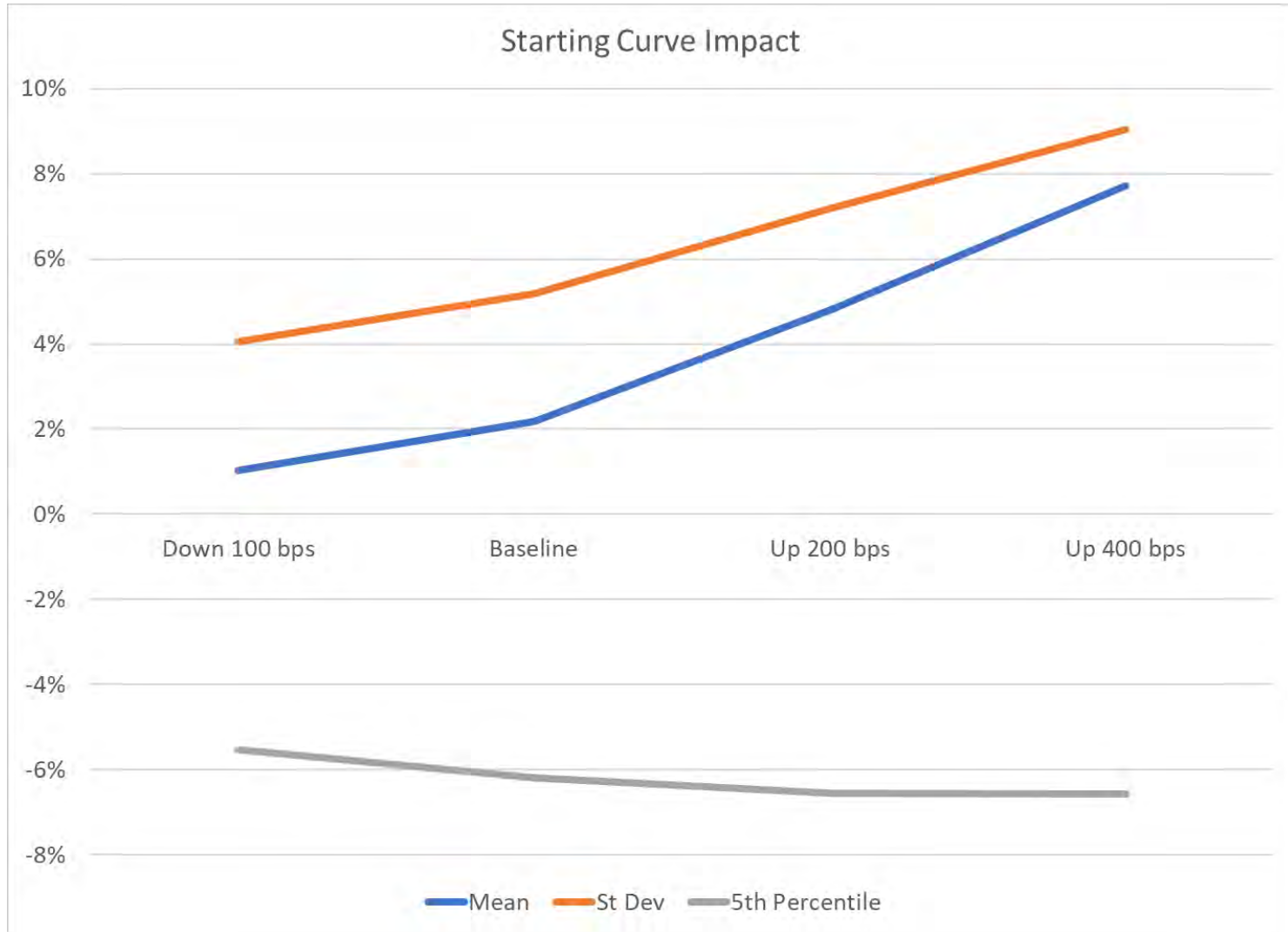
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Issues – Risk vs. Reward



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Issues – Risk vs. Reward



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Issues – Short-Term Projections

