Public Information and the Securities Lending Market

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securities lending around announcements

Securities lending market has a large impact on stock prices

- 20% of stocks "on special" with loan fees 1.5 - 50%
- Often use loan fees to proxy for **over-valuation**

Large *empirical* literature focuses on short-selling around public announcements

Christophe, Ferri, and Angel (2004), Berkman et al. (2009), Berkman and McKenzie (2012), Engelberg, Reed, and Ringgenberg (2012), Alexander, Peterson, and Beardsley (2014), Beneish, Lee, and Nichols (2015), Clinch and Li (2022), Weitzner (2024)

- Short sellers are more active around announcements
- Public announcements are large info events: resolve / trigger disagreement

Existing *theory* does not speak to how announcements affect short-selling

- Either considers static models or assumes constant information flow

what we do

Develop a dynamic model to analyze how a public announcement affects trading, loan fees and prices when short-selling is *costly*

- Short-sellers must borrow shares from long investors
- Shorts pay a **loan fee** when short demand is very high (stock is "on special")

Investors may disagree about firm value and / or the interpretation of the signal

Firm value: $x = x_{agree} + x_{disagree}$ Public Announcement: y

1. Concordant beliefs: standard "truth plus noise" signal $y = x + \varepsilon$
2. Signal agreement: $y = x_{agree} + \varepsilon$
3. Signal disagreement: $y = x_{disagree} + \varepsilon$

what we find

(1) Link between loan fees and valuation depends on info arrival and nature of disagreement

Pre-announcement loan fees can increase without affecting the price

(2) More informative announcements can lead to ***lower*** (post-announcement) valuations

in contrast to “more information is better”

(3) Different types of disagreement have ***qualitatively*** different predictions

Observable	**Concordant**	**Signal agreement**	**Signal disagreement**
Announcement Volume	Low	High	High
Pre-announcement Loan fee	Increases	Flat	Increases
Post-announcement Loan fee	Decreases	Increases	Decreases
Expected Ann. Return	Positive / Negative	Positive	Positive / Negative

⇒ Can use observables to infer nature of disagreement across investors

related literature

Existing models of security lending do not speak to impact of public announcements

- **Static:** Duffie (1996); D'Avolio (2002); Blocher Reed van Wesep (2013); Banerjee Graveline (2014); Nezafat Schroeder (2022)
- **Dynamic:** Duffie Garleanu Pedersen (2002); Atmaz Basak Ruan (2024); Weitzner (2023); Garleanu, Panageas, Zheng (2025)

We allow the rate of info arrival to vary

Focus on how different types of disagreement affect price and fee dynamics

More broadly, related to models of trading around public announcements

- No trade theorems: Milgrom Stokey (1982)
- Disagreement models: Kandel Pearson (1995), Banerjee Kremer (2010)

Very large empirical literature on short-selling frictions and returns / trading / disagreement around public announcements model setup

setup (1): payoffs, preferences, timeline

Two securities

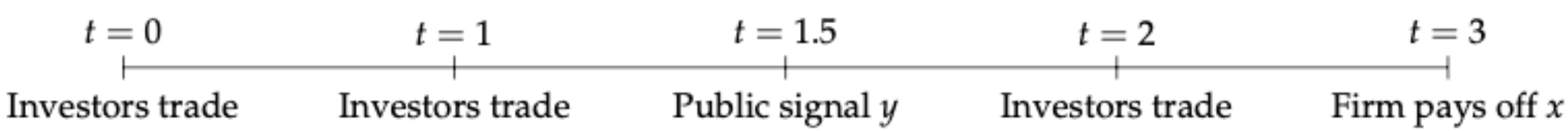
- Risk-free asset is normalized to numeraire
- Risky asset has terminal **payoff** x**,** **price** P_t, and per capita **supply** Q

Continuum of investors, indexed by $i \in [0,1]$

- CARA utility with risk aversion ρ over terminal wealth

Timeline:

announcement
period



pre-announcement
period

post-announcement
period

setup (2): information and beliefs

Terminal payoff x and public signal y are **jointly normal** with covariance matrix:

$$\Sigma_{xy} = \begin{pmatrix} \sigma_x^2 & \sigma_{xy} \\ \sigma_{xy} & \sigma_y^2 \end{pmatrix}$$

Investors have **correct beliefs** about $\Sigma_{x,y}$, but **agree to disagree** about means:

$$\mathbb{E}_i[x] = m_i \in [m_L, m_H] \qquad \text{and} \qquad \mathbb{E}_i[y] = \delta_i \in [\delta_L, \delta_H]$$

Disagreement about payoffs — Disagreement about signal

Cross-sectional distributions $G_m(\cdot)$ and $G_\delta(\cdot)$ are common knowledge

Generates a motive for trade

Abstract from private information and learning from prices (tractability!)

