

# Information Sharing in Financial Markets

Itay Goldstein<sup>1</sup> Yan Xiong<sup>2</sup> Liyan Yang<sup>3</sup>

<sup>1</sup>University of Pennsylvania

<sup>2</sup>HKUST

<sup>3</sup>University of Toronto

June 2022

# Info sharing is prevalent in financial markets

Professional investors share info among each other

- Shiller and Pound (1989) survey
- Hong, Kubik and Stein (2005), Pool, Stoffman, and Yonker (2015)
- Private investment communities: SumZero, Value Investors Club

The image displays two overlapping screenshots from a financial research platform. The left screenshot shows a detailed view of a research thesis for FRPH:US, including a disclaimer, a link to a formatted report, and a comments section with user avatars and text. The right screenshot shows a 'Performance Rankings' table for the period 4/11/2016 - 7/11/2016, listing six analysts and their respective performance metrics.

**Thesis: FRPH:US**

**Disclaimer:** The author of this site and the author's fund hold a position in this security at the time of posting and may trade in and out of this position without informing the fund's community.

**View the FRP Holdings, Inc. (FRPH:US) Formatted Report**

**Comments:**

- Steven Ridge** (4/11/2016): A management call conducted with Patrick Transportation scheduled in any way?
- Bill Chen** (4/11/2016): The Patrick Transportation team work Patrick Transportation. This is a problem for Value Investors as a result of interest. In reality, they are intent to spinoff the holding from the main business. Trading was roughly 50% of the volume and only 25% of the value. It assumed the value of the real estate and made a much better value. Equally important, the management's transparency, even though it was not intended to be a spin-off, you don't want that clarity to report all the way to the next edge of the market. This is a common theme in what the management's transparency is about to be a spin-off. The accuracy of the information is the key to the success of the spin-off.
- Patrick** (4/11/2016): In the next step a 10:1 conversion if the valuation doesn't convert that?
- Bill Chen** (4/11/2016): How do you view on the possible scenario of volatility?

**Performance Rankings** (4/11/2016 - 7/11/2016)

| Rank | Analyst        | Return | Alpha | Beta | Vol  |
|------|----------------|--------|-------|------|------|
| #1   | Neyan Singh    | 31%    | 10.2% | 0.75 | 0.18 |
| #2   | Stephanie Salt | 14%    | 10.2% | 0.75 | 0.18 |
| #3   | Jeremy Penn    | 11%    | 10.2% | 0.75 | 0.18 |
| #4   | Lisa Hansen    | 14%    | 10.2% | 0.75 | 0.18 |
| #5   | Lawrence Dao   | 39%    | 10.2% | 0.75 | 0.18 |
| #6   | Larry Hayes    | 10%    | 10.2% | 0.75 | 0.18 |

# Info sharing is prevalent in financial markets

Normal folks also share their investment ideas

- Twitter, Seeking Alpha, StockTwits, Reddit/ Wallstreetbets (WSB)

Posted by u/savvyliions 7 hours ago

76 43k yolo into RKL let's go

2:52

**RKL**  
Rocket Lab USA Inc

|                |                |               |
|----------------|----------------|---------------|
| Open P&L(USD)  | Day's P&L(USD) |               |
| -753.09 -1.72% | -2,067.45      |               |
| Market Value   | Total Cost     | Average Price |
| 43,035.74      | 43,788.83      | 20.00         |

325 Posted by u/myjobisontheline 1 day ago

**Uranium SUPPLY squeeze is ON.** Discussion

Hear-hear, autists and retards, Uranium is heating up to make all of you, as many trends as you desire.

Many have been following the industry, for years or months, and are witnessing the coming explosion of ALL companies Uranium. And they are fucking excited. BULLS did not think SPROTT would move the market with such ease. Which it is doing, with Canadian rupees.

Do you remember last year, posts about lumber, mattresses, or shipping, but ended up buying black berry and weed stocks?? Well this is your chance to make up for that horrible decision your wife left you over.

Some of these stocks will 3-5x, and nano caps could 10x.

194 Comments Award Share Save ...

# Info sharing is prevalent in financial markets

*Word-of-mouth transmission of ideas appears to be an important contributor to day-to-day or hour-to-hour stock market fluctuations.*  
— Shiller (2015, p.180)

Research questions:

1. Why do investors want to voluntarily share information?
2. Who shares information with whom?

# What do we do?

We consider a classic Kyle model to study info sharing in financial markets

Provide one rational theory of info sharing:

1. The coarsely informed investors have a strategic motive to share their info: “trading against order flow”/“trading against error”
  - Unique info flow: less informed  $\Rightarrow$  more informed
2. After info sharing,
  - sender profit  $\uparrow$  but receiver profit  $\downarrow$
  - liquidity  $\downarrow$ , price efficiency  $\uparrow$ , and trading volume may  $\uparrow$  or  $\downarrow$

