Market Power in the Securities Lending Market

Shuaiyu Chen[1] Ron Kaniel[2,4] Christian C. Opp[2,3]

[1] UVA Darden [2]University of Rochester [3]NBER [4]CEPR;ABFER

FMARC
June, 2026

Overview

1) Empirical evidence of market power in the securities lending market

- The securities lending market is highly concentrated due to intermediation by custodians
- Prices: Fees are orders of magnitude above lenders' marginal costs
- Quantities: Slack inventory & high fees $\rightarrow$ evidence of strategic rationing

Overview

1) Empirical evidence of market power in the securities lending market

- The securities lending market is highly concentrated due to intermediation by custodians
- Prices: Fees are orders of magnitude above lenders' marginal costs
- Quantities: Slack inventory & high fees $\rightarrow$ evidence of strategic rationing

2) Theoretical implications of this market structure

- Model: shorting is more profitable for both short sellers & shares lenders when intermediated by a custodian lender with market power
  - Shorting = 2-step transaction $\Rightarrow$ information leakage concerns
  - Endogenous scale economies:
    Concentration of intermediation $\uparrow \Rightarrow$ incentive compatible fee passthrough $\uparrow$
  - Information leakage in centralized venues undermines short sellers' business model

Overview

1) Empirical evidence of market power in the securities lending market

- The securities lending market is highly concentrated due to intermediation by custodians
- Prices: Fees are orders of magnitude above lenders' marginal costs
- Quantities: Slack inventory & high fees $\rightarrow$ evidence of strategic rationing

2) Theoretical implications of this market structure

- Model: shorting is more profitable for both short sellers & shares lenders when intermediated by a custodian lender with market power
  - Shorting = 2-step transaction $\Rightarrow$ information leakage concerns
  - Endogenous scale economies:
    Concentration of intermediation $\uparrow \Rightarrow$ incentive compatible fee passthrough $\uparrow$
  - Information leakage in centralized venues undermines short sellers' business model

3) Quantitative analyses, including centralized market counterfactual

- Lenders' excess valuations for due to fee income under intermediation:
  Value wedges between 1.3% (large-cap, low-fee) and $\approx 90\%$ (nano)
- Short sellers' net-of-fee alphas reach 30% for micro-cap stocks
  Fees reduce short sellers' profits by about 54%
- Intermediation dominates direct lending, especially for smaller, illiquid stocks

Literature

Implications of short-sales constraints on prices
Miller (1977), Harrison and Kreps (1978), Diamond and Verrecchia (1987), Hong and Stein (2003), and Scheinkman and Xiong (2003), Cherkes et al. (2013).

Dynamic heterogenous beliefs models with borrowing
Duffie, Garleanu, Pedersen (2002) and Vayanos and Weill (2008), Nutz and Scheinkman (2020), Garleanu and Panageas (2021), Atmaz, Basak, and Ruan (2022), Evgeniou, Hugonnier, Prieto (2022)

Static models
Duffie (1996), Blocher, Reed, Van Wesp (2013), Banerjee and Graveline (2014), Nezafat and Schroder (2021)

This paper:

- Documents market power in the securities lending market
- Conceptually: private information $\Rightarrow$ concerns about information leakage & commitment
- Estimated model yields value wedges and net-of-fee alphas in the cross-section of stocks Counterfactual analyses of direct securities lending in centralized market

Examining the Cross-section of Stocks

Sorting procedure: we split stocks into **25 groups** of stocks

- **5 size bins**

  Large-cap (top 1-200)

  Mid-cap (201-1000)

  Small-cap (1001-2000)

  Micro-cap (2001-4000)

  Nano-cap (all remaining stocks)

- **5 fee-yield bins**

  Fee yield $\equiv \frac{\text{fee income}}{\text{market value of inventory}}$ $\Rightarrow$ akin to dividend yield for lenders

  Bottom 80%

  80%-90%

  90%-95%

  95%-98%

  98%-100%

Evidence of Market Power: Market Shares

Panel A. Market Share of the Lender with the Highest Value on Loan

Fee Yield Percentiles	Large-Cap (1)	Mid-Cap (2)	Small-Cap (3)	Micro-Cap (4)	Nano-Cap (5)
$\leq 80\%$	30.14	30.51	32.79	33.21	51.42
80-90%	26.56	26.78	29.06	32.79	47.77
90-95%	25.46	25.83	26.90	31.07	46.51
95-98%	24.53	24.13	26.46	30.75	45.42
$\geq 98\%$	23.44	23.48	26.79	32.75	47.58

Panel B. Market Share of the Lender with the Second Highest Value on Loan

Fee Yield Percentiles	Large-Cap (1)	Mid-Cap (2)	Small-Cap (3)	Micro-Cap (4)	Nano-Cap (5)
$\leq 80\%$	16.51	18.50	19.82	19.04	18.72
80-90%	16.18	18.24	18.45	18.09	19.28
90-95%	16.75	17.68	17.39	17.44	19.74
95-98%	16.82	16.63	16.51	17.73	19.82
$\geq 98\%$	16.18	15.61	17.49	17.87	19.77

Table 2: Concentration of Lenders' Value on Loan (Markit-coverage Adjusted)

Top 2 lenders alone typically command a combined market share of $40\% - 70\%$

Evidence of Market Power: Prices and Quantities

Lending Fee (annual, in percent)