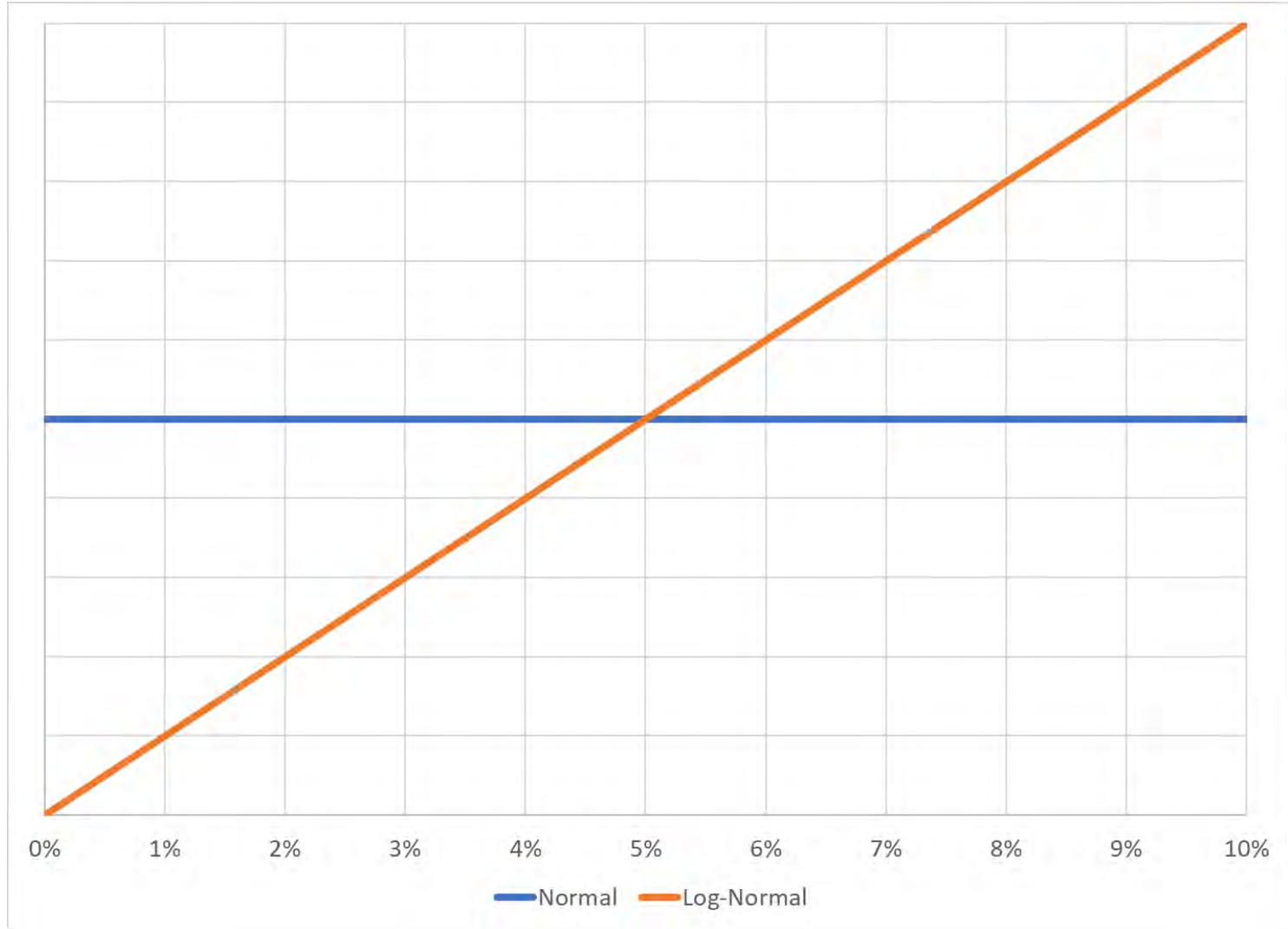
Another Application is Short-Term Projections

