



## **Economic Capital: Key Modeling Considerations**

Daniel Finn

## Background

---

- ◆ “Economic Capital” usually refers to two things
  - Economic Capital calculation
  - Calculation of amount of “Required” Capital

# Standard Accounting

---

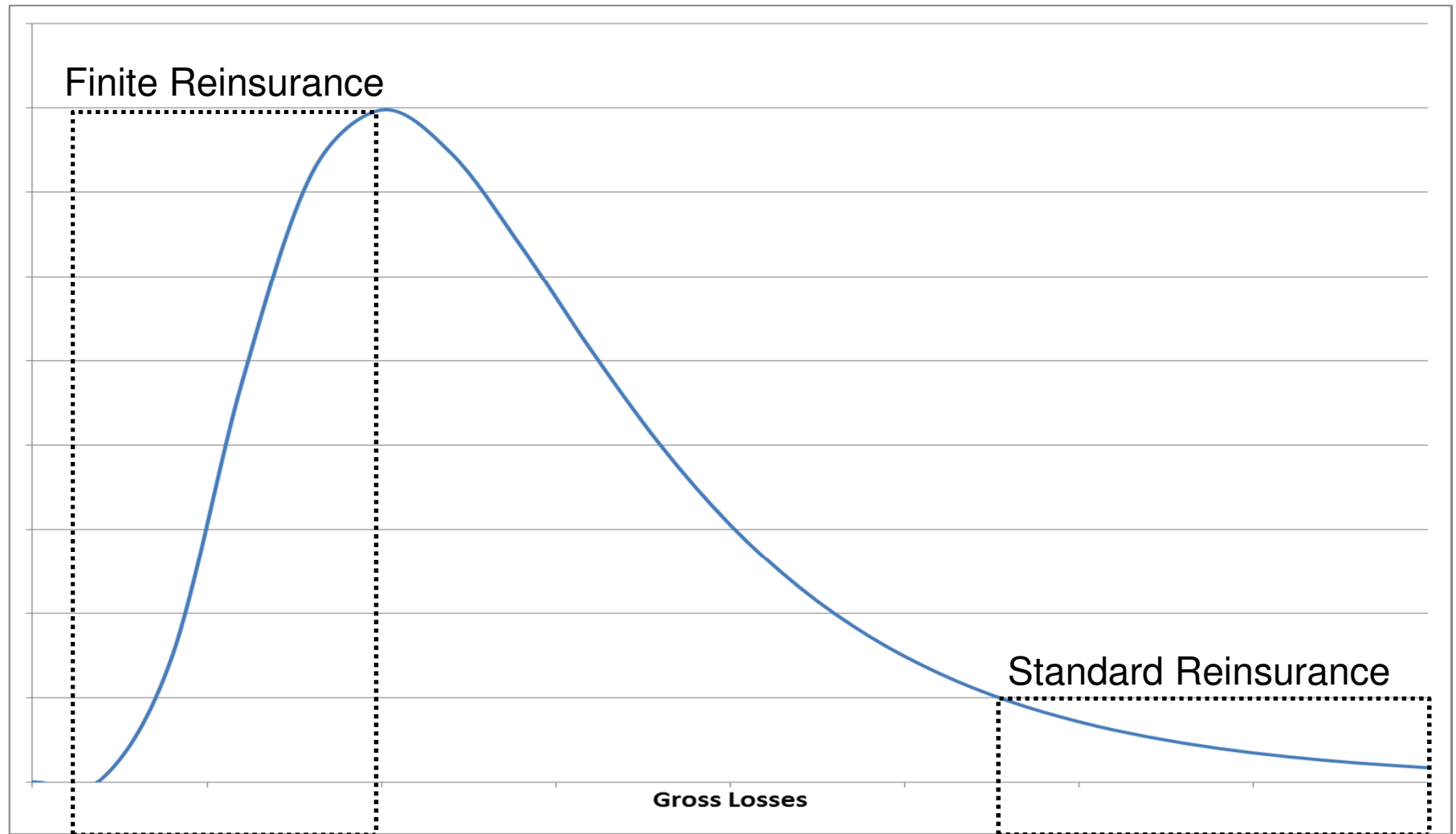
- ◆ Standard Accounting tends to focus on the Income Statement
  - Matching Revenues and Expenses
  - May allow smoothing due to long-term nature of policies
- ◆ Balance Sheet is usually a result of Income assumptions
  - For US Stat, Income for most Bonds is based on solely Coupons
  - As a result, Bonds are held at Book Value

## Standard Accounting

---

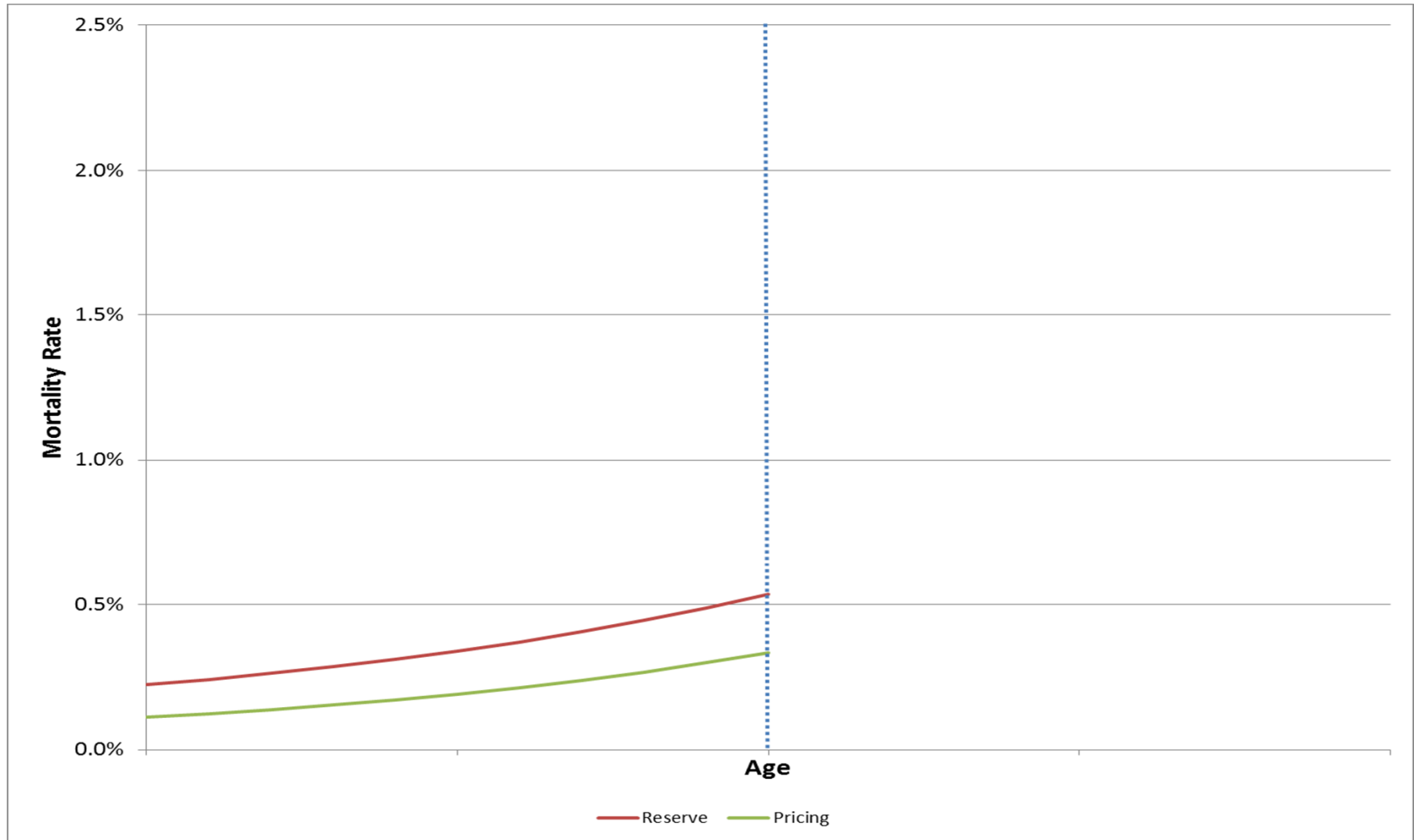
- ◆ Sometimes, this creates a difference between Accounting and Market Value
  - Can happen on Assets
  - More common on the Liability side
- ◆ When the difference is large enough, companies find a way around it
  - Finite Reinsurance
  - Term Insurance