Fee Yield Percentiles	Large-Cap (1)	Mid-Cap (2)	Small-Cap (3)	Micro-Cap (4)	Nano-Cap (5)
$\leq 80\%$	0.285	0.276	0.290	0.498	3.887
80-90%	0.287	0.305	0.487	2.188	18.223
90-95%	0.288	0.463	1.205	6.254	31.631
95-98%	0.313	1.263	3.150	14.340	48.157
$\geq 98\%$	2.204	6.880	12.242	38.425	75.141

Notes: Custodians typically pass through 90% of fee income to beneficial owners

Evidence of Market Power: Prices and Quantities

Lending Fee (annual, in percent)

Fee Yield Percentiles	Large-Cap (1)	Mid-Cap (2)	Small-Cap (3)	Micro-Cap (4)	Nano-Cap (5)
$\leq 80\%$	0.285	0.276	0.290	0.498	3.887
80-90%	0.287	0.305	0.487	2.188	18.223
90-95%	0.288	0.463	1.205	6.254	31.631
95-98%	0.313	1.263	3.150	14.340	48.157
$\geq 98\%$	2.204	6.880	12.242	38.425	75.141

Notes: Custodians typically pass through 90% of fee income to beneficial owners

Utilization of Inventory (in percent)

Fee Yield Percentiles	Large-Cap (1)	Mid-Cap (2)	Small-Cap (3)	Micro-Cap (4)	Nano-Cap (5)
$\leq 80\%$	2.39	9.86	17.96	20.83	30.96
80-90%	8.12	27.41	39.30	52.92	54.20
90-95%	13.30	38.91	52.16	67.92	66.33
95-98%	21.90	51.41	64.55	76.28	74.86
$\geq 98\%$	52.30	74.40	78.88	82.28	84.84

- Significant **slack inventory** at quoted fees, even for high-fee stocks

Model Overview

Continuous-time model with two trading venues

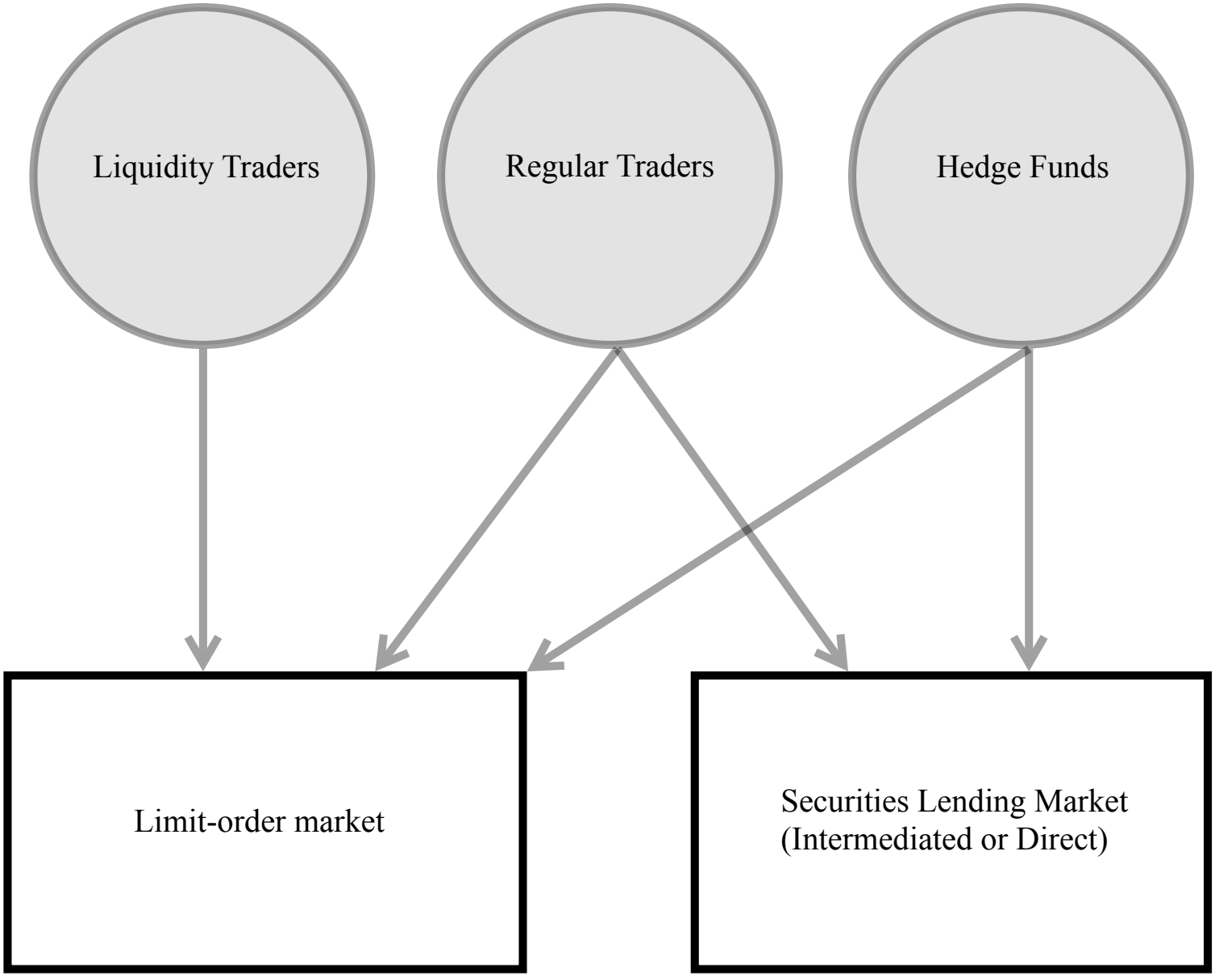
- Centralized limit order market (akin to Glosten & Milgrom, 1985)
- Securities lending market (delegated vs. centralized)