## 1. Info sharing

- Manipulation: Benabou and Laroque (1992)
- Price correction acceleration: Ljungqvist and Qian (2016), Kovbasyuk and Pagano (2015), Liu (2017), Schmidt (2019)
- Commitment to aggressive trading: Indjejikian, Lu and Yang (2014)
- Advantage over uninformed followers: Van Bommel (2003)
- “Talk for her book”: Pasquariello and Wang (2016)
- Disagreement: Balasubramaniam (2020)

Our complementary explanation: info from less informed to more informed

## 2. Noise/supply info in financial markets:

- Ganguli and Yang (2009), Marmora and Rytchkov (2018), Farboodi and Veldkamp (2020)

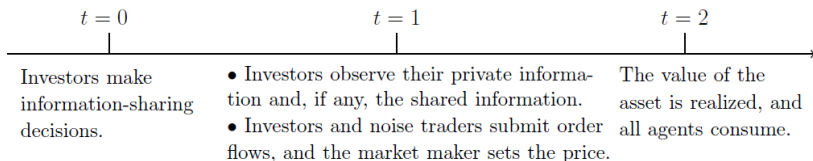
Our focus: noise in investor's info/sentiment; who shares with whom

# Model Setup

# Model setup: Key departures

Two key departures from Kyle (1985)

1. Two rational investors with info of different precision;
2. Info can be shared between them.





# Model setup: Specifics

- A risky asset with date-2 value  $\tilde{v} \sim N(0, 1)$ .
- Two risk-neutral rational investors with different-quality info
  - H observes  $\tilde{v}$
  - L observes

$$\tilde{y} = \tilde{v} + \tilde{e}, \text{ with } \tilde{e} \sim N(0, \rho^{-1}) \text{ and } \rho \in (0, \infty)$$

- At  $t = 0$ , info-sharing decisions:  $A_i \in \{\text{Share, Not share}\}$
- Investor  $i$  places order  $\tilde{x}_i$  to maximize expected profits

$$E[\tilde{x}_i(\tilde{v} - \tilde{p}) | \mathcal{F}_i]$$

For instance, if L shares but H does not,  $\mathcal{F}_H = \{\tilde{v}, \tilde{y}\}$  and  $\mathcal{F}_L = \{\tilde{y}\}$

- Trading. Noise traders  $\tilde{u} \sim N(0, \sigma_u^2)$  and market makers set pricing rule

$$\tilde{p} = E(\tilde{v} | \tilde{\omega}), \text{ with } \tilde{\omega} = \tilde{x}_H + \tilde{x}_L + \tilde{u}$$

## Results

# Equilibrium at the trading stage

## Subgames at the trading stage

- **Subgame 1:** Neither investors shares info:  $A_L = \emptyset$  and  $A_H = \emptyset$ 
  - Info sets:  $\mathcal{F}_L = \{\tilde{y}\}$  and  $\mathcal{F}_H = \{\tilde{v}\}$
  - Trading strategies:  $\tilde{x}_L = \beta_y^{\emptyset\emptyset} \tilde{y}$  and  $\tilde{x}_H = \alpha_v^{\emptyset\emptyset} \tilde{v}$ , where

$$\beta_y^{\emptyset\emptyset} = \frac{\rho\sigma_u}{\sqrt{4 + \rho(5 + 2\rho)}} \text{ and } \alpha_v^{\emptyset\emptyset} = \frac{(2 + \rho)\sigma_u}{\sqrt{4 + \rho(5 + 2\rho)}}$$

- Pricing rule  $\tilde{p} = \lambda^{\emptyset\emptyset} \tilde{\omega}$ , where

$$\lambda^{\emptyset\emptyset} = \frac{\sqrt{4 + \rho(5 + 2\rho)}}{(4 + 3\rho)\sigma_u}$$

# Equilibrium at the trading stage

- **Subgame 2:** L shares but H does not:  $A_L = S$  and  $A_H = \emptyset$ 
  - Info sets:  $\mathcal{F}_L = \{\tilde{y}\}$  and  $\mathcal{F}_H = \{\tilde{v}, \tilde{y}\}$
  - Trading strategies:  $\tilde{x}_L = \beta_y^{S\emptyset} \tilde{y}$  and  $\tilde{x}_H = \alpha_v^{S\emptyset} \tilde{v} + \alpha_y^{S\emptyset} \tilde{y}$ , where

$$\beta_y^{S\emptyset} = \frac{2\rho\sigma_u}{\sqrt{(1+\rho)(9+8\rho)}}, \quad \alpha_v^{S\emptyset} = \frac{3\sigma_u\sqrt{1+\rho}}{\sqrt{9+8\rho}},$$

$$\text{and } \alpha_y^{S\emptyset} = -\frac{\rho\sigma_u}{\sqrt{(1+\rho)(9+8\rho)}}$$