# Finite Reinsurance



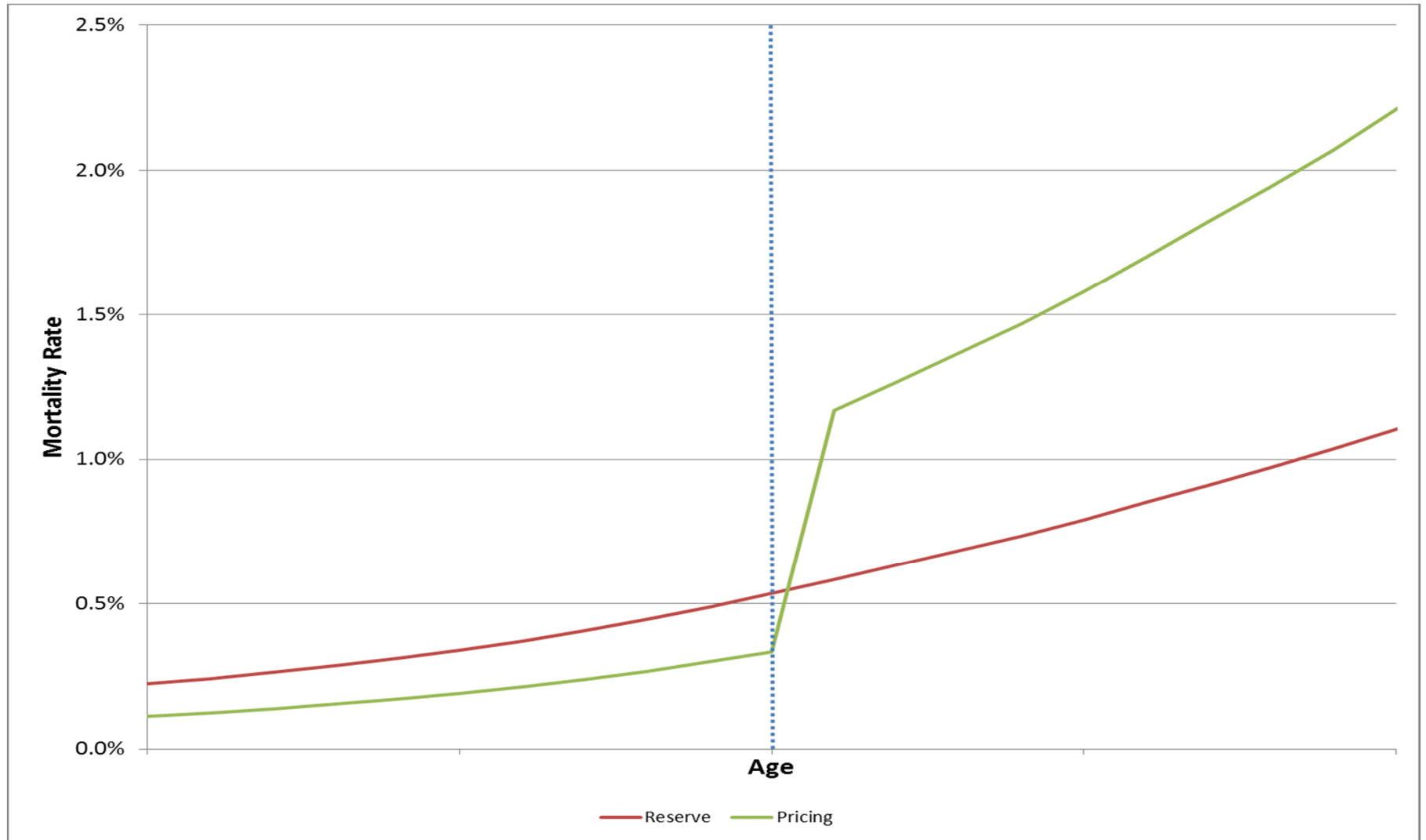
Source: Conning

# Term Insurance



Source: Conning

# Term Insurance



Source: Conning

## Standard Accounting Risk

---

- ◆ With Standard Accounting, Risk usually occurs when the assumptions are violated
- ◆ Consider 2008 and US Stat



## Standard Accounting Risk

---

- ◆ Under US Stat accounting, most Bonds are carried at Book Value
  - Exceptions for High Yield and downgraded bonds
- ◆ During 2008, Corporate spreads gapped out to unprecedented levels
  - Some bonds got downgraded
  - Majority just dropped in value
  - Not a problem, though, for US Stat fillers

## Standard Accounting Risk

---

- ◆ Then, a “funny” thing happened: the auditors got involved
  - Under US GAAP, many of these bonds lost enough value to trigger an Other Than Temporary Investment (OTTI) write down
  - Auditors stepped in and said: if you write it down for GAAP, we’re going to make you write it down for Stat, as well
- ◆ Resulted in some companies taking huge write-downs
  - Some, like the Hartford, even needed to raise additional capital

# Economic Capital

---

- ◆ Since Economic Capital focuses on solvency, it flips the accounting approach on its head
  - Focus is on Balance Sheet
- ◆ Want something which is universal
  - Life and P&C
  - Across Multiple Economies
  - Comparable across Companies
  - Not easily manipulated

## Economic Capital

---

- ◆ For universal, need to strip away accounting issues
  - Mark Assets and Liabilities to Market
  - Reflect all obligations (e.g. Taxes)
- ◆ Risk then arises from Asset and Liabilities moving differently

# Economic Capital

---

- ◆ There are a number of issues with this definition
- ◆ Biggest is valuing Liabilities
  - Long term obligations
  - No market to “trade” them on
- ◆ Can lead to differences between companies
  - Different discount rates
  - Magnitude of Risk Margin

## Required Economic Capital

---

- ◆ Calculating Economic Capital usually just the first step
  - Typically Followed by calculating “Required” Capital
- ◆ “Requirement” is based on why the Company holds Capital
  - Who are the Stakeholders? Regulators? Rating Agencies?
  - How much Capital do they require us to hold?

