Teaching Material:
Corporate Discount Rates and Cost of Capital in Practice

Niels Joachim Gormsen and Kilian Huber

University of Chicago

Introduction

Aim. These slides provide an overview of how firms estimate their cost of capital and decide on discount rates in practice.

Overview of slides

1. Capital budgeting in practice
2. Estimating the cost of capital
3. Firms' perceived cost of capital
4. Firms' final discount rates

Auxiliary Material

- See costofcapital.org for additional material as well as data on firms' perceived cost of capital and discount rates

Capital Budgeting in Practice

Managers often evaluate new projects based on their NPV:

$$\text{NPV} = \sum_{s=0}^{S} \delta^{-s} \mathbb{E}[\text{Revenue}_s - \text{Cost}_s].$$

The discount rate δ is set based on the *perceived cost of capital* plus a wedge κ,

$$\delta = 1 + r^{\text{per.}} + \kappa.$$

We will discuss where the wedge κ comes from later.

Firms' perceived cost of capital is based on the *financial cost of capital*. Firms estimate it based on financial markets, but they do so imperfectly, leading to a wedge υ:

$$r^{\text{per.}} = r^{\text{fin.}} + \upsilon.$$

The resulting discount rates used by firms reflect two wedges:

$$\begin{aligned} \delta &= 1 + r^{\text{per.}} + \kappa \\ &= 1 + r^{\text{fin.}} + \upsilon + \kappa, \end{aligned}$$

Here, υ is interpreted as a mistake whereas κ is a deliberate choice.

Estimating the Financial Cost of Capital

Definition

The first step of capital budgeting is to estimate the cost of capital in financial markets. It is the weighted average of cost of debt and cost of equity:

$$r_t^{\text{fin}} = \omega_t \times (1-\tau) \times r_t^{\text{debt}} + (1-\omega_t) \times r_t^{\text{equity}}, \tag{1}$$

where r_t^{debt} and r_t^{equity} are the cost of debt and equity, τ is the firm's tax rate, and ω_t is the leverage ratio (i.e., the market value of debt relative to the market value of debt plus equity).

Estimation

See textbooks for specific guidelines on how to estimate the financial cost of capital (e.g., Welch or Berk and DeMarzo).

A few notes:

- **Cost of debt** can be somewhat easily inferred from interest expenses and yields on outstanding debt. Remember to account for credit risk!
- **Cost of equity** is often estimated using the CAPM:

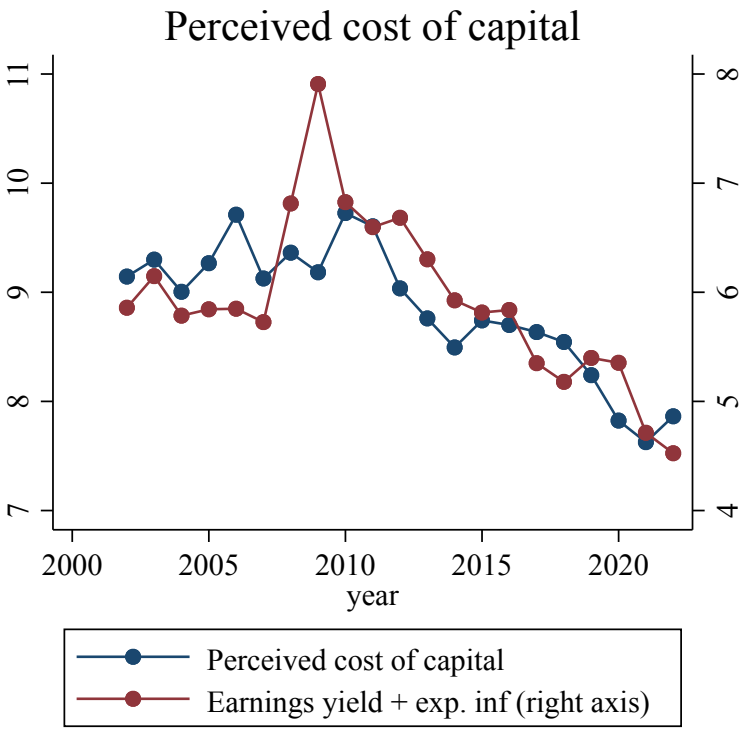
$$E_t^{\text{CAPM}}[r_t^{\text{equity,firm}}] = r_t^f + \beta_t^{\text{firm}} \lambda_t,$$