- Variability around budgets
- Timeframe of 3–5 years

Regulatory models typically focus on long-term dynamics

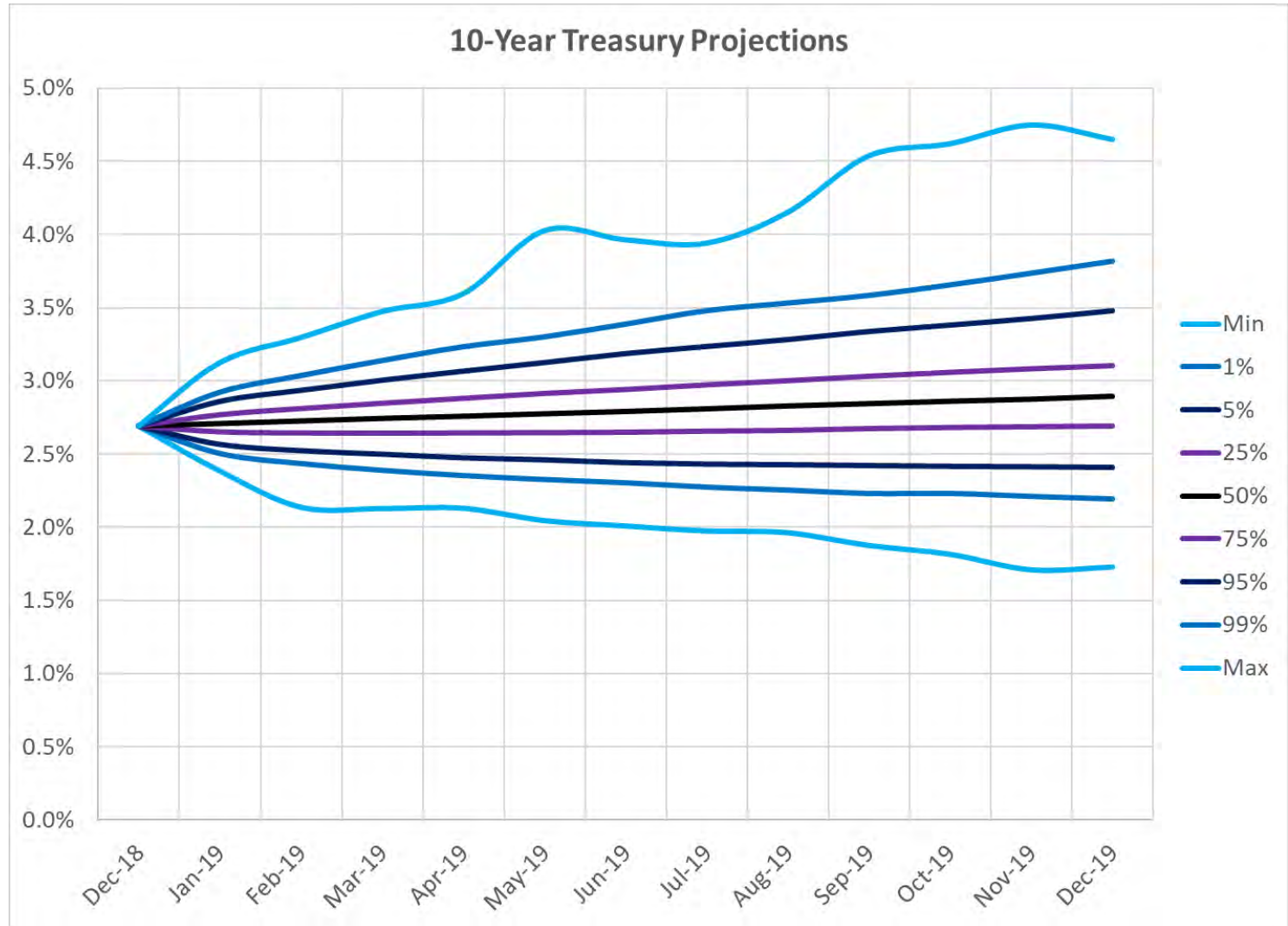
- Easier to calibrate
- Easier to maintain: Models with short-term targets need to be constantly updated and tested