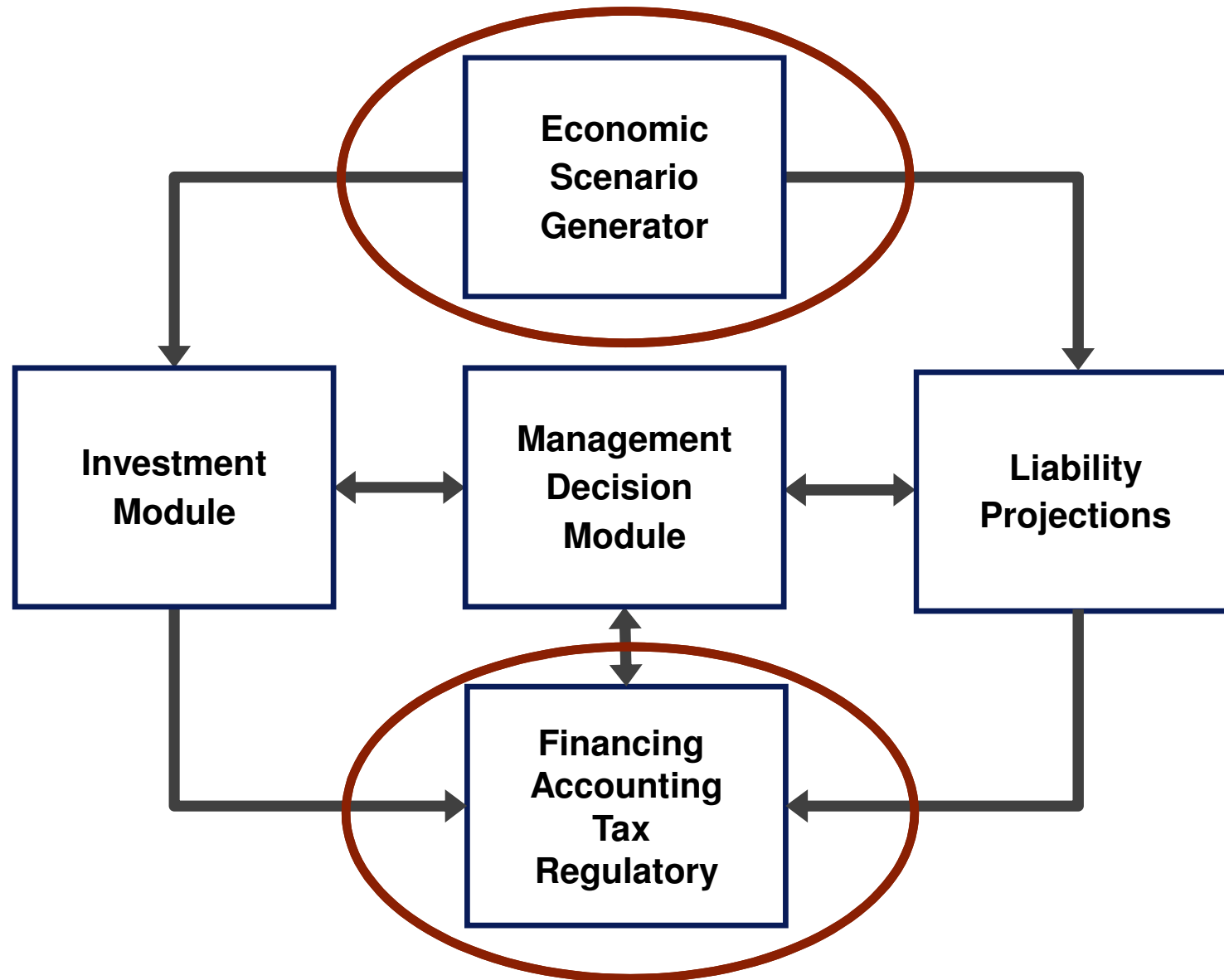
## Required Economic Capital

---

- ◆ Consider a Typical example
  - Company needs their “A” rating to write business
  - To be “A” rated, Rating Agency wants chance of default to be remote (say 1 in 500 over the next year)
- ◆ In this case, Company would
  - Simulate a wide range of possible results
  - Determine how much capital they lose in the 99.8% case.
  - That amount is the “Required” Capital
- ◆ Key component of this approach is a robust Economic Scenario Generator (ESG)

## Modeling Approach

---





# Economic Scenario Generator

---

- ◆ So, what makes a good ESG?
- ◆ Clearly, it has to model all of the Company's Major Economic Risks
  - Interest Rate
  - Spread Changes
  - Equity
  - Inflation

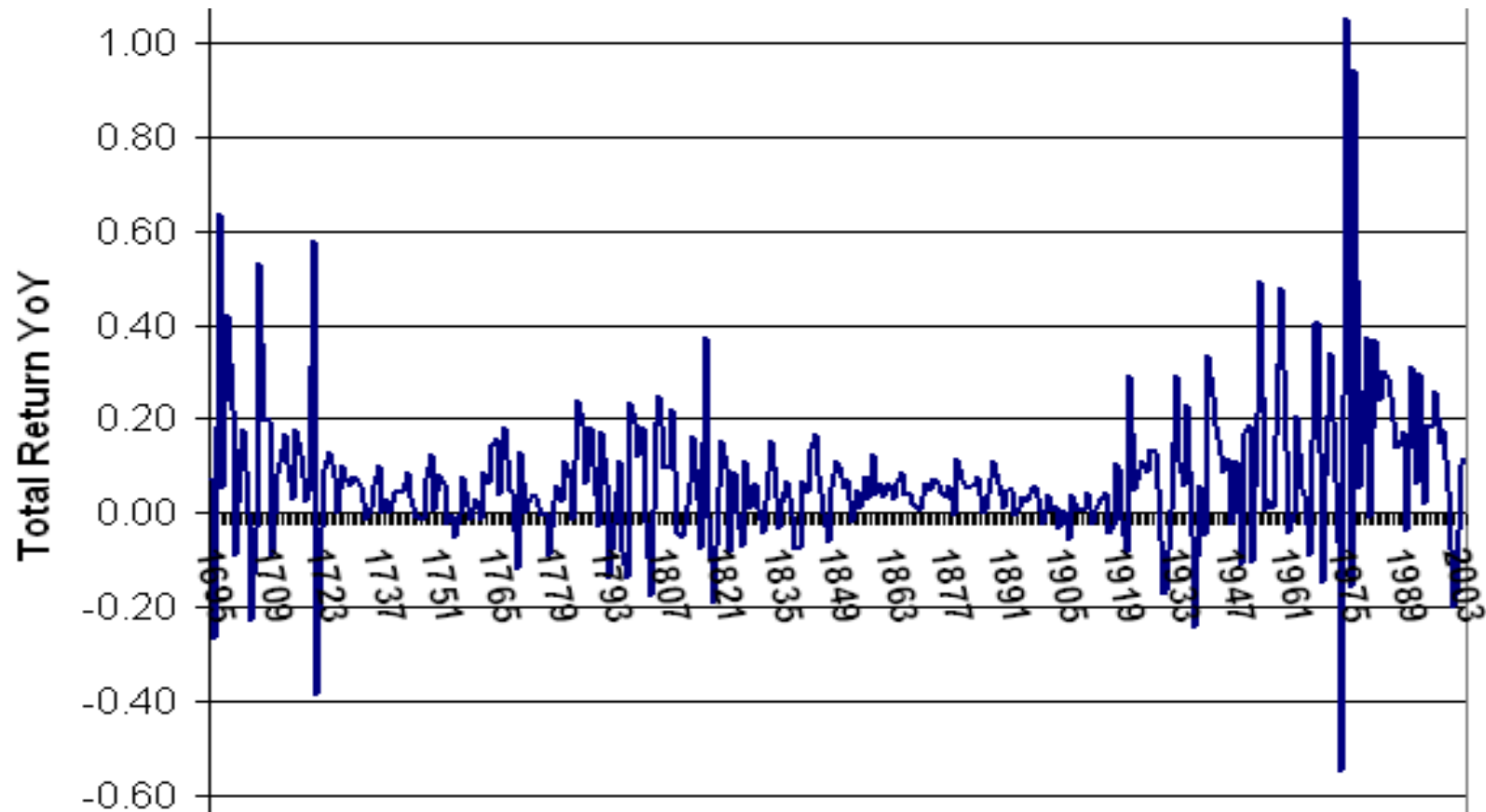
# Economic Scenario Generator

---

- ◆ Key focus is this application is on the tails of distributions
- ◆ So, models must capture full range of possibilities
  - What has happened
  - What could happen