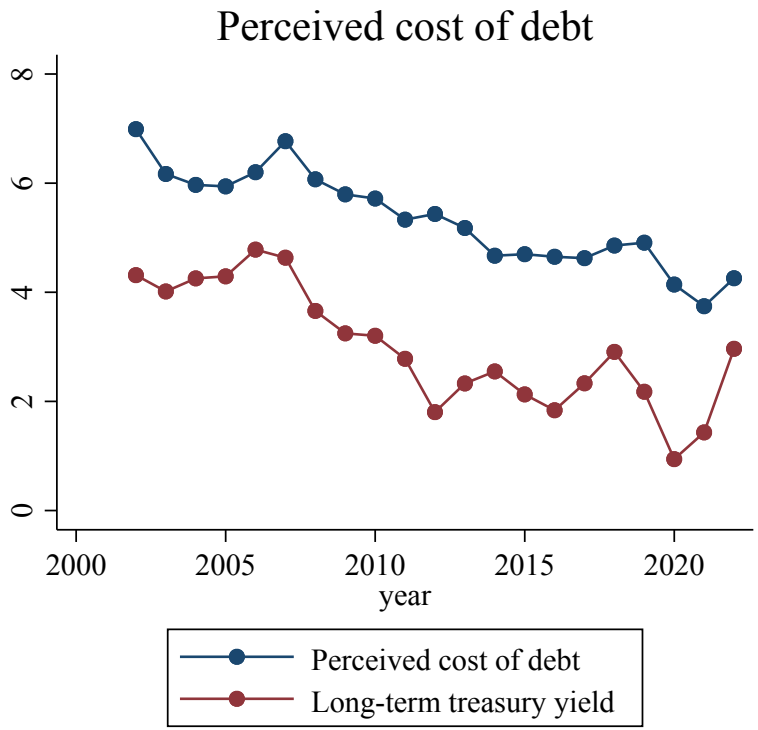
  β = exposure to the market portfolio. See Welch (2019) for optimal estimates
  λ = market risk premium. Remember, it is based on *long run* expected stock returns.

Firms' Perceived Cost of Capital

Time-Variation in the Perceived CoC in the US

$$r_{i,t}^{\text{perc.}} = a_0 + 0.59^{***} \times \text{Earnings yield}_t + 0.32^{***} \times \text{Treasury yield}_t + \varepsilon_{i,t}$$