Two-step transaction matters due to asymmetric information

Investor groups:

1. *Hedge funds*
   Obtain private information & may short stocks
2. *Liquidity traders*
   Trade for liquidity reasons
3. *Regular traders*
   Provide liquidity in limit-order market & can lend out their shares
4. *Custodian shares lender*
   Intermediates shares lending

Model Overview



Investor Groups' Objectives

Investors' SDF

- Institutions value cash flows according to SDF m following

$$\frac{dm_t}{m_t} = -r_f dt - \chi dB_t,$$

where r_f is the risk free rate and χ is the price of risk. B_t is publicly observable.

Traded assets

- Stocks generate lumpy dividends payments c_t when a Poisson process $\{N_t\}$ jumps.
  c_t = productivity-adjusted capital following

$$\frac{dc_t}{c_{t-}} = \mu_c dt + \sigma_c dB_t + (e^{v_{t-}} - 1)dN_t,$$

where $v_{t-} \sim$Normal$(-\frac{\sigma_v^2}{2}, \sigma_v)$ is private info of hedge funds; c_t is publicly observable.

Investor Groups' Objectives

Investors' SDF

- Institutions value cash flows according to SDF m following

$$\frac{dm_t}{m_t} = -r_f dt - \chi dB_t,$$

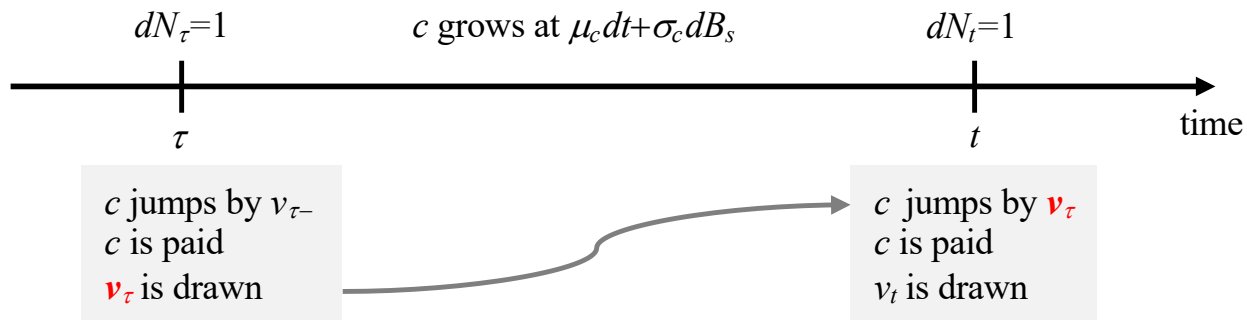
where r_f is the risk free rate and χ is the price of risk. B_t is publicly observable.

Traded assets

- Stocks generate lumpy dividends payments c_t when a Poisson process $\{N_t\}$ jumps.
  c_t = productivity-adjusted capital following

$$\frac{dc_t}{c_{t-}} = \mu_c dt + \sigma_c dB_t + (e^{v_{t-}} - 1)dN_t,$$

where $v_{t-} \sim$ Normal$(-\frac{\sigma_v^2}{2}, \sigma_v)$ is private info of hedge funds; c_t is publicly observable.



Intermediated Securities Lending

- Custodian lender chooses fee offer ϕ, not knowing HFs' private info **(screening game)**
- Committed not to opportunistically use info revealed by HFs' demand (e.g., front running)

Intermediated Securities Lending

- Custodian lender chooses fee offer ϕ, not knowing HFs' private info **(screening game)**
- Committed not to opportunistically use info revealed by HFs' demand (e.g., front running)

Foundation of custodian commitment & concentrated intermediation sector:

- Threat of losing present value of future fee income retained by custodian

  Folk Theorem with imperfect public information (Fudenberg/Levine/Maskin, 1994)

  - Date-0: multiple custodian intermediaries compete for investor enrollment

    Offer: $\delta_i \in [0,1] \equiv$ fraction of fees retained by custodian intermediary i
  - Intermediary competition $\Rightarrow$ maximum fee passthrough s.t. custodian incentives
  - Endogenous scale economies:
    Maximum passthrough can be offered if one intermediary enrolls all investors, since continuation value is not split ...

$$\underbrace{(B(c) - \mathbb{E}[e^v | v < v_\phi] P(c))}_{\text{One-shot trading profit}} \leq \underbrace{\delta \cdot \frac{\lambda \cdot F_v(v_\phi) \frac{\pi \phi(c)}{\rho}}{r_f + \sigma_c \chi - \mu_c}}_{\text{Continuation value } = \delta \cdot \text{ PV(fees)}} \qquad \text{(IC)}$$

Market Structure & Timing with Delegated Lending

Upon an innovation $dN_t = 1$, the following logical order of events applies:

1. Capital c jumps & **dividend income** is collected by agents who held the asset at time $t-$
2. Investors can **post shares** with the custodian lender (until settlement, step 7)
   - The custodian lender optimally sets the fee ϕ_t per unit
   - Loan agreements start at time t and mature at next $dN_\tau = 1$
   - At maturity, borrower has to return asset + dividend to the lender
3. A new hedge fund and a new cohort of liquidity investors arrive to the market
4. Investors can **borrow shares** at the fee posted by the custodian lender
   The custodian lender does not reveal the total demand at this stage
5. Bid and ask **quotes are posted**
6. Investors **trade shares** at the posted bid and ask prices in limit order market
7. **Contracts are settled** via delivery of the asset in accordance with all lending contracts and trades (steps 2, 4, 5, and 6 above)

Market Structure & Timing with Delegated Lending

Upon an innovation $dN_t = 1$, the following logical order of events applies:

1. Capital c jumps & **dividend income** is collected by agents who held the asset at time $t-$
2. Investors can **post shares** with the custodian lender (until settlement, step 7)
   - The custodian lender optimally sets the fee ϕ_t per unit
   - Loan agreements start at time t and mature at next $dN_\tau = 1$
   - At maturity, borrower has to return asset + dividend to the lender
3. A new hedge fund and a new cohort of liquidity investors arrive to the market
4. Investors can **borrow shares** at the fee posted by the custodian lender
   The custodian lender does not reveal the total demand at this stage
5. Bid and ask **quotes are posted**
6. Investors **trade shares** at the posted bid and ask prices in limit order market
7. **Contracts are settled** via delivery of the asset in accordance with all lending contracts and trades (steps 2, 4, 5, and 6 above)

Key economic features of the custodian lender:

- strategically chooses fees
- does not instantaneously reveal shorting demand to other market participants

Market Structure and Timing with Centralized Lending

Upon an innovation $dN_t = 1$, the following logical order of events applies:

1. Dividend income is collected by agents who held the asset at time $t-$
2. Investors can post shares & fees for lending (tied up until settlement)
   - Loan agreements start at time t and mature at next $dN_\tau = 1$
   - At maturity, borrower has to return asset + dividend to the lender
3. A new hedge fund and a new cohort of liquidity investors arrive to the market
4. Investors compete for picking up fee quotes for lendable shares
   The realized volume of borrowed shares becomes publicly observable
5. Bid and ask quotes are posted in the centralized limit order market
6. Investors trade shares at the posted bid and ask prices in limit order market.
7. Contracts are settled via delivery of the asset in accordance with all lending contracts and trades (steps 2, 4, 5, and 6 above)

Buy-and-Hold Value

A lender's ex-dividend buy-and-hold value at time t is given by:

$$P_t = \mathbb{E} \int_t^{\infty} \frac{m_\tau}{m_t} \cdot \Big(\underbrace{c_\tau}_{\text{Dividend}} + \underbrace{(1-\delta)}_{\text{Pass-through}} \cdot \underbrace{F_v(v_\phi)}_{\text{Pr[shorting]}} \cdot \underbrace{\frac{\pi \phi_\tau}{\rho}}_{\text{Fee yield}} \Big) \cdot dN_\tau.$$

Relevant state absent signals about v: capital c

Proposition 1. *The buy-and-hold value of the asset conditional on prior beliefs about v is given by:*

$$P(c) = \frac{\lambda \cdot (c + (1-\delta) \cdot F_v(v_\phi) \cdot \frac{\pi \phi(c)}{\rho})}{r_f + \sigma_c \chi - \mu_c}.$$

The buy-and-hold value conditional on observing v is given by:

$$Q(c, v) = e^v \cdot P(c).$$

Bid and Ask Quotes

Bid quotes satisfy the break even condition:

$$\frac{B}{P} = \frac{\pi F_v(v_\phi) \cdot \mathbb{E}[e^v | v \leq v_\phi] + (1-\pi)}{\pi F_v(v_\phi) + (1-\pi)}.$$

Ask quotes satisfy break even conditions that depend on existing short interest

Without existing short interest:

$$\frac{A_0 + \kappa_0}{P} = \frac{\pi(1 - F_v(w_{A_0})) \cdot \mathbb{E}[e^v | v \geq w_{A_0}] + 1 - \pi + F_v(v_\phi)\frac{\pi}{\rho}\frac{\phi}{P}}{\pi(1 - F_v(w_{A_0})) + 1 - \pi},$$

With existing short interest:

$$\frac{A_1 + \kappa_1}{P} = \frac{2 - \pi + \pi(1 - F_v(w_{A_1})) \cdot \mathbb{E}[e^v | v \geq w_{A_1}] + 2F_v(v_\phi)\frac{\pi}{\rho}\frac{\phi}{P}}{2 - \pi + \pi(1 - F_v(w_{A_1}))}.$$

Quotes + commissions compensate liquidity providers for adverse selection
& foregone lending fee income

Hedge Funds' Decisions and Equilibrium Fees

Given a loan fee $\phi(c)$, hedge funds borrow if they observe a v such that:

$$\underbrace{\phi(c)}_{\text{Fee}} \leq \underbrace{B(c)}_{\text{Bid quote}} - \underbrace{L(c,v)}_{\text{PV(Liability to redeliver)}} \qquad \text{where} \quad L(c,v) = e^{v}\frac{\lambda\cdot(c+A_1(c))}{r_f+\sigma_c-\mu_c+\lambda}$$