# What Has Happened

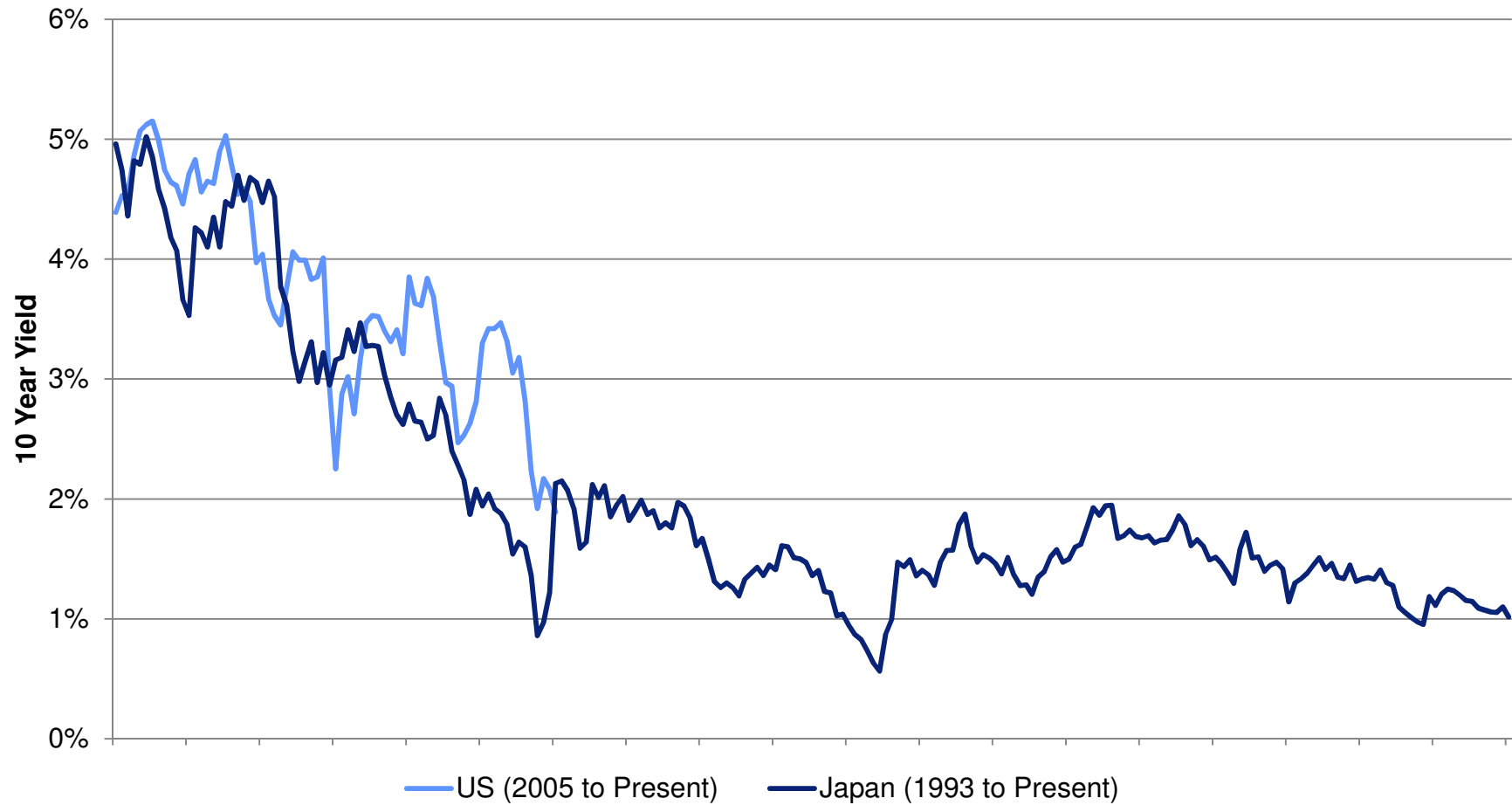
## UK Equity Returns Since 1694



Source: Bloomberg

# What Could Happen

## Japan vs. US 10 Year Yield



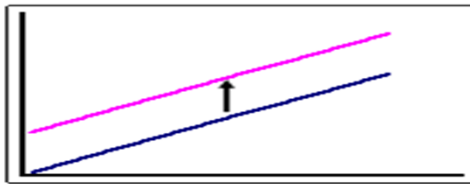
Source: Bloomberg

# Modeling Interest Rate Risk

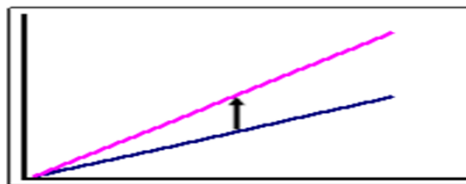
---

- ◆ Model must go beyond basic risks
- ◆ Consider Interest Rate risks
- ◆ 3 main sources

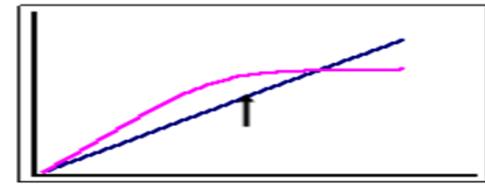
Shift



Slope



Twist




# Managing Interest Rate Risk

---

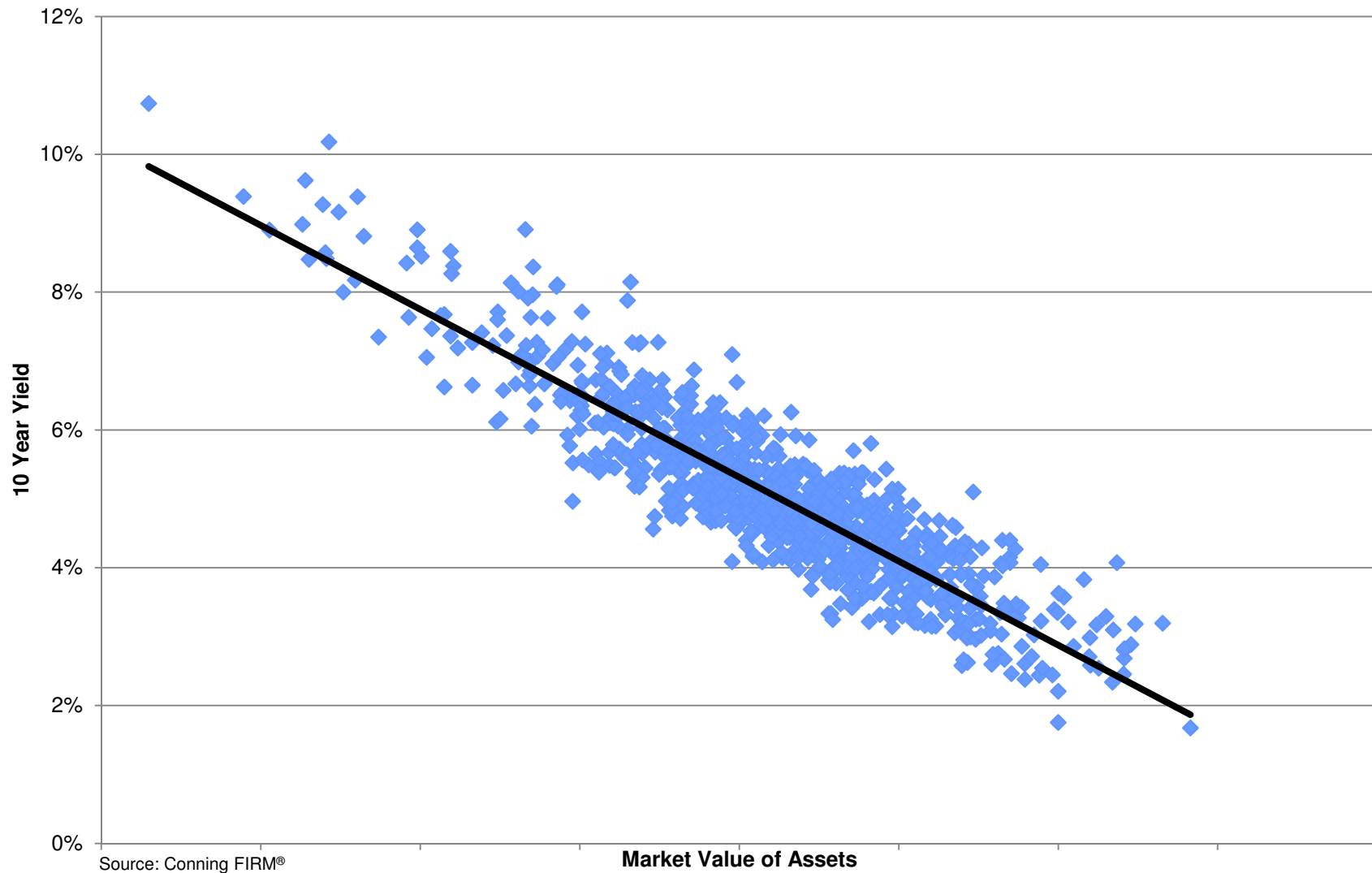
- ◆ Most Companies can handle first two
  - Shift can be managed by Duration
  - Slope can be managed by adding key Rate Duration
- ◆ Twist is the one that can cause problems
  - Assets tend to be Negatively Convex
  - Liabilities tend to be Positively Convex
  - Can create huge mismatches in Twist Scenarios

