

# Secret and Overt Information Acquisition in Financial Markets

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# Secret information acquisition

Existing literature usually takes investors' info acq as *observable*.

# Secret information acquisition

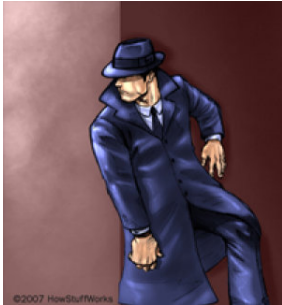
Existing literature usually takes investors' info acq as *observable*.

Yet, many situations feature secret info acq:

- Coverage and depth of the in-house research within a fund
- Client base of a data vendor
- Investors often hide and erase their footprints
- ...

# Transition to overt information acquisition

- Corporate site visits to firms listed in SZSE
- Downloading on SEC EDGAR data filings
- MiFID II research unbundling
- News clicks
- ...



(a) Secret



(b) Overt

# Research questions

1. Does an investor act differently when info acq becomes overt?
2. Implications for aggregate market quality?
3. Would an investor make her info acq overt or secret?

To answer these questions, we build a model based on Kyle (1985)

- Departure: unobservable info acq

# Summary

1. Relative to secret info acq, overt info acq can lead to more or less info production depending on:
  - (1) **Pricing effect:** b/t investors and market makers
  - (2) **Competition effect:** among investors
2. Prisoner's dilemma when investors can make observability decisions
3. A parsimonious framework with rich policy/empirical implications

1. Endogenous info acq in financial markets.
  - Grossman and Stiglitz (1980), Admati and Pfleiderer (1986, 1988), etc
  - Banerjee and Green (2015), Back et al (2018), Dai et al (2019)
  - Mendelson and Tunca (2004), Banerjee and Breon-Drish (2020)
  - Our paper: secret info acq, multiple strategic traders
2. Unobservability in the game-theoretic framework
  - Hauk and Hurkens (2001)
  - Our paper: novel pricing effect, interplay of the two effects
3. Transparency
  - Portfolio investment vs. info investment
  - Our paper: a new dimension of transparency



## Model Setup

# Model setup (general)

A risky asset with liquidation value  $\tilde{v} \sim N(0, 1)$ .

Three groups of agents:

- $J \geq 1$  strategic investors:
  - a fraction  $\mu \in \{0, 1/J, \dots, 1\}$  are *overt investors*
  - the rest  $1 - \mu$  are *secret investors*
- noise traders  $\tilde{u} \sim N(0, \sigma_u^2)$  and
- market makers

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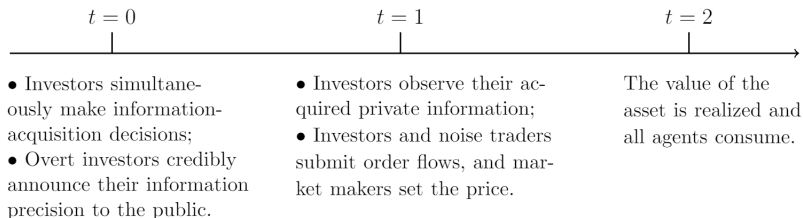


Figure: Timeline

# Model setup (general)

- On  $t = 0$ , investor  $j$  acquires info

$$\tilde{y}_j = \tilde{v} + \tilde{\epsilon}_j, \text{ where } \tilde{\epsilon}_j \sim N(0, h_j^{-1})$$

at cost  $C(h_j) = c \cdot h_j$

- Overt  $\Rightarrow h_j$  is observable
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$$E \left[ \tilde{x}_j (\tilde{v} - \tilde{p}) \mid \tilde{y}_j; h_1, \dots, h_{\mu J} \right].$$

Market makers observe order flow  $\tilde{\omega} = \tilde{x}_1 + \dots + \tilde{x}_J + \tilde{u}$  and set prices

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- Focus on symmetric Perfect Bayesian equilibrium (PBE)

# Illustration of the game

Example: investor 1 (overt) and investor 2 (secret)