Fee set by custodian lender (screening problem)

Choosing a fee ϕ is equivalent to choosing the marginal hedge fund type v_ϕ
The custodian lender maximizes the expected fee revenue (quantity-price tradeoff)

$$\Pi(v_\phi) = \underbrace{\pi \cdot F_v(v_\phi)}_{\mathbb{E}[\text{Quantity}]} \cdot \underbrace{(B(c) - L(c,v_\phi))}_{\phi}.$$

Hedge Funds' Decisions and Equilibrium Fees

Given a loan fee $\phi(c)$, hedge funds borrow if they observe a v such that:

$$\underbrace{\phi(c)}_{\text{Fee}} \leq \underbrace{B(c)}_{\text{Bid quote}} - \underbrace{L(c,v)}_{\text{PV(Liability to redeliver)}} \qquad \text{where} \quad L(c,v) = e^{v}\frac{\lambda\cdot(c+A_1(c))}{r_f+\sigma_c-\mu_c+\lambda}$$

Fee set by custodian lender (screening problem)

Choosing a fee ϕ is equivalent to choosing the marginal hedge fund type v_ϕ
The custodian lender maximizes the expected fee revenue (quantity-price tradeoff)

$$\Pi(v_\phi) = \underbrace{\pi \cdot F_v(v_\phi)}_{\mathbb{E}[\text{Quantity}]} \cdot \underbrace{(B(c) - L(c,v_\phi))}_{\phi}.$$

The optimal marginal type v_ϕ chosen by the custodian solves:

$$\frac{f_v(v_\phi)}{F_v(v_\phi)} \cdot \left(\frac{B(c)}{L(c,v_\phi)} - 1\right) = 1$$

Centralized Lending Market

Features of the direct lending market equilibrium (signaling game):

- A hedge fund follows a mixed strategy: borrows with positive probability even when it has positive news and intends to buy the asset. Borrows with probability 1 if $v < v_\phi$.
- Multiple mixed-strategy equilibria: we choose the one that is robust to the presence of ϵ exogenous costs to borrowing
- In equilibrium, the ask price conditional on borrowing is the same as the ask price conditional on not borrowing. Yet the bid prices differ depending on borrowing volume.

Proposition 4. *When shares lending is moved to the direct (centralized) lending market, the following equilibrium outcomes obtain:*

- *Shares lenders are strictly worse off, since the lending fee is zero, that is, $\phi = 0$.*
- *Hedge funds may be worse off, in particular if their trading capacity π is sufficiently large.*

Model extension used for quantitative analysis:

Continuum of hedge funds with noisy signals
$\Rightarrow$ stronger info leakage due to diversification of idiosyncratic noise via demand aggregation

The Value Implications of Fee Income for Lenders

What is the **excess value** lenders assign to shares because of fee income ($\equiv$ **value wedge**)?

Suppose both the **fee yield** and the **dividend yield** are **constant over time**

$$\textbf{Value Wedge} = \frac{\text{Stock price with fee income}}{\text{Stock price without fee income}} - 1 = \textbf{Fee-to-dividend ratio}$$

Fee Yields versus Dividend Yields

Fee Yield (annual, in percent)

Fee Yield Percentiles	Large-Cap (1)	Mid-Cap (2)	Small-Cap (3)	Micro-Cap (4)	Nano-Cap (5)
$\leq 80\%$	0.003	0.011	0.0295	0.028	0.100
80-90%	0.019	0.081	0.193	0.970	10.815
90-95%	0.035	0.184	0.616	3.873	22.803
95-98%	0.065	0.668	1.936	10.090	37.242
$\geq 98\%$	0.850	4.446	8.675	29.315	63.955

Dividend Yield (annual, in percent)

Loan Yield Percentiles	Large-Cap (1)		Mid-Cap (2)		Small-Cap (3)		Micro-Cap (4)		Nano-Cap (5)	
	Data	Model	Data	Model	Data	Model	Data	Model	Data	Model
$\leq 80\%$	2.09	2.12	1.76	1.78	1.47	1.48	1.01	1.02	1.08	1.09
80-90%	2.27	2.27	1.84	1.86	0.99	0.99	1.16	1.16	0.33	0.30
90-95%	2.36	2.38	1.62	1.63	1.05	1.07	1.16	1.17	0.14	0.14
95-98%	2.12	2.13	1.81	1.83	1.59	1.60	0.71	0.71	0.07	0.06
$\geq 98\%$	2.31	2.20	1.96	1.96	1.29	1.30	0.33	0.33	0.11	0.08

Under **static view** of fee-to-dividend ratios, value wedges = 0.2% to 57,861,818%