## Common ESG Pitfall

---

- ◆ Don't assume that missing capabilities aren't a problem
    - “It's OK that my ESG doesn't produce low rates, that's not a risk for my company...”
  
  - ◆ Let's go back to the definition of Economic Capital
    - Market value of assets
    - - Discounted value of liabilities
    - - Taxes
-  **Drops with rising rates**



# 10 Year Yield vs Market Value of Assets



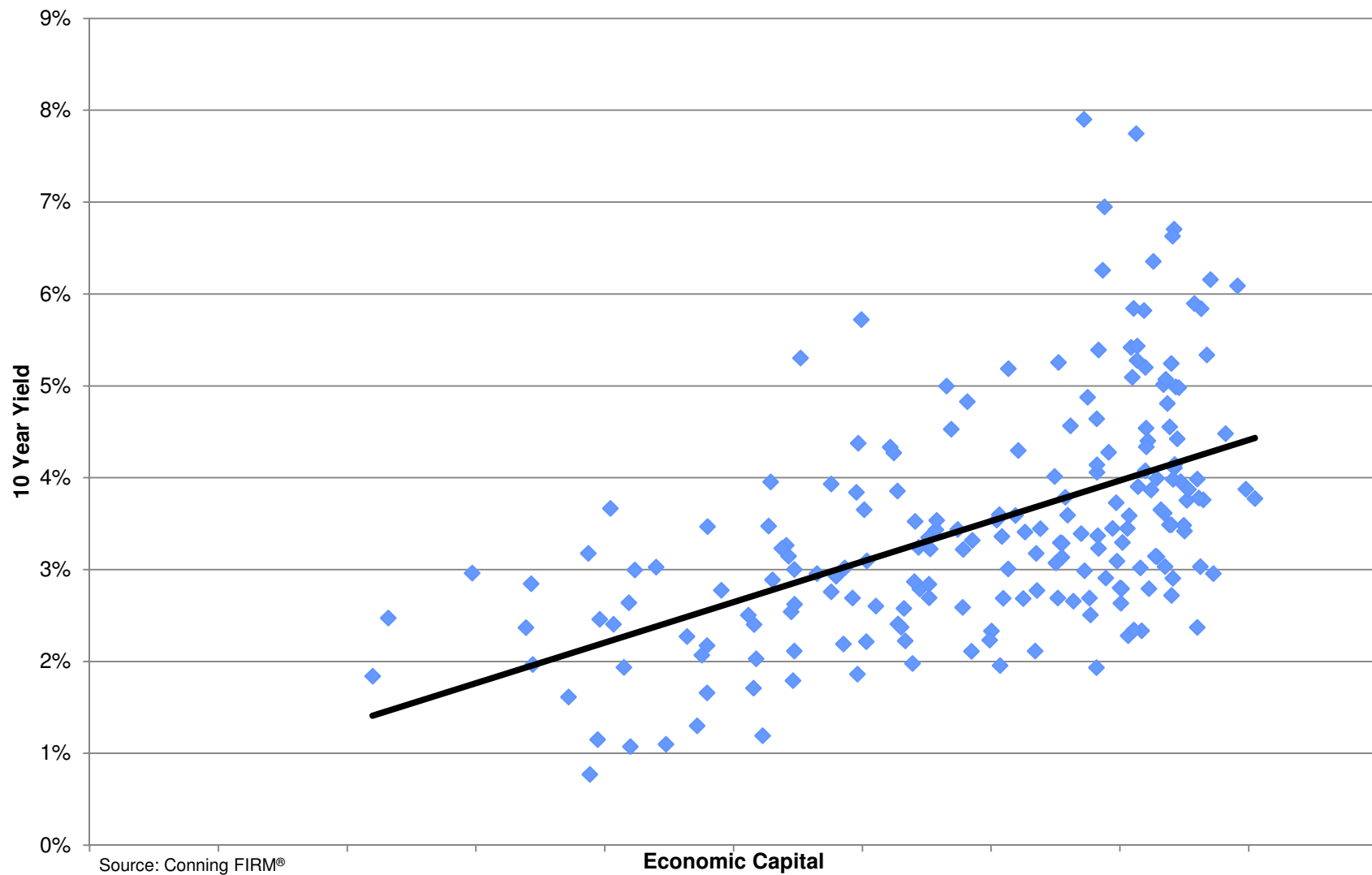


## Common ESG Pitfall

---

- ◆ Don't assume that missing capabilities aren't a problem
  - “It's OK that my ESG doesn't produce low rates, that's not a risk for my company...”
  
- ◆ Let's go back to the definition of Economic Capital
  - Market value of assets  **Drops with rising rates**
  - - Discounted value of liabilities  **But, so does this**
  - - Taxes
  
- ◆ So, it is possible for the Economic Capital to increase with rising rates
  - That's why it's so important to focus on the entire picture

# 10 Year Yield vs Economic Value



# Correlation

---

- ◆ Since we are focusing on total risk, another key factor is correlation
  - One bad outcome is a problem
  - Everything going wrong at once is a catastrophe
- ◆ Several ways to incorporate this is a model
  - Correlation matrices
  - Copulas
  - Dependency structures