Most results are unaffected by who is "correct"

setup (3): securities lending and market clearing

Short-sellers must **borrow** shares from long investors

Short-sellers pay a loan fee $f_t \geq 0$ per share

Long investors can lend out at most fraction $\alpha < 1$ of their shares

e.g., ETFs / mutual funds can only lend out a fraction of their shares

Two market clearing conditions:

(1) Cash market clearing:

$$Q_{Lt}(P_t, f_t) + Q_{St}(P_t, f_t) = Q$$

(2) Securities lending market clearing:

$$|Q_{St}(P_t, f_t)| \leq \alpha\, Q_{Lt}(P_t, f_t)$$

where $Q_{Lt}(P_t, f_t)$ and $Q_{St}(P_t, f_t)$ are aggregate demand from longs and shorts equilibrium

optimal demand has “standard form”

Investor i chooses demand schedule D_{it} to maximize CARA utility over terminal wealth

$$W_{i3} = \sum_{t=0}^{2} D_{it}(x - P_t) + \sum_{t=0}^{2} D_{it}\left[\mathbf{1}(D_{it} > 0)\alpha f_t + \mathbf{1}(D_{it} < 0) f_t\right]$$

Denote investor i's subjective beliefs at date t by:

$$\mu_{it} \equiv \mathbb{E}_{it}[P_{t+1}] \quad \text{and} \quad \sigma_t^2 \equiv \mathbb{V}_{it}[P_{t+1}]$$

CARA utility + normal Payoffs ⇒ Familiar “mean-variance” form for demand:

$$D_{it}(\mu_{it}) = \begin{cases} \frac{\mu_{it} - (P_t - \alpha f_t)}{\rho \sigma_t^2} & \text{when } \mu_{it} > P_t - \alpha f_t \\ 0 & \text{when } \mu_{it} \in [P_t - f_t, P_t - \alpha f_t] \\ \frac{\mu_{it} - (P_t - f_t)}{\rho \sigma_t^2} & \text{when } \mu_{it} < P_t - f_t \end{cases}$$

Long if optimistic enough

Short if pessimistic enough

When short-selling is costly (i.e., $f_t > 0$), investors with intermediate beliefs **stay out!**

market clearing ⇒ bounds on agg. demand

Denote the **net price** for longs by $P_{Lt} \equiv P_t - \alpha f_t$ and shorts by $P_{St} \equiv P_t - f_t$

Then, aggregate demand from longs and shorts are:

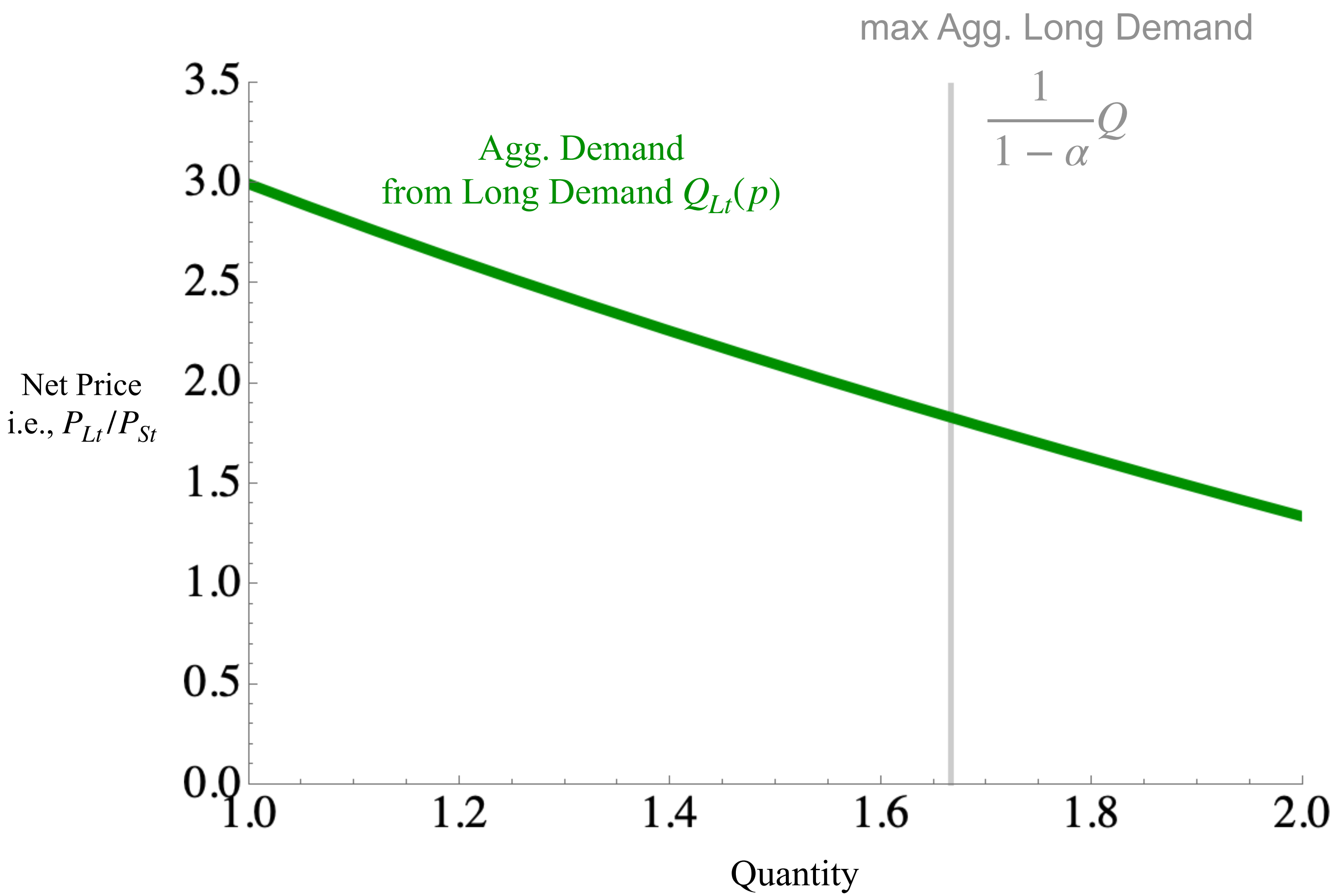
$$Q_{Lt}\left(P_{Lt}\right) \equiv \int_{P_{Lt}}^{\infty} \frac{\mu_{jt} - P_{Lt}}{\rho\sigma_t^2} dj \quad \text{and} \quad Q_{St}\left(P_{St}\right) \equiv \int_{-\infty}^{P_{St}} \frac{\mu_{jt} - P_{St}}{\rho\sigma_t^2} dj$$