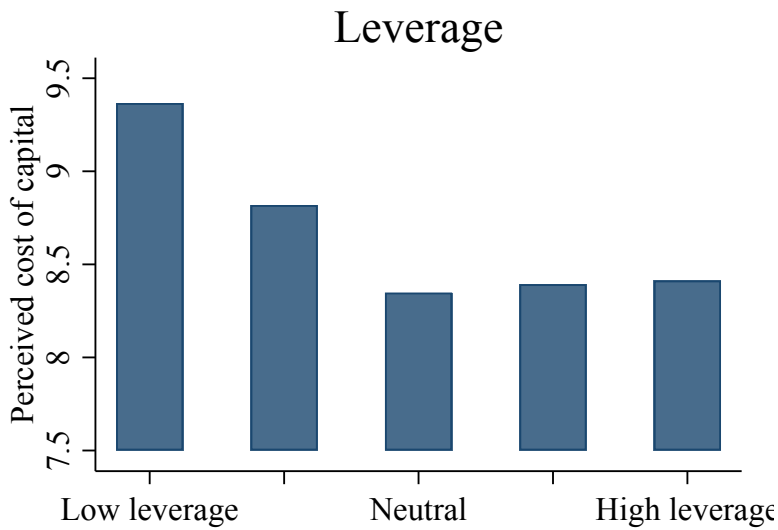


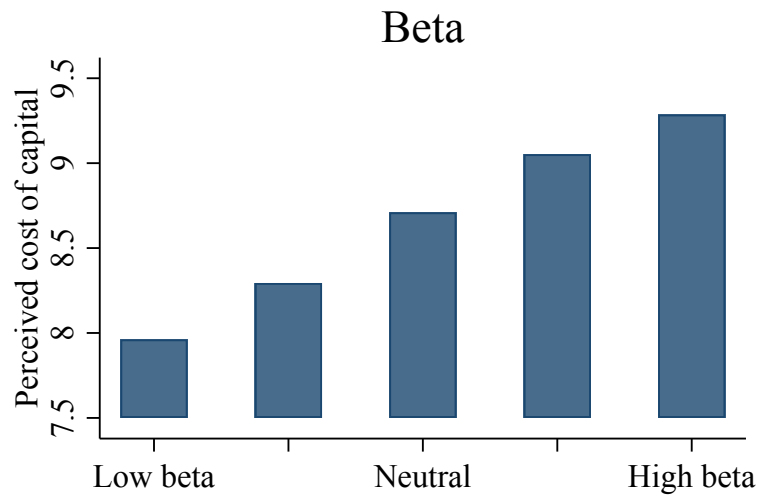
Takeaways:

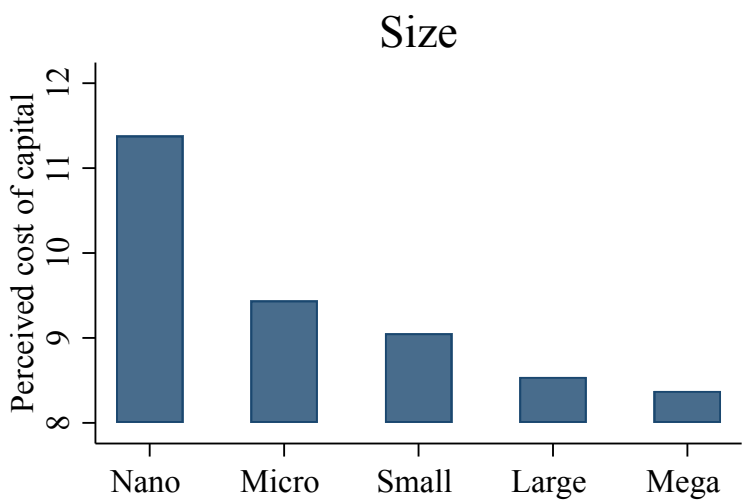
- Firms' perceived cost of capital on average incorporate expected stock returns and bond returns as expected
- Similar results in the US

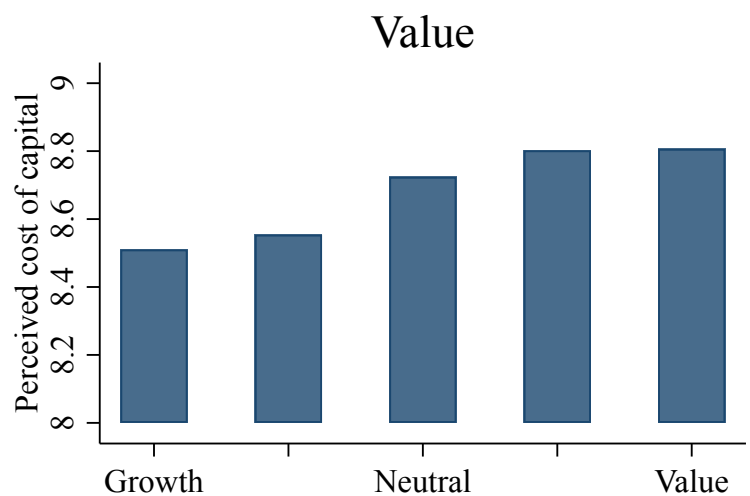
Source: "Firms' Perceived Cost of Capital"