Issues – Short-Term Projections



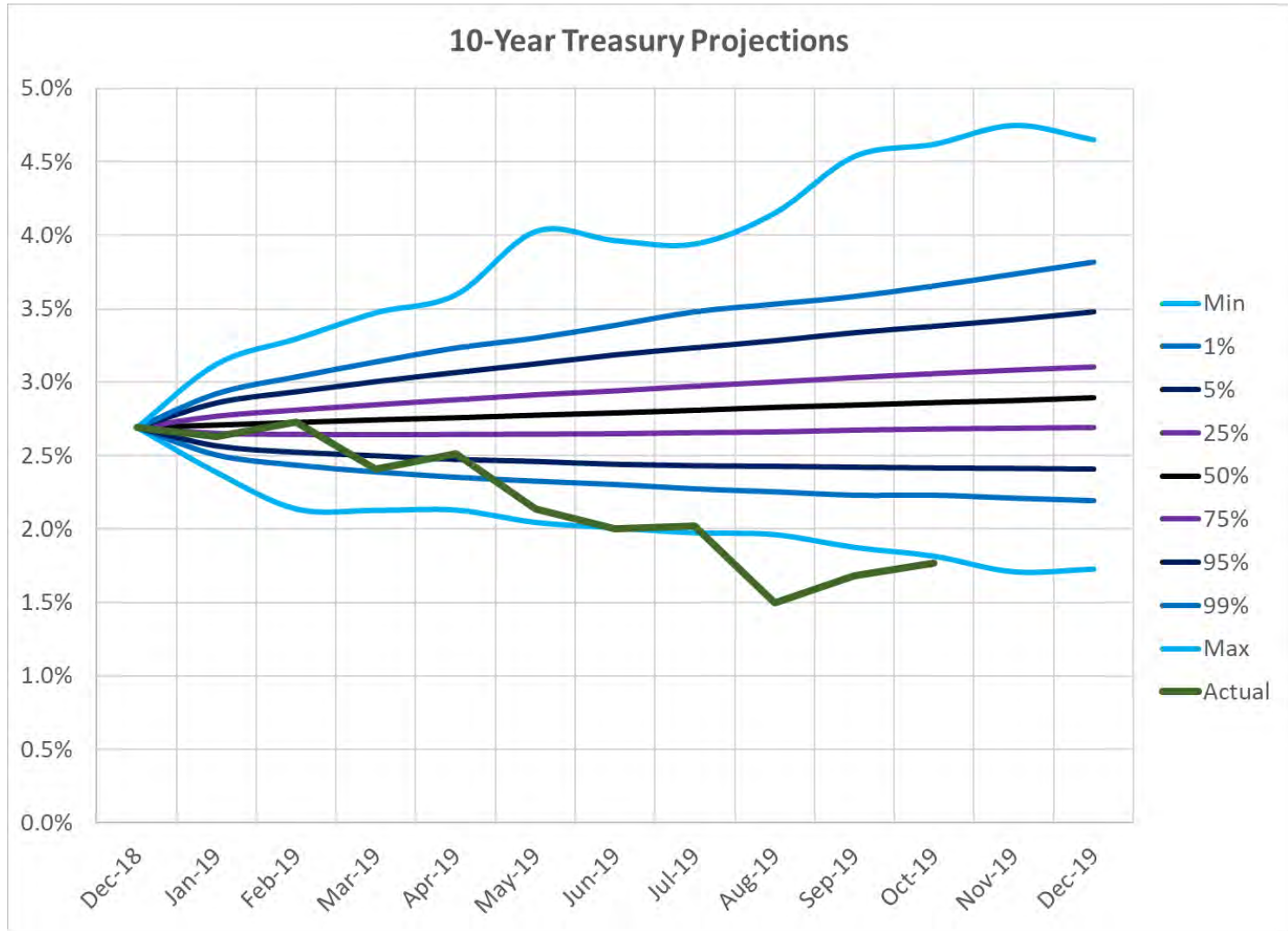
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Issues – Short-Term Projections