These depend on the distribution of beliefs in the cross-section

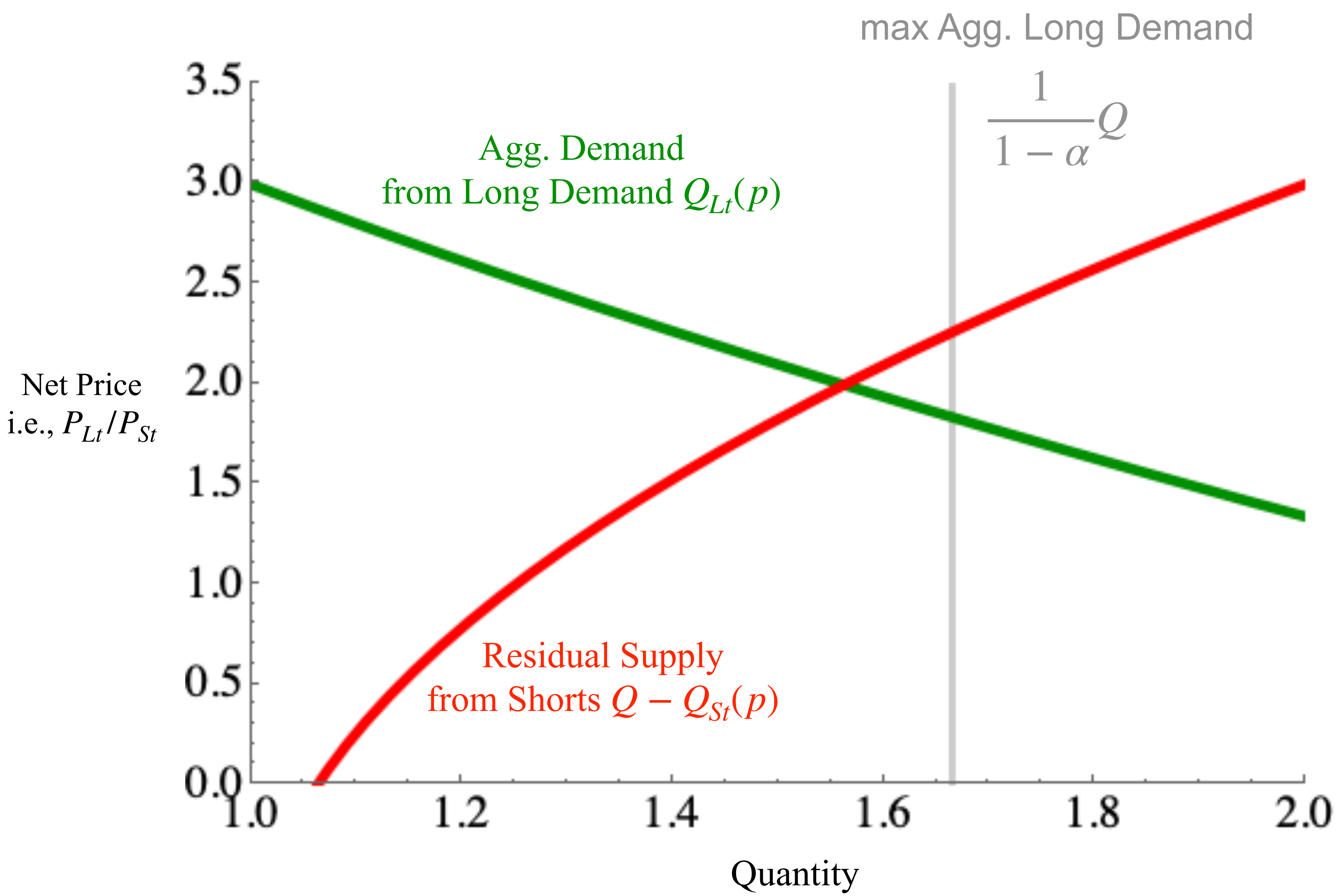
Two market clearing conditions ⇒ Bounds on aggregate demands:

$$Q_{Lt}(P_{Lt}) \leq \frac{1}{1-\alpha} Q \quad \text{and} \quad Q_{St}(P_{St}) \geq -\frac{\alpha}{1-\alpha} Q$$

intuition: supply and demand

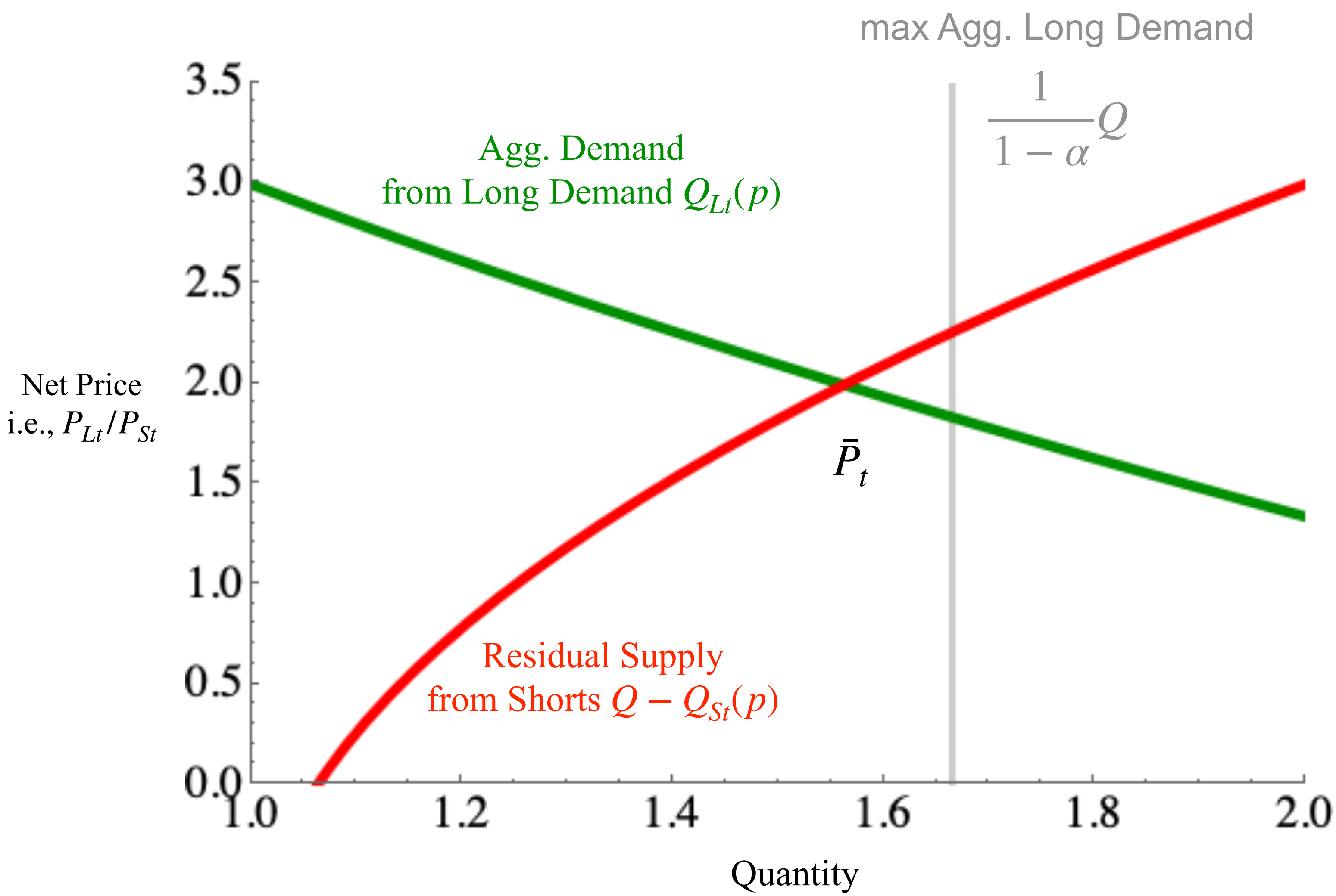


intuition: supply and demand



low disagreement ⇒ zero lending fee

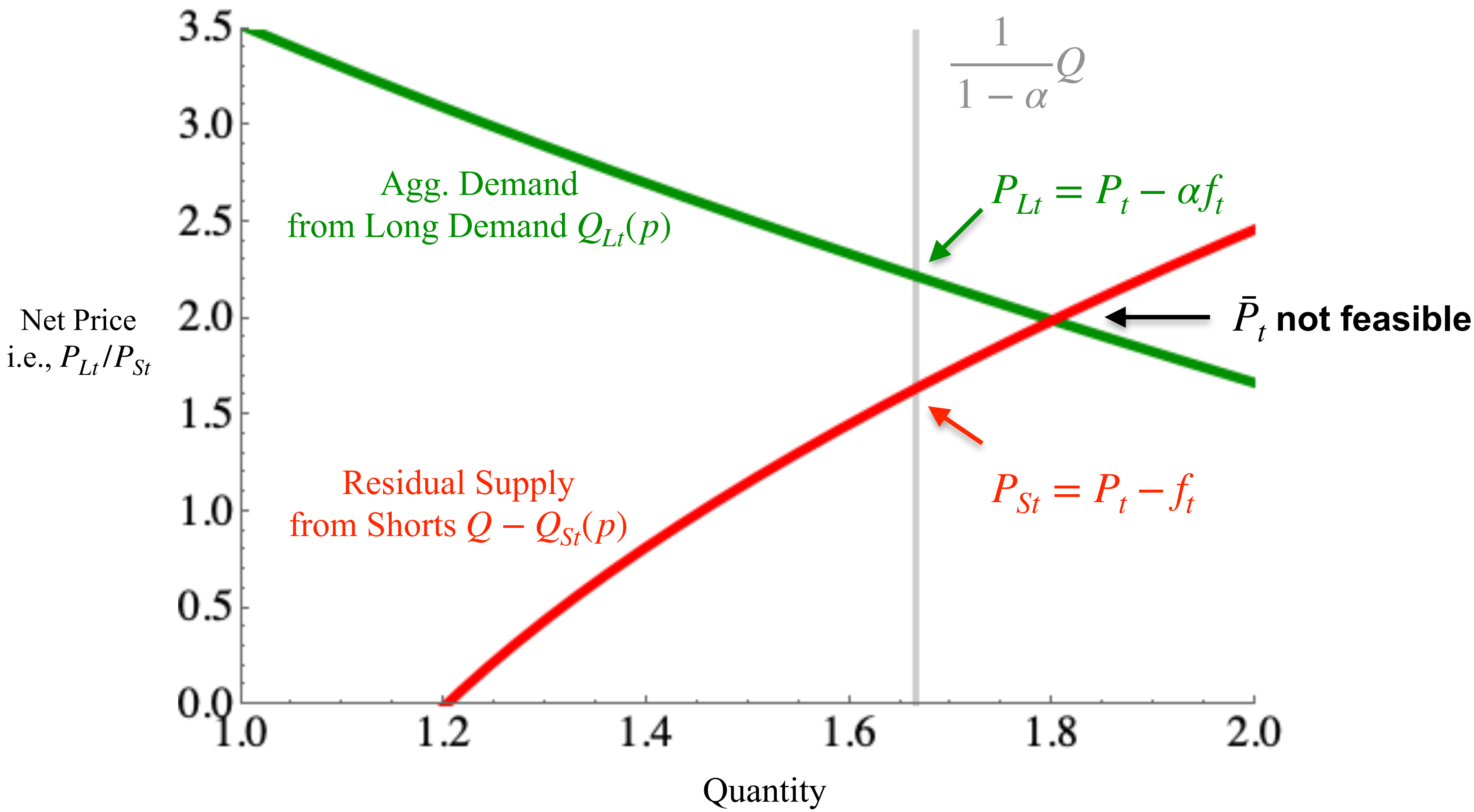
Scenario 1: There exists a single price $P_{Lt} = P_{St} = \bar{P}_t$ such that both markets clear



high disagreement ⇒ positive lending fee

Scenario 2: Single price **cannot clear** both markets

⇔ Lending fee $f_t > 0$ so that $P_{Lt} \neq P_{St}$ clear markets



there exists a unique equilibrium

Result: Let P_{Lt} and P_{St} denote the unique solutions to

$$Q_{Lt}(P_{Lt}) = \frac{1}{1-\alpha}Q \quad \text{and} \quad Q_{St}(P_{St}) = -\frac{\alpha}{1-\alpha}Q,$$

respectively. Then, the equilibrium loan fee is given by

$$f_t = \frac{1}{1-\alpha}\max\{0, P_{Lt} - P_{St}\}$$

and the equilibrium price is given by

$$P_t = \begin{cases} \bar{P}_t & \text{if} \quad f_t = 0 \\ \frac{P_{Lt} - \alpha P_{St}}{1-\alpha} & \text{if} \quad f_t > 0 \end{cases}$$

where $\bar{P}_t = \bar{\mu}_t - \rho \mathbb{V}_t[x]Q$ and $\bar{\mu}_t \equiv \int_j \mu_{jt} dj.$

equilibrium loan fees

Equilibrium **loan fee** depends on "precision weighted belief dispersion":

$$f_t = \max\left\{0, \quad \frac{\rho\sigma_t^2}{1-\alpha}\left(\boxed{\frac{\mu_{Lt}-\mu_{St}}{\rho\sigma_t^2}} - \left(\frac{1}{\lambda_{Lt}}+\frac{\alpha}{\lambda_{St}}\right)\frac{Q}{1-\alpha}\right)\right\}$$

where μ_{Lt}, μ_{St} denote avg. beliefs of long / short investors and $\lambda_{Lt}, \lambda_{St}$ denote their masses