Cross-Sectional Variation and Classic Factors



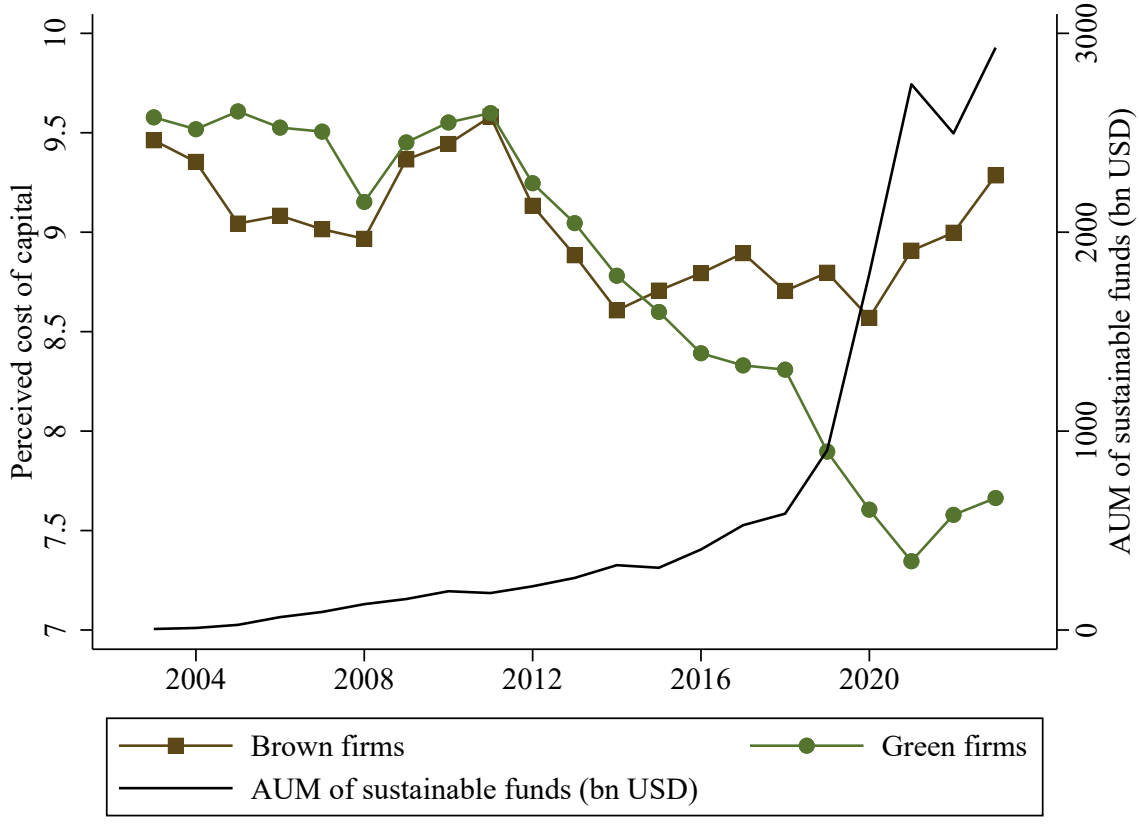






Source: "Firms' Perceived Cost of Capital"

The Perceived Cost of Capital Is Falling for Greener Firms



Takeaways:

- The perceived cost of capital has fallen for green firms relative to brown firms
- The divergence coincides with the rise of sustainable investing

Source: “Climate Capitalists”

A New Method for Estimating Cost of Capital

- The paper "Firms' Perceived Cost of Capital" shows that firms' perc. CoC deviates fundamentally from the "true cost of capital."
- The issue is driven by firms' perceived cost of equity
- We therefore suggest a different method to calculate the cost of equity:

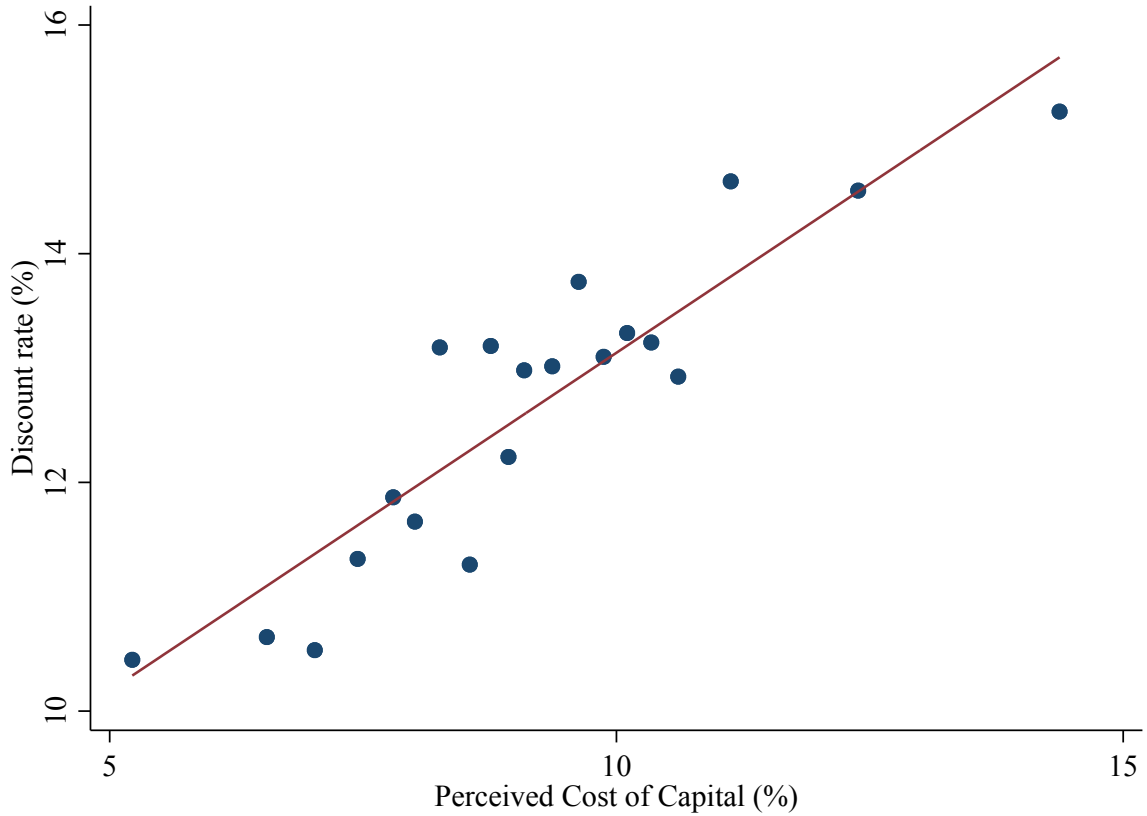
$$r_{i,t}^{\text{equity,CAPE}} = \frac{\text{Earnings}_t}{\text{Price}_t} + 2\% + E_t[\text{Inflation}], \tag{2}$$

- Here $\frac{\text{Earnings}_t}{\text{Price}_t}$ is the earnings-to-price ratio of the overall market portfolio. It can be calculated as the inverse of the CAPE ratio from Robert Shiller
- The method abstracts from any cross-sectional variation and focuses only on time-variation in the cost of equity
- The method ensures that the perceived cost of equity is unbiased.