Evidence on Fee Yield Dynamics

From/To		Large-Cap					Mid-Cap					Small-Cap					Micro-Cap					Nano-Cap				
		≤ 80%	80-90%	90-95%	95-98%	≥ 98%	≤ 80%	80-90%	90-95%	95-98%	≥ 98%	≤ 80%	80-90%	90-95%	95-98%	≥ 98%	≤ 80%	80-90%	90-95%	95-98%	≥ 98%	≤ 80%	80-90%	90-95%	95-98%	≥ 98%
Large-Cap	≤ 80%	0.96	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	80-90%	0.45	0.40	0.12	0.02	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	90-95%	0.11	0.28	0.42	0.15	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	95-98%	0.06	0.07	0.24	0.48	0.13	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	≥ 98%	0.07	0.01	0.06	0.16	0.67	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mid-Cap	≤ 80%	0.01	0.00	0.00	0.00	0.00	0.95	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	80-90%	0.00	0.00	0.00	0.00	0.00	0.32	0.53	0.13	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	90-95%	0.00	0.00	0.00	0.00	0.00	0.07	0.28	0.49	0.13	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	95-98%	0.00	0.00	0.00	0.00	0.01	0.04	0.06	0.22	0.53	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	≥ 98%	0.00	0.00	0.00	0.00	0.02	0.03	0.01	0.01	0.22	0.68	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Small-Cap	≤ 80%	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.92	0.03	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	80-90%	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.28	0.54	0.10	0.01	0.00	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	90-95%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.06	0.27	0.46	0.12	0.02	0.03	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	95-98%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.04	0.25	0.45	0.14	0.01	0.03	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00
	≥ 98%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.01	0.04	0.22	0.60	0.00	0.01	0.03	0.02	0.03	0.00	0.00	0.00	0.00	0.00
Micro-Cap	≤ 80%	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.95	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	80-90%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.01	0.00	0.33	0.51	0.07	0.02	0.00	0.01	0.00	0.00	0.00	0.00
	90-95%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.02	0.02	0.05	0.27	0.43	0.13	0.03	0.01	0.01	0.00	0.00	0.00
	95-98%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.04	0.03	0.06	0.27	0.39	0.15	0.01	0.01	0.01	0.01	0.00
	≥ 98%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.05	0.00	0.03	0.07	0.24	0.54	0.00	0.01	0.01	0.01	0.02
Nano-Cap	≤ 80%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.01	0.01	0.00	0.00	0.85	0.03	0.00	0.00	0.00
	80-90%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.03	0.02	0.02	0.01	0.29	0.47	0.11	0.02	0.01
	90-95%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.04	0.02	0.07	0.30	0.38	0.12	0.03
	95-98%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.04	0.03	0.02	0.09	0.27	0.39	0.13
	≥ 98%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.09	0.01	0.04	0.06	0.24	0.53

Table 3: Markov Matrix

This table reports the Markov matrix of quarterly transition rates of firms across the 25 size and loan yield groups. The quarter-t transition rate from group i to group j is computed as $p_t^{i\to j} = \frac{TotalMarketValue_t^{i\to j}}{\sum_{j=1}^{25} TotalMarketValue_t^{i\to j}}, i,j = 1,2,\ldots,25$, where $TotalMarketValue_t^{i\to j}$ is the sum of market capitalizations of stocks moving from group i to group j over quarter t. The Markov matrix presents the time-series average of transition rates, which are standardized such that the sum of rates in each row equals one. See the caption in Table 1 for construction details of the 25 size and loan yield groups.

Generalizing the Model Dynamics

Corresponding to 25 groups, consider a 25-state Markov chain indexed by state s

Capital evolution is generalized to:

$$\frac{dc_t}{c_{t-}} = \mu_c dt + \sigma_c(s_{t-})dB_t + (e^{v_{t-}} - 1)dN_t + \sum_{s' \in \Omega} \left(e^{u(s') - u(s_{t-})} - 1 \right) dM_t(s_{t-}, s')$$

- Risk exposure σ_c and distribution of v can vary with state s
- Expected growth of capital also varies by state s
- Fee-to-dividend ratio varies with s (key metric from the lending market)
  Distribution of private information v changes

Continuum of hedge funds with **noisy signals**: $w_i = v + \epsilon_i$

- Absent additional frictions, aggregate borrowing demand reveals v perfectly
  $\Rightarrow$ Centralized market would always be dominated by intermediated market
- We introduce additional aggregate noise in information aggregation

Modular Estimation Approach

(1) Parameters relevant for quantifying **value wedges**

- SDF parameters: match r_f & equity premium
- Risk exposures $\sigma_c(s)$: match CAPM or Cahart 4-Factor premia
- Fee-to-dividend ratios: match data counterparts
- General trend growth μ_c & conditional growth target dividend yields in all 25 states.
- We convert the Markov matrix to a continuous time generator matrix

(2) Additional parameters relevant for **counterfactuals & short sellers' net-of-fee alphas**

- Informed-trading capacity π: match US equity trading volume by hedge funds, mutual funds and banks
- Arrival rate of next contract period λ: Expected contract length $=$ 1 day
- Private information $\sigma_v(s)$: match fee-to-dividend ratios in each state
- Noise in hedge fund signals $\sigma_\epsilon(s)$: match average utilization in each state

Alphas and Fee Yields

Prices capitalize fees earned by lenders

$\Rightarrow$ **negative alphas** obtained in standard asset pricing tests that **omit fee income from returns**:

$$\alpha = -\text{ fee yield} = -\frac{(1-\delta)\lambda F_v(v_\phi)\pi\frac{\phi}{\rho}}{P}.$$

- Consistent with empirical evidence that asset pricing anomalies are concentrated in the short leg, among high-fee stocks

  (Stambaugh,Yu, and Yuan (2012), Muravyeva, Pearson, and Pollet, (2023))