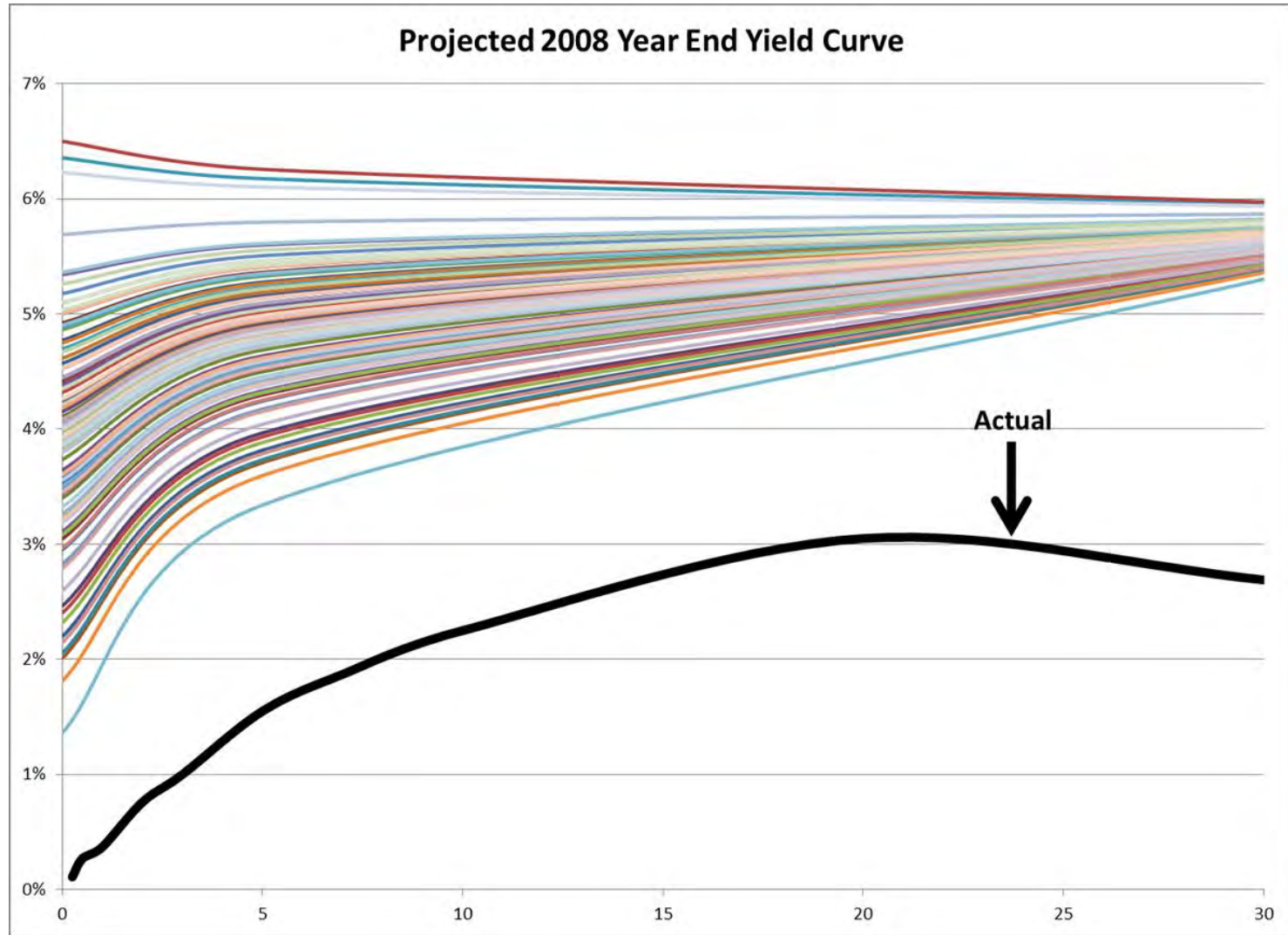
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Issues – Short-Term Projections



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Issues – Short-Term Projections



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Conclusions

Know Your ESG

- What was it designed for
- What are its strengths
- What are its weaknesses or blind spots

Understand How These Factors Impact Your Application

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