From the Perceived Cost of Capital to Discount Rates

Discount Rates and the Perceived Cost of Capital

$$\delta = 1 + r^{\text{per.}} + \kappa$$



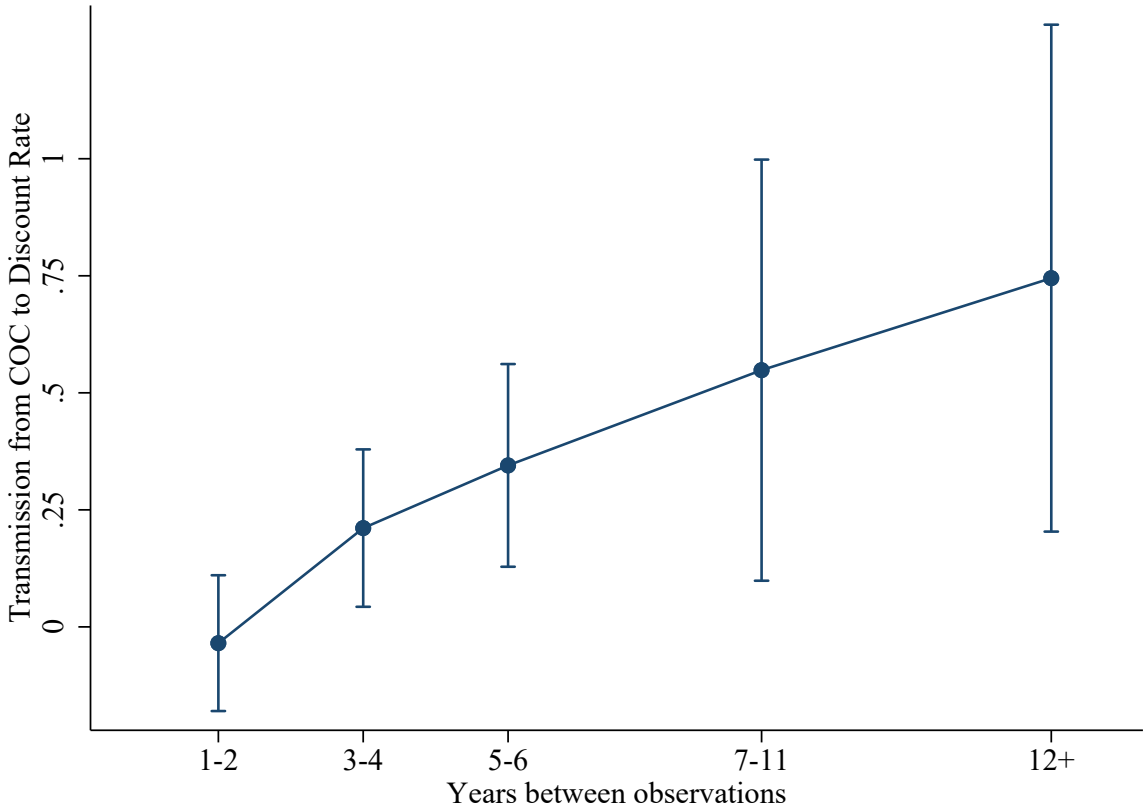
Takeaways:

- Unconditionally, discount rates related to perc. CoC
- 1 pct higher perc. CoC == 0.6 pct higher discount rate

Source: "Corporate Discount Rates"

Discount Rates Slow to Incorporate Changes in Perc. CoC

$$\delta = 1 + r^{\text{per.}} + \kappa$$



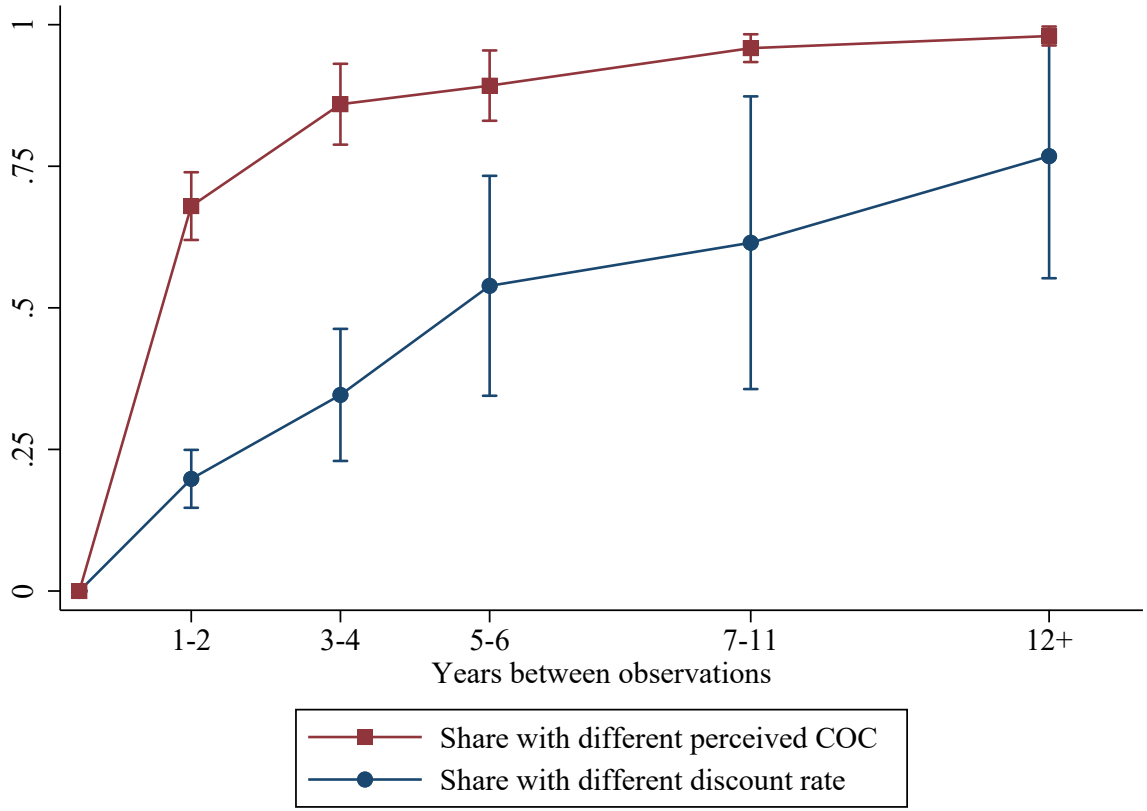
Takeaways:

- Discount rates are slow to incorporate changes in the perc. cost of capital
- Leads to time-varying discount rate wedges κ

Source: "Corporate Discount Rates"

Discount Rates Slow to Incorporate Changes in Perc. CoC

$$\delta = 1 + r^{\text{per.}} + \kappa$$



Takeaways:

- Discount rates very sticky over time
- Part of the reason for slow transmission of change in perc. CoC into discount rates

Source: "Corporate Discount Rates"

Firms Add other Factors to their Discount rates

What is κ?

$$\delta = 1 + r^{\text{per.}} + \kappa$$

- κ in part reflects slow transmission of perc. CoC (see previous slides)
- But it also reflects an additional premium firms add on top of their perceived cost of capital.

Why do firms add κ?

Standard theory tells managers to set $\delta = 1 + r^{\text{per.}}$. Why might they add κ in practice?

1. Many managers want to maximize the economic value added (i.e., the profits earned in excess of the cost of capital). They believe $\kappa > 0$ helps them do so.
2. Managers account for higher risk on their new projects by increasing κ.
3. Managers use κ to capture financial and organizational constraints.

TABLE 6 FROM GORMSEN AND HUBER (2022A)

VARIABLES	(1) Discount rate	(2) κ	(3) $\kappa+\upsilon$
Market Power (2002)	1.30*	1.18*	1.23*
	(0.63)	(0.60)	(0.60)
Risk (2002)	2.14***	1.72***	1.47***
	(0.57)	(0.53)	(0.50)
Fin. Constraints (2002)	0.83	0.97	1.05*
	(0.56)	(0.57)	(0.55)
Observations	799	799	799
R-squared	0.184	0.169	0.163
FE	Country/year	Country/year	Country/year
Cluster	Firm/year	Firm/year	Firm/year
Within R^2	0.12	0.10	0.095

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

From the Perceived Cost of Capital to Discount Rates

Quotes. Below are quotes from managers on why they use high discount rates (i.e., high κ). Note that managers often refer to discount rates as "hurdle rates."

2016-11-10, Halyard Health Inc., Steve Voskuil, CFO: *"...So that's kind of how we come to the 9 percent [hurdle rate]. We start with the capital markets' rates and look at our capital structure, and then we add a little bit to that to reflect risk in the portfolio and execution."*

2016-10-19, Kinder Morgan, Kim Dang, CFO: *"We are living within our cash flow, meaning that we want to be able to fund our CapEx and our dividend from our cash flow. And so that is the constraint, and so, because we have a limited amount of capital, that is why we have the hurdle rate set at 15 percent IRR for projects."*

2009-07-30, Lincoln National Corporation, Fred Crawford, CFO: *"As a matter of being conservative in our approach, we've been hiking up those discount rates quite considerably on our businesses (...). Example being variable business is up into the mid teens with life businesses in and around the 10 percent range, even 11 percent range, depending on the business. But that's for purposes of being conservative."*

2009-01-14, Ryland Group, Inc., Larry Nicholson, President & COO: *"Our hurdle rates have always been 30 percent as long as I've been with the Company – that's 14 years – and Chad, as long as he's been with the Company, has maintained that. I think that's served us well, kept us from doing some things maybe that would have hurt us in the downturn. I think it kept us out of a lot of trouble. So I think the strategy's been good. I think it's been prudent."*