

# 15.472: Introduction

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# Overview: Part 2 of the Course

## Three main topics:

1. Computation
2. Estimation of cross-sectional asset pricing models
3. Term structure models

# Overview: Computation

- ▶ Huge array of problems that cannot be solved by pencil and paper.
  - Computation vastly expands space of potential models.
- ▶ Vast computing power now available. Can we just solve complex models with brute force?
  - No! Curse of dimensionality can overwhelm even biggest computing clusters.
- ▶ This class: learn methods to
  - Approximate functions to high accuracy with vastly fewer points.
  - Compute highly accurate integrals and derivatives.
  - Solve fixed point and dynamic programming problems without iteration.
- ▶ Hands on examples so you will be ready to solve your own models right away.

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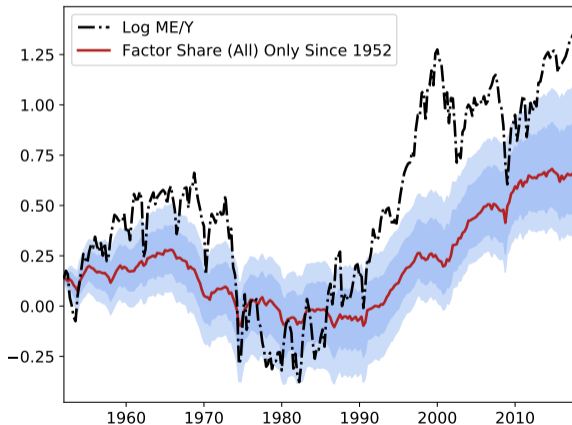
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# Overview: Term Structure Models

- ▶ Highly tractable models for capturing dynamics of interest rates at various horizons.
  - We will cover workhorse models in the literature, and key motivating empirical patterns.
  - Models can reproduce time-varying slopes, term premia, and zero lower bounds.
- ▶ Response of long rates to shocks likely key to many macrofinancial questions.
- ▶ But methodology not only usable to study interest rates!
  - Extends to tractable model of many asset classes, including corporate equity.

# Overview: Term Structure Models

- ▶ Example: Greenwald, Lettau, Ludvigson (2021) estimates contribution of macro and finance factors to equity prices in the time series.



# Overview: Cross-Sectional Asset Pricing

- ▶ Core question: what factors determine the expected return on a stock?
- ▶ Approach: estimate exposures to factors and prices of risk using GMM.
- ▶ Emphasis on practical methods:
  - Most textbooks provide GMM formulas for single moment condition.
  - Cross-sectional AP requires multiple moments, formulas won't work!
  - We will go step by step through this important tool (multi-moment GMM).
- ▶ Close with discussion of false discovery control.
  - Unlimited number of potential factors out there ("factor zoo").
  - If researchers try enough, can get hundreds of spurious factors with statistical significance.
  - We will go over empirical methods to test for and control number of false discoveries.



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# Final Thoughts

- ▶ This course is designed to not just teach theories, but provide direct recipes for application, and hands on experience.
  - Great way to build your toolset and jump start your JMP research.
  - Skills have broad applicability beyond asset pricing.
- ▶ Macro and finance are more integrated these days than ever.
  - This class provides core asset pricing models and mechanisms behind these links.
- ▶ See you in October!