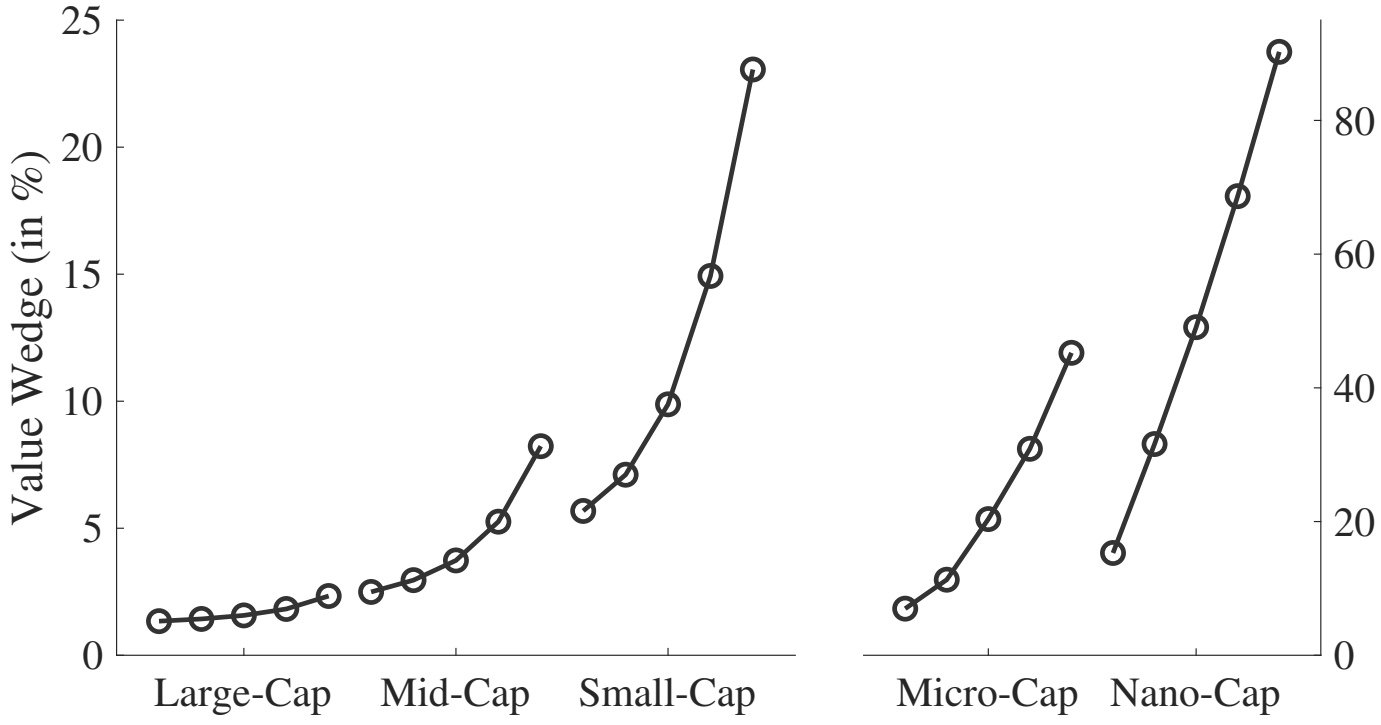
- Prices are actually efficient in that they reflect the present value all income to investors.

  However, they deviate from the text-book valuations (present value of dividends)

Another application:

- **Index funds can outperform the index** by α, due to additional fee income
- Underlying assets have an additional **convenience yield = fee yield**
- Example: basket of underlying securities vs. synthetic basket