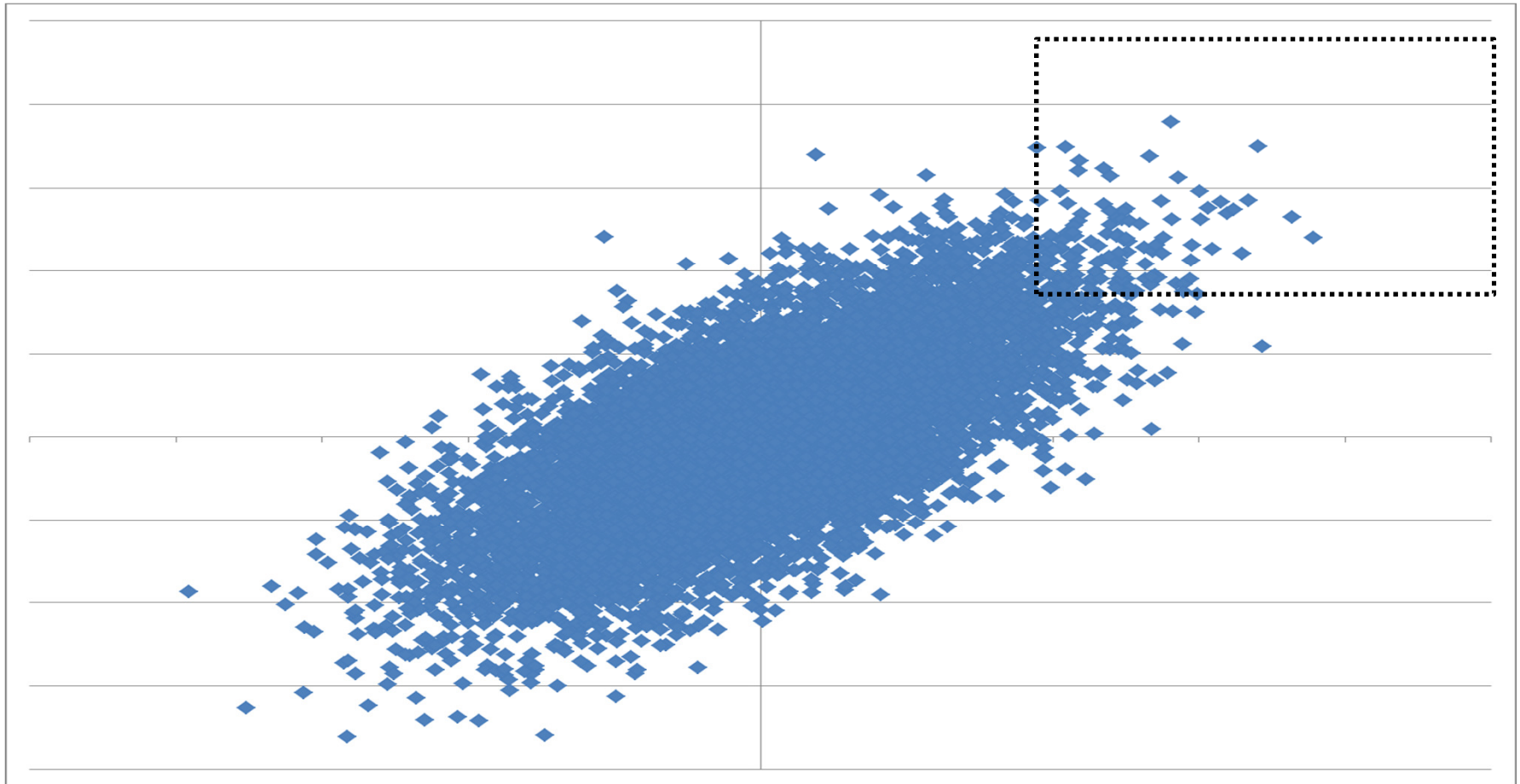
# Correlation

---

- ◆ Most common approach is correlation matrices
  - Easy to implement
  - Fairly well understood by non-modelers
- ◆ There are some key concerns
  - Become unwieldy for large variable sets
  - Control over tail relationships