Public announcements have two effects:

- Reduce dispersion in beliefs $|\mu_{it}-\bar{\mu}_t| \downarrow$ $\Rightarrow$ decrease loan fee
- Increase precision / reduce posterior uncertainty $\sigma_t^2 \downarrow$ $\Rightarrow$ increase loan fee

Impact on loan fees and trading volume depends on relative impact of the two

equilibrium prices and over-valuation

Post-announcement price

avg beliefs - risk premium over-valuation at date 2

$$P_2 = \int_j \mathbb{E}_{j2}[x \mid y]dj - \rho \mathbb{V}[x \mid y]Q \quad + \quad \max\{\eta_2, 0\}$$

More informative announcement $\Rightarrow$ lower risk-premium

Over-valuation η_2 depends on (i) positive loan fee (ii) bias due to limited participation

Pre-announcement price

over-valuation at date 1

$$P_1 = \int_j \mathbb{E}_{j1}[x]dj - \rho \mathbb{V}[x]Q \quad + \quad \max\{\eta_2, 0\} \quad + \quad \max\{\eta_1, 0\}$$

Note: date 2 over-valuation is anticipated at date 1

Date 0 price $P_0 = P_1$, loan fee $f_0 = 0$

No new information or risk between these dates

announcement returns

More informative announcements have two effects:

$$ER \equiv \mathbb{E}[P_2 - P_1] = \underbrace{\rho Q(\mathbb{V}[x] - \mathbb{V}[x \mid y])}_{\text{risk-premium } (+)} - \underbrace{\max\{\eta_1, 0\}}_{\text{overvaluation } (-)}$$

Reduction in **risk premium**: bigger reduction in uncertainty ⇒ higher return

Reversion of date 1 **over-valuation**: higher date 1 fee ⇒ lower return

Note: Date 2 over-valuation η_2 is anticipated in date 1, so doesn't affect return.

Result: More informative announcements

⇒ positive announcement returns for firms not on special   standard intuition

⇒ negative announcement returns with high loan fees and small risk premium (ρQ)

analysis: types of disagreement

specifying different types of disagreement

Firm value: $$x = \underbrace{x_{agree}}_{\text{investors agree}} + \underbrace{x_{disagree}}_{\text{investors disagree}}$$

Concordant beliefs case: Announcement is $y = x + \varepsilon$

Benchmark case (including rational expectations)

Disagreement driven by priors

Signal agreement case: Announcement is $y = x_{agree} + \varepsilon$

Agree about short term performance, but disagree about long term potential (e.g., growth firms)

CoreWeave

Signal disagreement case: Announcement is $y = x_{disagree} + \varepsilon$

Disagree about current / short-term performance, and unpredictable long term performance (e.g., after founder quits)

analysis: concordant beliefs

concordant beliefs ⇒ no trade

Concordant beliefs: Investors ***agree*** on the interpretation of the announcement given the terminal value i.e., for all $i \neq j$, $f_i(y\,|\,x) = f_j(y\,|\,x)$

Concordant beliefs + Normal payoffs / signals ⇒ agree about noise i.e.,

$$y = x + \varepsilon \quad \text{where investors all } \textbf{agree } \varepsilon \sim N(0, \sigma_\varepsilon^2)$$

This implies that **precision weighted belief dispersion** is constant i.e.,

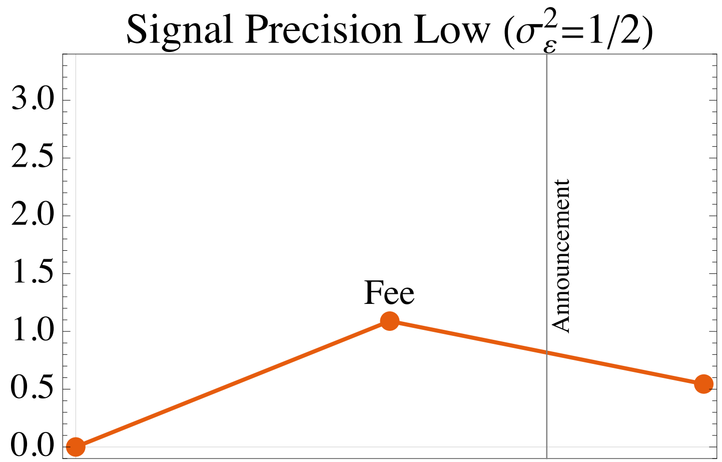
$$\frac{\mu_{i1} - \bar{\mu}_1}{\sigma_1^2} = \frac{\mu_{i2} - \bar{\mu}_2}{\sigma_2^2}$$