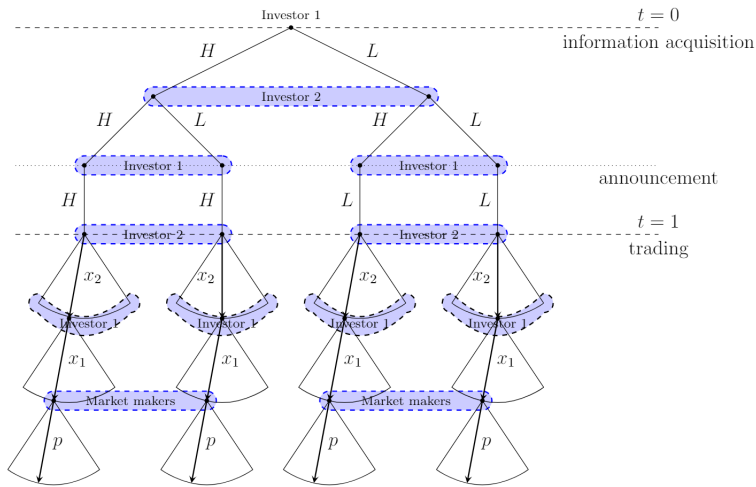


Figure S1: Illustration of the game

## 1. Economy with exogenous transparency

|                   |                  |                 |
|-------------------|------------------|-----------------|
|                   | Secret $\mu = 0$ | Overt $\mu = 1$ |
| Monopoly $J = 1$  |                  |                 |
| Oligopoly $J > 1$ |                  |                 |

## 2. Economy with endogenous transparency (duopoly)

|            |        |            |        |
|------------|--------|------------|--------|
|            |        | Investor 1 |        |
|            |        | Overt      | Secret |
| Investor 2 | Overt  |            |        |
|            | Secret |            |        |



## Exogenous Observability

# Monopoly $J = 1$ : Solve the model

- Secret info acq Equilibrium  $(h_s, \alpha_s, \lambda_s)$
- MM conjecture  $(h_s, \alpha_s)$  and set price  $\tilde{p} = \lambda\tilde{\omega}$  with

$$\lambda = \lambda(h_s, \alpha_s)$$

- Investor's belief  $\lambda_s$ .
  1. Optimal trading strategy given  $(h, \lambda_s)$

$$\begin{aligned} & \max_{\tilde{x}} E[\tilde{x}(\tilde{v} - \tilde{p}) | \tilde{y}] \\ & \Rightarrow \tilde{x} = \alpha\tilde{y} \text{ with } \alpha = \alpha(h, \lambda_s) \end{aligned}$$

2. Optimal info-acq strategy

$$\max_h \pi(h, \lambda_s) \Rightarrow h = h(\lambda_s)$$

- In equilibrium,  $(\lambda, \alpha, h) = (\lambda_s, \alpha_s, h_s)$

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## Overt info acq

On date 1,

$$\lambda = \lambda(h, \alpha)$$

$$\alpha = \alpha(h, \lambda)$$

$$\Rightarrow \lambda(h) \text{ and } \alpha(h)$$

On date 0,

$$\max_h \pi(h)$$

# Monopoly $J = 1$

Overt investor's info-acq incentive:

$$\frac{d\pi}{dh} = \underbrace{\frac{\partial\pi}{\partial h}}_{\text{standard trade-off (?)}} + \underbrace{\frac{\partial\pi}{\partial\lambda} \frac{\partial\lambda}{\partial h}}_{\text{pricing effect (<0)}}$$

Relative to secret market, overt market leads to:

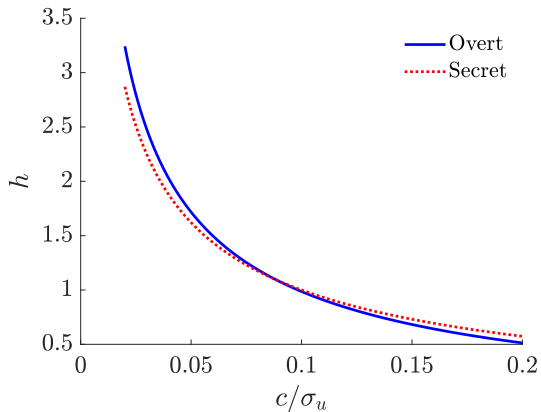
- less info production
- higher market liquidity
- lower market efficiency

Overt investors' info-acq incentive:

$$\frac{d\pi_j}{dh_j} = \underbrace{\frac{\partial \pi_j}{\partial h_j}}_{\text{standard trade-off (?)}} + \underbrace{\frac{\partial \pi_j}{\partial \lambda} \frac{\partial \lambda}{\partial h_j}}_{\substack{<0 \\ \text{pricing effect (?)}}} + \underbrace{\frac{\partial \pi_j}{\partial \alpha} \frac{\partial \alpha}{\partial h_j}}_{\substack{<0 \\ \text{competition effect (>0)}}} .$$