# Correlation

**Consider two normal distributions with 70% correlation**

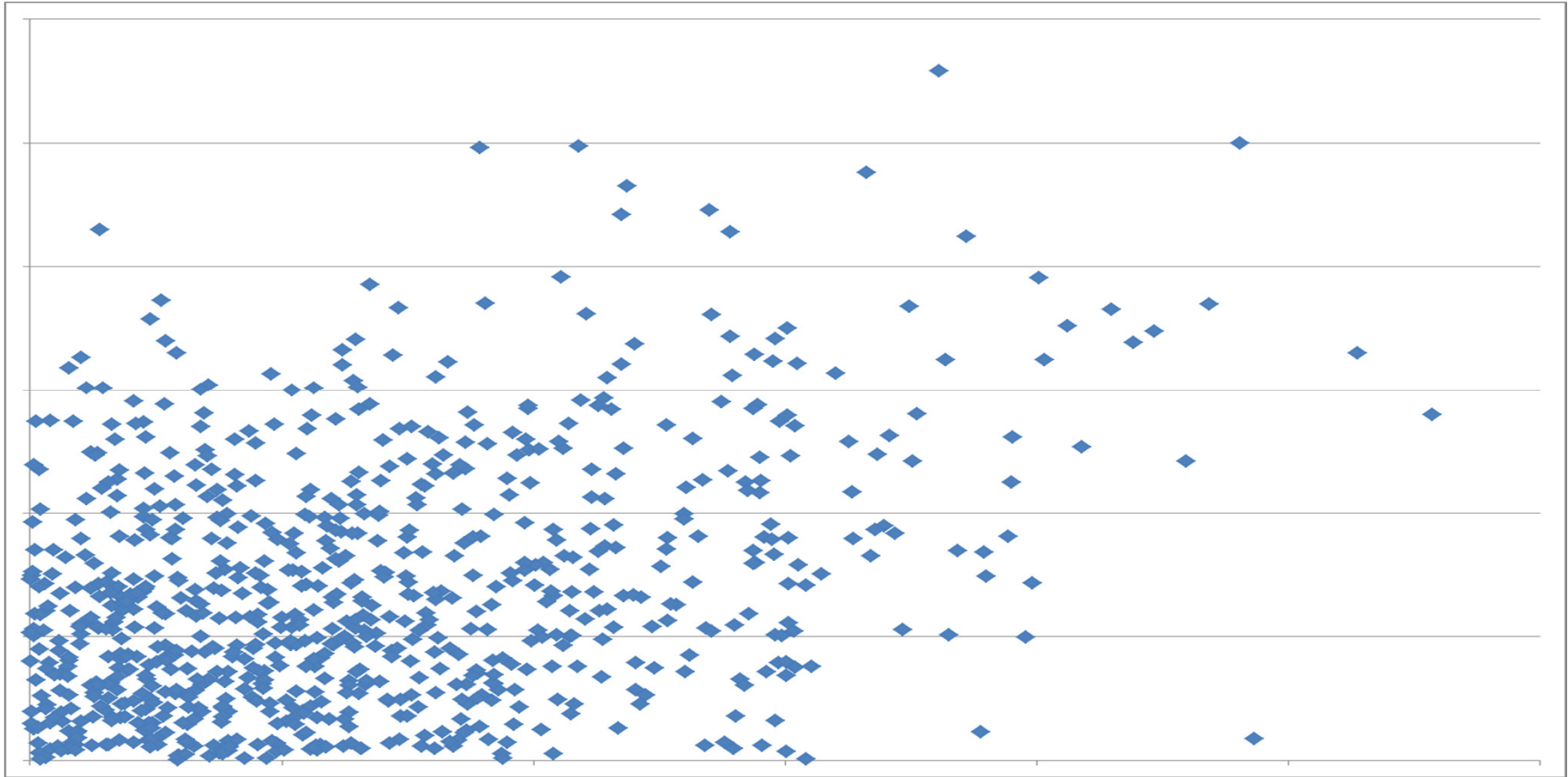


Source: Conning

# Correlation

---

**Different picture when we focus on the tail**



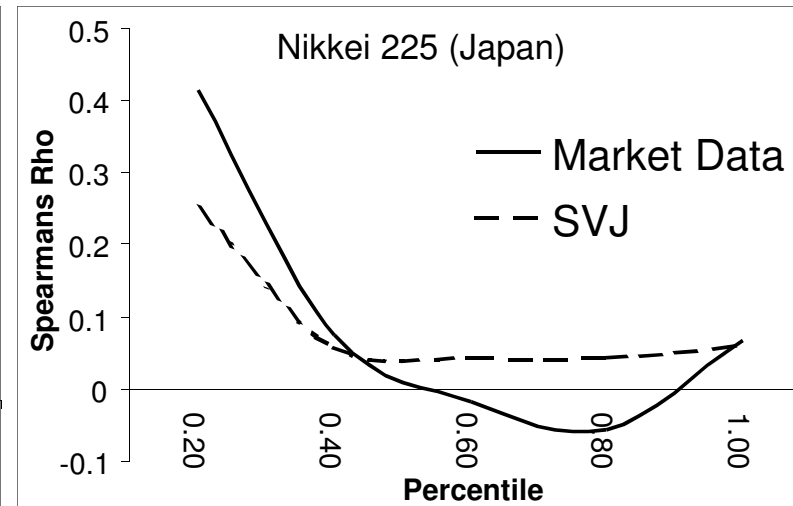
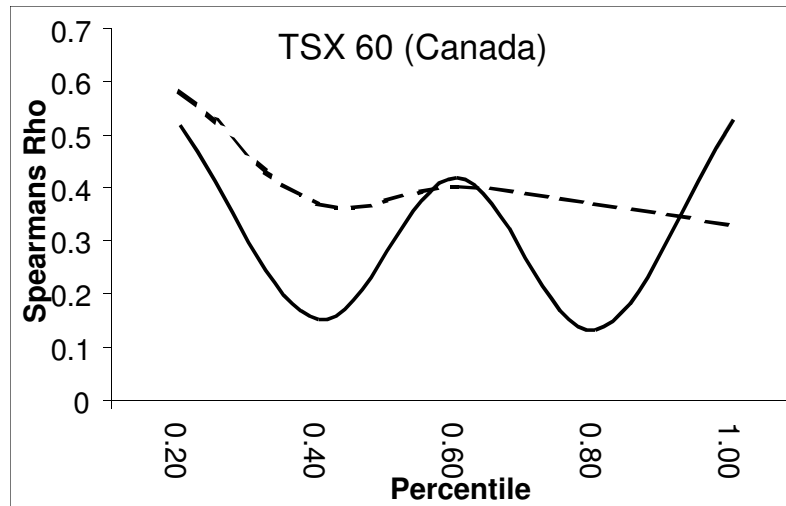
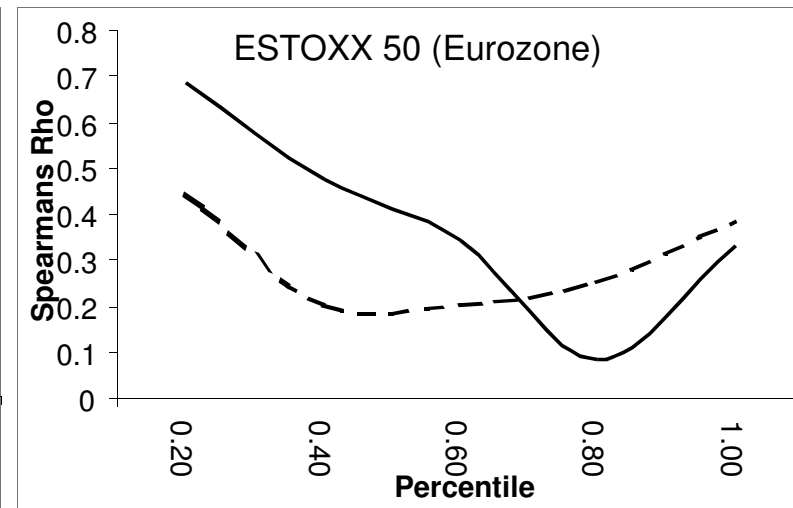
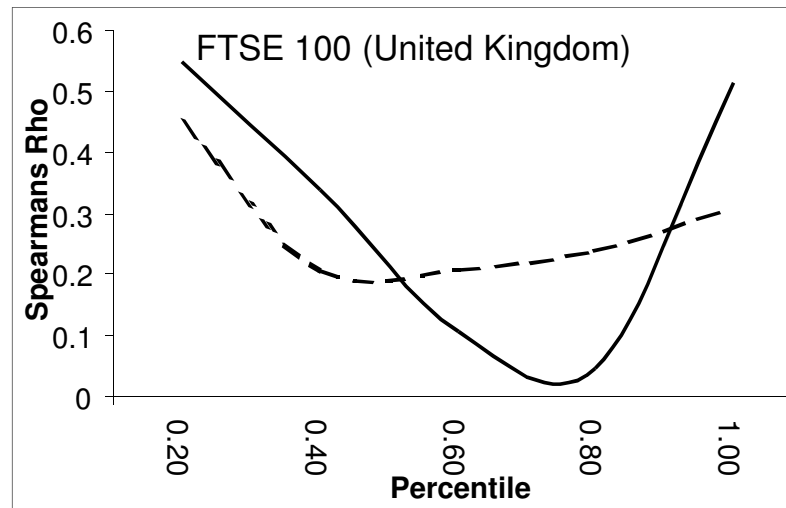
Source: Conning

# Correlation

---

- ◆ Modelers are moving towards Dependency Structures
  - Results of one model feed into other downstream models
  - e.g. Simulated interest Rates impacting Equity Returns
- ◆ Results in much more robust relationships
  - Direct control over tail correlations
  - More robust correlation dynamics