and loan fees are proportional over time i.e., $f_1/\sigma_1^2 = f_2/\sigma_2^2$

Result: There is **no trade** around the announcement i.e., $D_{i1} = D_{i2}$

No-trade theorem (Milgrom-Stokey) holds even though loan fees are changing

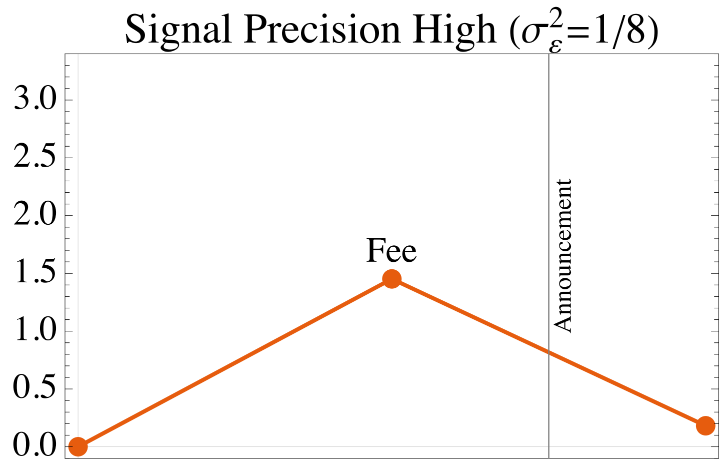
loan fees dynamics



Result: Fees increase before the announcement and decrease afterwards

Pessimists only pay a high short fee when they expect price to correct after announcement

loan fees dynamics



Result: Fees increase before the announcement and decrease afterwards

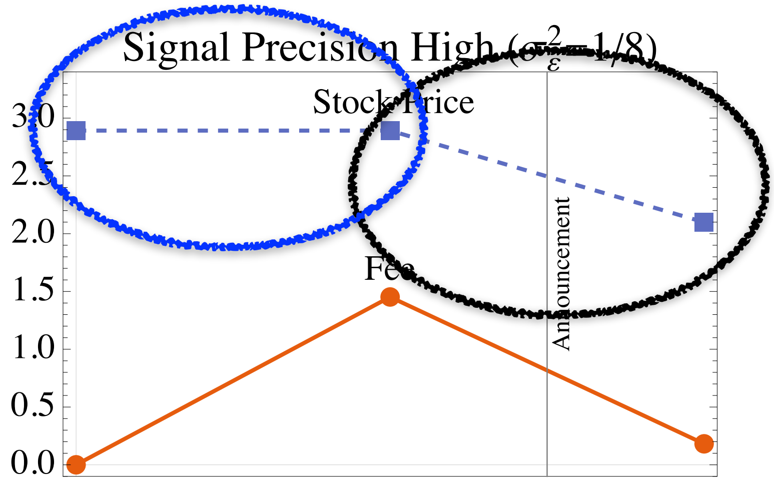
Pessimists only pay a high short fee when they expect price to correct after announcement

More informative announcement (higher $1/\sigma_\varepsilon^2$)

$\Rightarrow$ lower posterior uncertainty $\sigma_2^2 \Rightarrow$ lower post-announcement fee f_2

$\Rightarrow$ higher price uncertainty σ_1^2 at date 1 $\Rightarrow$ higher pre-announcement fee f_1

price dynamics and announcement returns



Result: Announcement returns can be ***negative*** if stocks are on special pre-announcement

- Decrease in risk-premium dominated by reduction in loan fees (over-valuation)
- More likely if announcement is firm-specific, risk premium is small

Result: *Pre*-announcement price is ***unaffected*** by public info precision

$$P_1 = \int_j \mathbb{E}_{j1}[x]dj - \rho\mathbb{V}[x]Q + \max\{\eta_1, 0\} + \max\{\eta_2, 0\}$$

Concordant beliefs: Higher info precision $\Rightarrow$ $\eta_1 \uparrow$ and $\eta_2 \downarrow$ perfectly offset each other

analysis: non-concordant beliefs

signal agreement case: $y = x_{agree} + \varepsilon$

Announcement resolves uncertainty about x_{agree}

$\Rightarrow$ posterior beliefs dominated by **disagreement** about $x_{disagree}$

$\Rightarrow$ Precision weighted belief dispersion is **higher** after ann. i.e., $\frac{|\mu_{i2} - \bar{\mu}_2|}{\sigma_2^2} > \frac{|\mu_{i1} - \bar{\mu}_1|}{\sigma_1^2}$

Results:

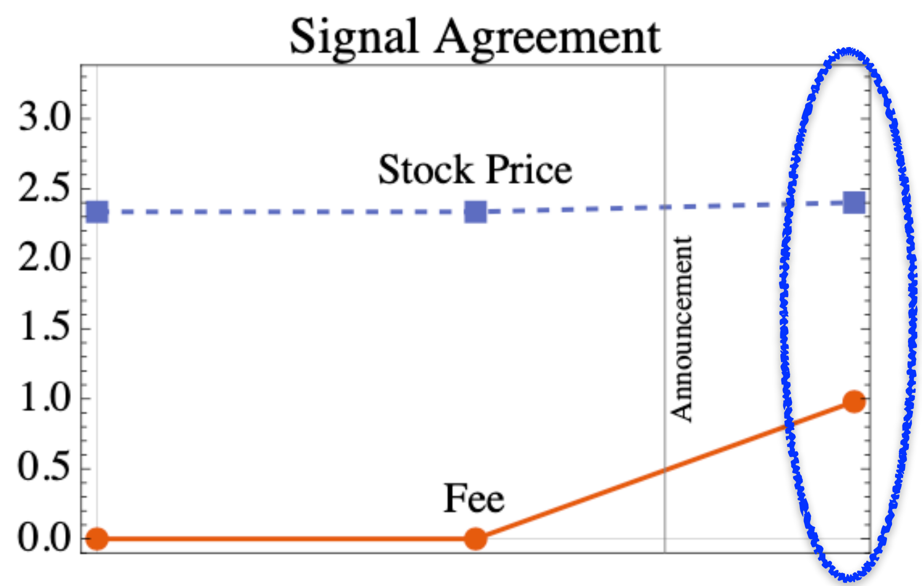
1. Investors agree on announcement and so wait till after the announcement to trade i.e., $D_{i1} = Q$

2. Pre-announcement loan fee is low, but **increases** after the announcement

3. Ann. expected returns are **always positive**

Low date 1 over-valuation + risk-premium effect

$\Rightarrow$ high ann. return



signal disagreement case: $y = x_{disagree} + \varepsilon$

Public announcement resolves uncertainty about $x_{disagree}$

$\Rightarrow$ posterior beliefs dominated by **agreement** about x_{agree}

$\Rightarrow$ Precision weighted belief dispersion is **lower** after ann. i.e., $\dfrac{|\mu_{i2} - \bar{\mu}_2|}{\sigma_2^2} < \dfrac{|\mu_{i1} - \bar{\mu}_1|}{\sigma_1^2}$

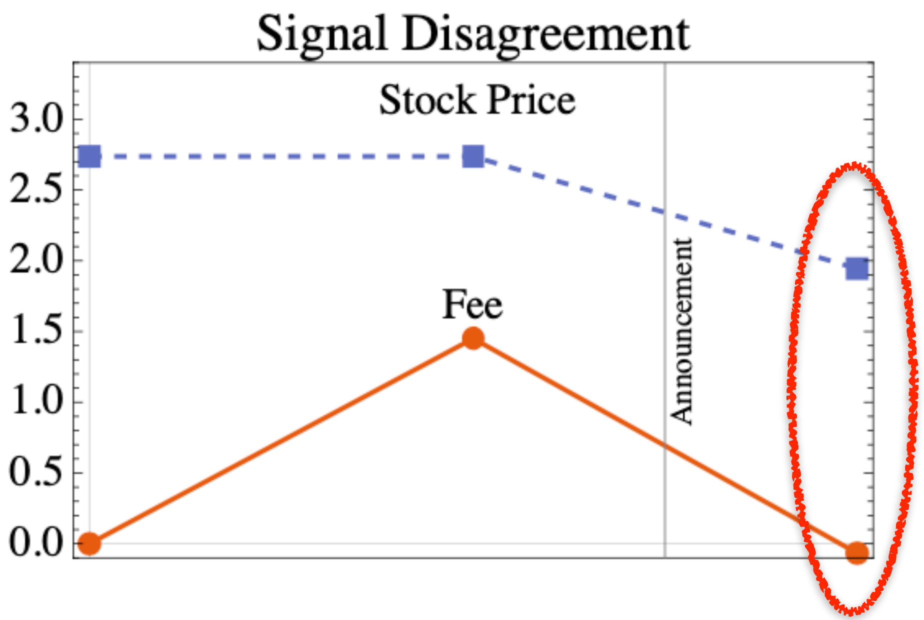
Results:

1. Investors with extreme beliefs speculate on x_d before announcement and converge afterward

2. Pre-announcement loan fee is high and **decreases** after announcement

3. Ann. expected returns are **negative** iff stock is sufficiently special pre-announcement

like w/ concordant beliefs



conclusions

takeaways

Prediction 1: Loan fees can *increase* before announcement while price remains *unchanged*

link between over-valuation and loan fees depends on nature of disagreement

Prediction 2: More precise announcements can lead to ***lower*** prices / ***negative*** announcement returns when stock is on special (high loan fees) and information is idiosyncratic

counter common wisdom "better information ⇒ higher valuations"

Prediction 3: Different types of disagreement have ***qualitatively*** different predictions

Observable	**Concordant**	**Signal agreement**	**Signal disagreement**
Announcement Volume	Low	High	High
Pre-announcement Loan fee	Increases	Flat	Increases
Post-announcement Loan fee	Decreases	Increases	Decreases
Expected Ann. Return	Negative if sufficiently special before	Positive	Negative if sufficiently special before

⇒ Can use observables to ***infer*** nature of disagreement across investors