1. Competition effect  $> 0$
2. Pricing effect  $< 0$  if
  - $J$  is small and/or
  - $c/\sigma_u$  is high

# Oligopoly $J \geq 2$

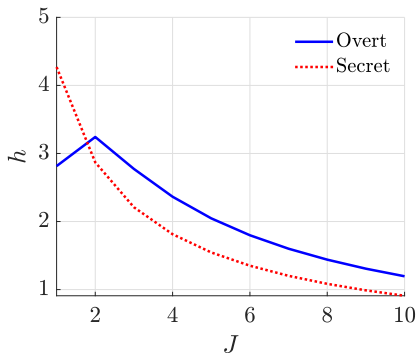


# Remarks

## 1. Observability matters for small economy

- As  $J \rightarrow +\infty$ , overt market  $\rightarrow$  secret market

## 2. Qualitative difference



## Endogenous Observability



# Endogenous observability: monopoly

Extend the model:

At  $t = -1$ , investors can decide the observability of their info acq

A monopolist investor always chooses overt info acq

# Endogenous observability: duopoly

|            |        | Investor 2                      |                         |
|------------|--------|---------------------------------|-------------------------|
|            |        | Overt                           | Secret                  |
| Investor 1 | Overt  | ( <u>.1209</u> , <u>.1209</u> ) | ( <u>.1245</u> , .1204) |
|            | Secret | (.1204, <u>.1245</u> )          | (.1235, <u>.1235</u> )  |

(a)  $c/\sigma_u = 0.06$

|            |        | Investor 2                      |                                 |
|------------|--------|---------------------------------|---------------------------------|
|            |        | Overt                           | Secret                          |
| Investor 1 | Overt  | ( <u>.0937</u> , <u>.0937</u> ) | (.0901, <u>.0941</u> )          |
|            | Secret | ( <u>.0941</u> , <u>.0901</u> ) | ( <u>.0911</u> , <u>.0911</u> ) |

(b)  $c/\sigma_u = 0.12$

- Prisoner's dilemma
- Mandatory disclosure is effective when  $c/\sigma_u$  is high
  - Investors' payoff  $\uparrow$ , market liquidity  $\uparrow$
  - Market efficiency  $\downarrow$

## Three Applications

# Implication 1: Corporate site visits

In 2006, SZSE required listed firms to disclose private meetings with investors within two days

## Mapping to our framework

- Investor  $j$ 's site visit ( $l$ ) with a company generates a signal

$$\tilde{v} + \tilde{z}_{j,l}, \text{ where } \tilde{z}_{j,l} \sim N(0, \sigma_z^2)$$

- $H_j$  visits can lead to a sufficient statistics

$$\tilde{v} + \tilde{e}_j, \text{ where } \tilde{e}_j \equiv \frac{1}{H_j} \sum_{l=1}^{H_j} \tilde{z}_{j,l} \sim N(0, h_j^{-1}) \text{ and } h_j \equiv H_j \sigma_z^{-2}$$

# Implication 1: Corporate site visits

Effective?

- When  $c/\sigma_u$  is high, i.e.,
  - long traveling time and large expenses
  - mostly traded by institutional investors

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- When  $c/\sigma_u$  is high, i.e.,
  - long traveling time and large expenses
  - mostly traded by institutional investors

Consequences?

- info acq  $\downarrow$  but net profits  $\uparrow$
- market liquidity may  $\uparrow$
- price efficiency  $\downarrow$

## Implication 2: (Digital) footprints of investors

- Downloading on SEC's EDGAR data filings (Chen et al, 2019)
- News clicks (Fedyk, 2019)
- FDA-FOIA requests (Gargano et al, 2017)
- Lobbyists hiring (Gao and Huang, 2016)
- ...

Implications: For empirical studies, investors

- may behave differently  $\Rightarrow$  **affect empirical inference**
- may deliberately leave/erase footprints  $\Rightarrow$  **data self-selection issue**

## Implication 3: Buy-side in conference calls

- Buy-side's research activities are generally unobservable
- One exception: participation in firms' earnings conference calls
- Why?

### Implications:

- Explanation: competition effect
- Prediction: If  $c/\sigma_u$  is high, more likely to observe buy-side participation



# Conclusion

1. A parsimonious framework to study overt/secret info acq
2. Two strategic effects of overt info acq
  - pricing effect
  - competition effect
3. Prisoner's dilemma for endogenous observability
4. Insights into relevant policy debates and empirical regularities.