# Tail Correlation: Equity vs. Equity

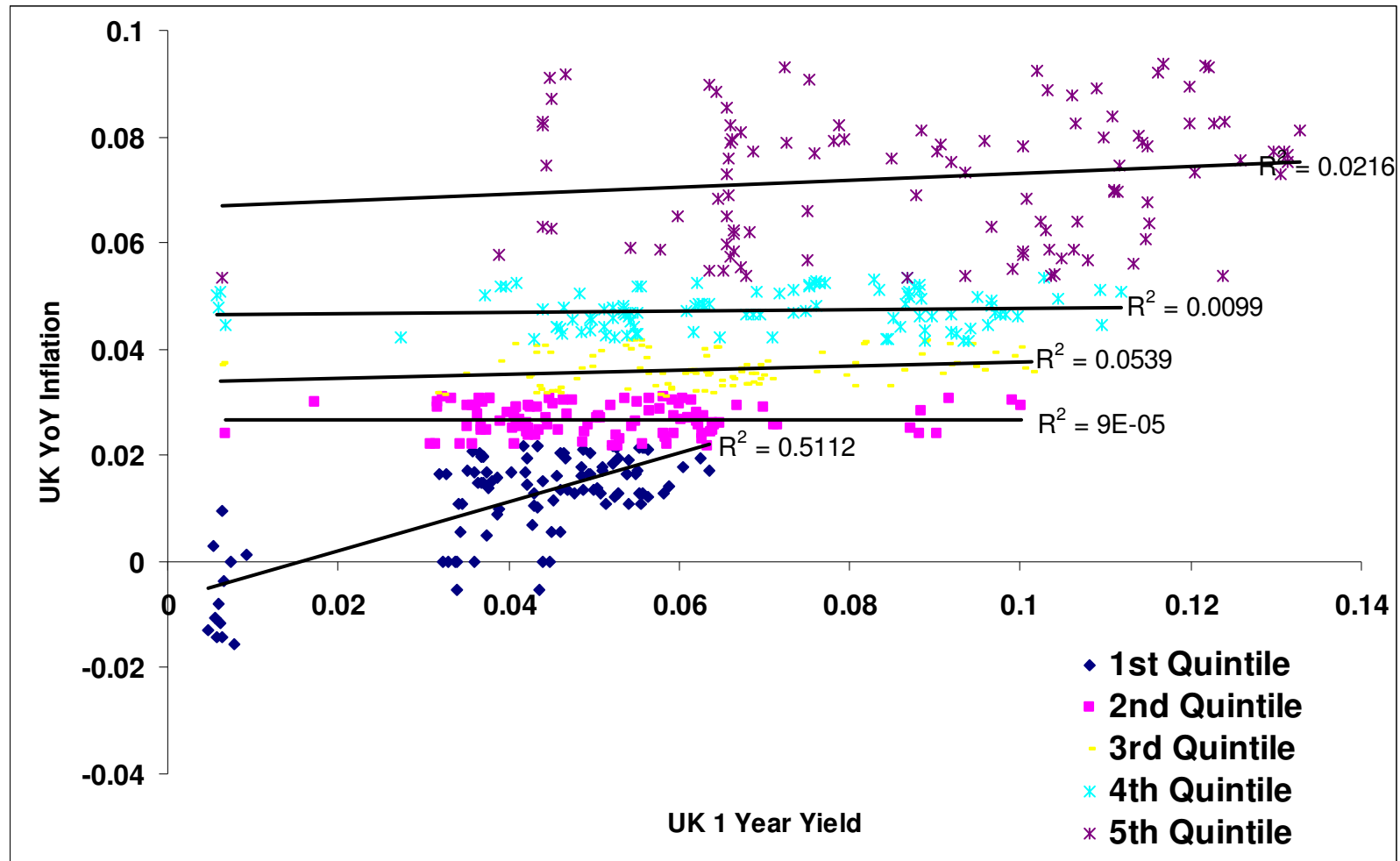


Sources: Bloomberg, Conning



# Correlation: Interest Rates and Inflation

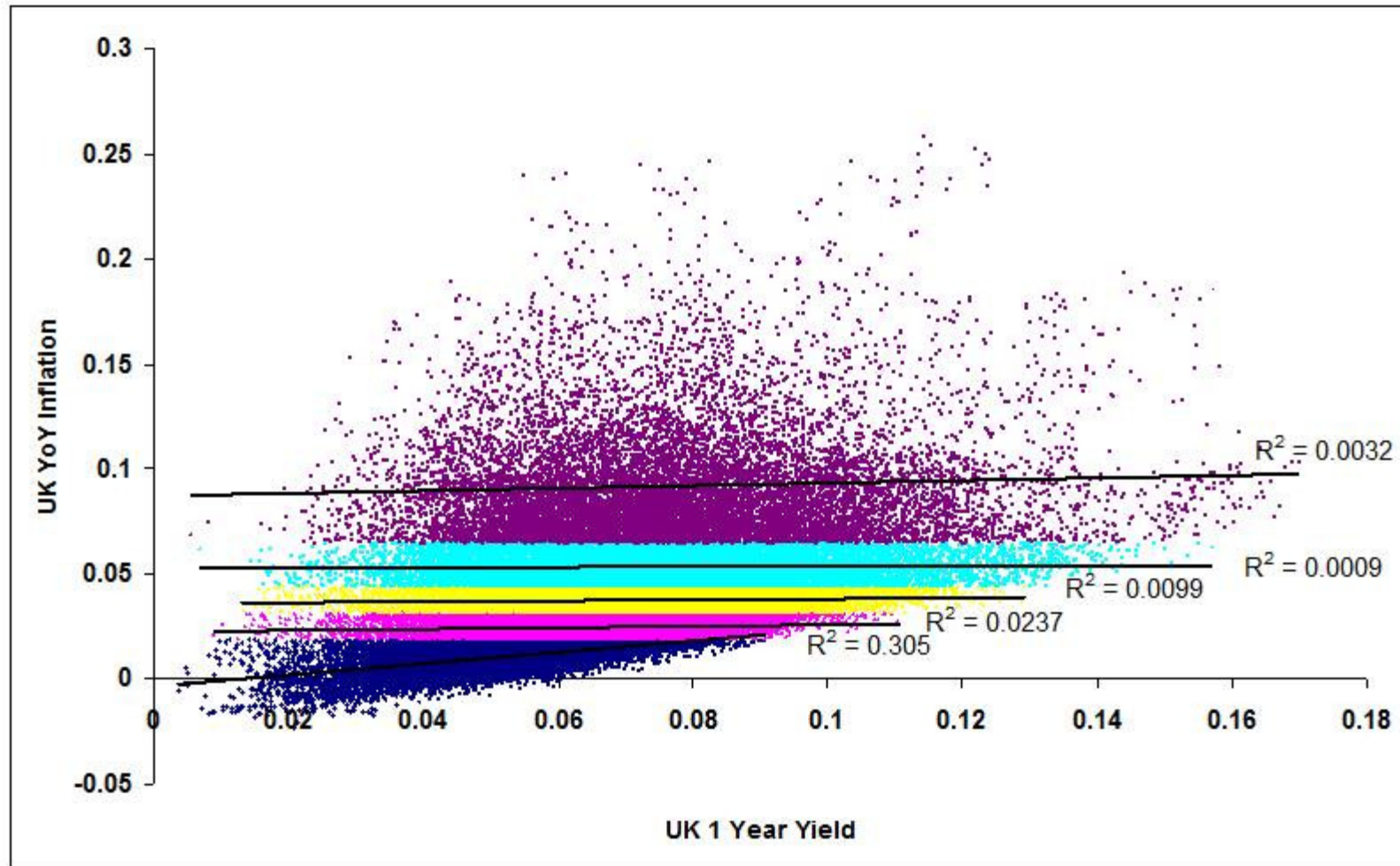
There is a variable relationship between nominal rates and inflation



Sources: Bloomberg/Conning

# Correlation: Interest Rates and Inflation

**Structural models can create this type of relationship in simulations**



Source: GEMS® simulation

## Model Complexity

---

- ◆ One final consideration is how complex the models need to be
  - Answer really depends on the company
- ◆ Some lines have relatively little economic exposure
  - Most P&C lines
  - Whole Life Insurance
  - Will allow a less robust economic modeling platform
- ◆ Others, have much more complex needs

## Model Complexity

---

- ◆ Consider a Variable Annuity writer
- ◆ Lots of optionality built into the product
  - Minimum guarantees
  - Policyholder put options
- ◆ Typically backed with riskier and more dynamic assets
  - Equities
  - Volatility managed funds
  - Foreign investments
- ◆ Typically include very active risk management
  - Includes use of options to hedge Greeks

## Model Complexity

---

- ◆ Need a very robust model to adequately measure the risk
  - Wide range of risky assets
  - Linked options
  - Variable management actions
- ◆ Without that, much more likely to miss the next big event
  - Just think back to 2008

## Model Complexity

---

- ◆ Of course, 2008 saw huge drops in most Asset Classes
- ◆ Only partially offset by company's hedging programs
- ◆ First problem: drops in underlying value brought more guarantees into play
  - Increased Greeks
  - Required purchase of lots of additional options
- ◆ Second problem: huge spike in option pricing volatilities
  - Led to dramatic increase in cost of additional protection

## Key Benefits

---

- ◆ Key question for many companies:
  - What do I get out of all of this?
- ◆ Better understanding of risk
  - What could get us in trouble
  - What can we do about it
- ◆ Improved ability to evaluate Risk/Reward tradeoffs
  - What happens if we invest more aggressively?
  - What if we bought less reinsurance?

---

## ABOUT CONNING

Conning ([www.conning.com](http://www.conning.com)) is a leading investment management company for the global insurance industry, with almost \$92 billion in assets under management as of June 30, 2014 through Conning, Inc., Conning Asset Management Limited, Cathay Conning Asset Management Limited, and Goodwin Capital Advisers, Inc. Conning's unique combination of asset management, risk and capital management solutions and insurance research helps clients achieve their financial goals through customized business and investment strategies. Founded in 1912, Conning is focused on the future, providing clients with innovative solutions, leveraging its global capabilities, investment experience, and proprietary research. Conning is headquartered in Hartford, Connecticut, with additional offices in New York, London, Cologne, and Hong Kong..

*All rights reserved. This presentation is produced by Conning and may not be reproduced or disseminated in any form without the express permission of Conning. This presentation is intended only to inform readers about general developments of interest and does not constitute investment advice. While every effort has been made to ensure the accuracy of the information contained herein, Conning does not guarantee such accuracy and cannot be held liable for any errors in or any reliance upon this information. Conning does not guarantee that this presentation is complete. Opinions expressed herein are subject to change without notice. Past performance is no indication of future results. Conning is a portfolio company of the funds managed by Aquiline Capital Partners LLC ("Aquiline"), a New York-based private equity firm.*