Value Wedges Due to Fee Income

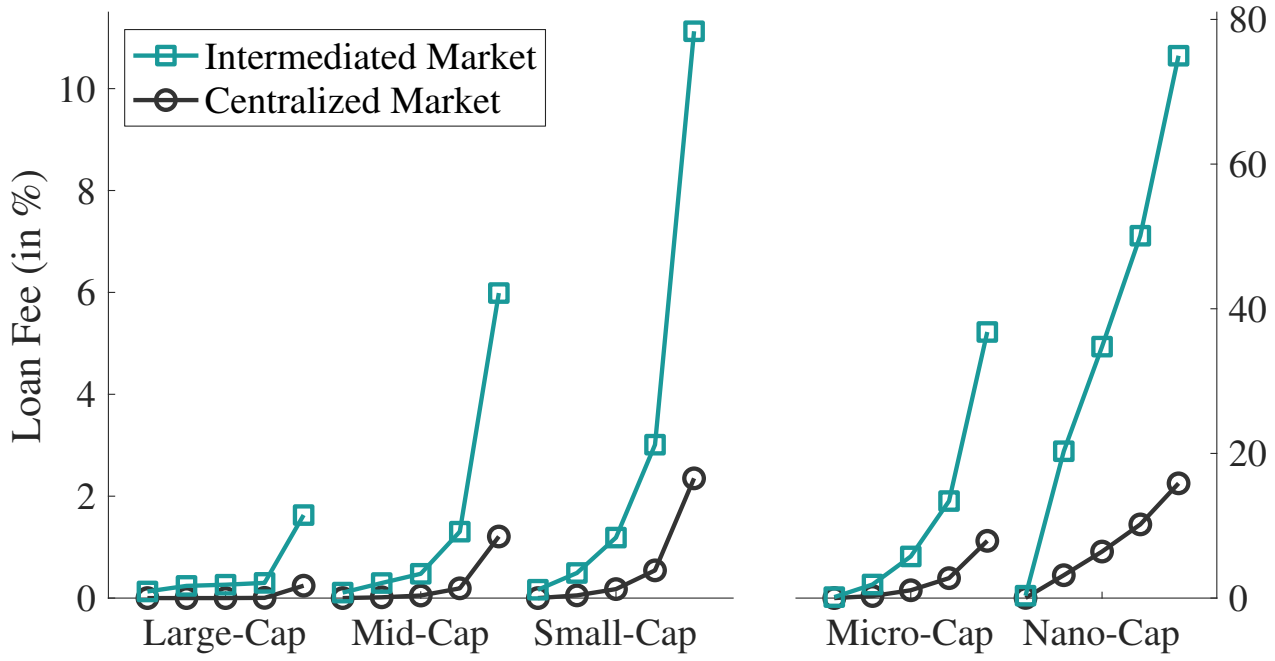


Stocks' incremental value to shares lenders due to fee income

Counterfactual Analysis:
Intermediated vs. Direct Lending

Loan fees & hedge fund alphas

Loan Fees

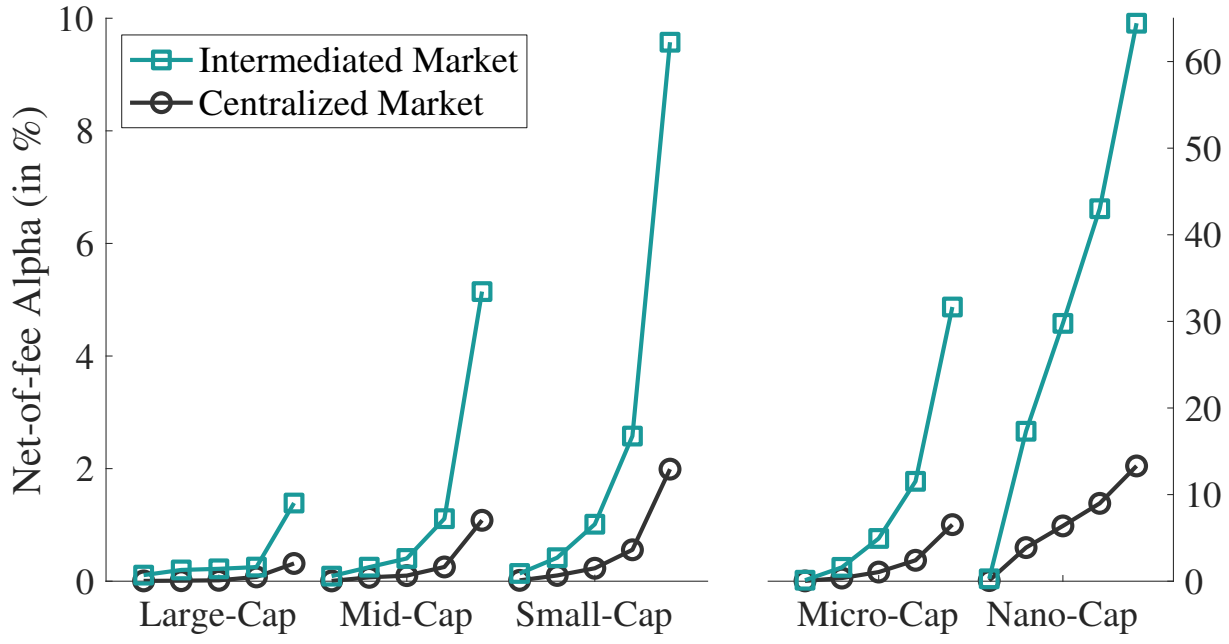


- **Intermediate market:** fees match data counterparts
- **Counterfactual centralized market:** fees drop substantially

  Still, fees are positive for many stock groups, as inventory becomes scarce

  Once inventory is scarce, fees are revealing info (ow. borrowing volume)

Net-of-fee Alphas from Shorting



Observations:

- Hedge funds prefer intermediation despite higher fees, especially for small stocks
  Information leakage in centralized venue undermines trading profits
- Intermediated market: Fees eliminate about **54%** of short sellers' trading gains
  Centralized market: Fees reduce trading gains less, but gains are lower

Summary & Conclusion

1) Empirical evidence of market power in the securities lending market

- The securities lending market is highly concentrated due to intermediation by custodians
- Prices: Fees are orders of magnitude above lenders' marginal costs
- Quantities: Slack inventory & high fees $\rightarrow$ evidence of strategic rationing

2) Theoretical implications of this market structure

- Model: shorting is more profitable for both short sellers & shares lenders when intermediated by a custodian lender with market power, especially for small stocks
  - Shorting = 2-step transaction $\Rightarrow$ information leakage concerns
  - Endogenous scale economies: Concentration of intermediation $\uparrow \Rightarrow$ incentive compatible fee passthrough $\uparrow$

3) Quantitative analyses, including centralized market counterfactual

- Lenders' excess valuations for due to fee income under intermediation: Value wedges between 1.3% (large-cap, low-fee) and $\approx 90\%$ (nano)
- Fees reduce short sellers' profits by about 54%
- Information leakage in centralized venues undermines short sellers' business model
- Intermediation dominates direct lending, especially for smaller, illiquid stocks