- Pricing rule  $\tilde{p} = \lambda^{S\emptyset} \tilde{\omega}$ , where

$$\lambda^{S\emptyset} = \frac{\sqrt{9+8\rho}}{6\sigma_u\sqrt{1+\rho}}.$$

H trades against the information shared by L:  $\alpha_y^{S\emptyset} < 0!$

# Why $\alpha_y^{S\emptyset} < 0$ ?

- Interpretation 1: Trade against order flow

$$\tilde{x}_H = \underbrace{\frac{1}{2\lambda^{S\emptyset}} E(\tilde{v}|\tilde{v}, \tilde{y})}_{\text{Forecasting fundamental}} \quad \underbrace{-\frac{1}{2} E(\tilde{x}_L|\tilde{v}, \tilde{y})}_{\text{Trading against order flow}}$$

- H has known the fundamental perfectly:  $\frac{\partial E(\tilde{v}|\tilde{v}, \tilde{y})}{\partial \tilde{y}} = 0$
- As L always trades on her information ( $\beta_y^{S\emptyset} > 0$ ),

$$\alpha_y^{S\emptyset} = \frac{\partial}{\partial \tilde{y}} \left[ -\frac{1}{2} E(\tilde{x}_L|\tilde{v}, \tilde{y}) \right] = -\frac{\beta_y^{S\emptyset}}{2} < 0$$

- Interpretation 2: Trade against error

$$\tilde{x}_H = \alpha_v^{S\emptyset} \tilde{v} + \alpha_y^{S\emptyset} \tilde{y} = \left( \alpha_v^{S\emptyset} + \alpha_y^{S\emptyset} \right) \tilde{v} + \alpha_y^{S\emptyset} \tilde{e}$$

- L's trading on  $\tilde{e}$  is dumb money in the eye of H

# Equilibrium at the trading stage

- **Subgame 3:** H shares info:  $A_H = S$ 
  - Info sets:  $\mathcal{F}_L = \{\tilde{y}\}$  and  $\mathcal{F}_H = \{\tilde{v}\}$  (or  $\mathcal{F}_H = \{\tilde{v}, \tilde{y}\}$ )
  - Trading strategies:  $\tilde{x}_L = \beta_v^S \tilde{v}$  and  $\tilde{x}_H = \alpha_v^S \tilde{v}$ , where

$$\beta_v^S = \alpha_v^S = \frac{\sigma_u}{\sqrt{2}},$$

- Pricing rule  $\tilde{p} = \lambda^{\emptyset\emptyset} \tilde{\omega}$ , where

$$\lambda^{\emptyset\emptyset} = \frac{\sqrt{4 + \rho(5 + 2\rho)}}{(4 + 3\rho)\sigma_u}$$

# Equilibrium at the info-sharing stage

Go back to date 0 to analyze investors' info sharing decisions.

|   |                           | H  |  |
|---|---------------------------|--|--|
|   |                           | Not share ( $\emptyset$ )  | Share ( $S$ )  |
| L | Not Share ( $\emptyset$ ) | $\frac{\rho(1+\rho)\sigma_u}{(4+3\rho)\sqrt{4+5\rho+2\rho^2}}, \frac{(2+\rho)^2\sigma_u}{(4+3\rho)\sqrt{4+5\rho+2\rho^2}}$ | $\frac{\sigma_u}{3\sqrt{2}}, \frac{\sigma_u}{3\sqrt{2}}$ |
|   | Share ( $S$ )             | $\frac{2\rho\sigma_u}{3\sqrt{(1+\rho)(9+8\rho)}}, \frac{(9+4\rho)\sigma_u}{6\sqrt{(1+\rho)(9+8\rho)}}$                     | $\frac{\sigma_u}{3\sqrt{2}}, \frac{\sigma_u}{3\sqrt{2}}$ |

## Proposition

*There exists a unique equilibrium in which L shares her info whereas H does not.*

# Why does L share info?

Decomposition of L's profit:

$$\underbrace{\pi_L^{S\emptyset} - \pi_L^{\emptyset\emptyset}}_{\text{total effect: } > 0} = \underbrace{\pi_L^{\text{direct}} - \pi_L^{\emptyset\emptyset}}_{\text{direct effect: } > 0} + \underbrace{\pi_L^{S\emptyset} - \pi_L^{\text{direct}}}_{\text{indirect effect: } > 0}$$

- Direct effect: holding constant L's trading rule and the market maker's pricing rule, H trades against L's info
- Indirect effect: investor L's trading rule and the market maker's pricing rule adjust in response to info sharing



## Proposition

*From no info sharing to info sharing:*

(1) *L's profit  $\uparrow$ , H's profit  $\downarrow$ , and the combined profit  $\uparrow$*

- H's profit:

$$\underbrace{\pi_H^{S\emptyset} - \pi_H^{\emptyset\emptyset}}_{\text{total effect: } < 0} = \underbrace{\pi_H^{\text{direct}} - \pi_H^{\emptyset\emptyset}}_{\text{direct effect: } > 0} + \underbrace{\pi_H^{S\emptyset} - \pi_H^{\text{direct}}}_{\text{indirect effect: } < 0}$$

- Example: if  $\rho = 1$  and  $\sigma_u = 1$ , via info sharing,  $\pi_L \uparrow 32.7\%$ ,  $\pi_H \downarrow 4.1\%$ , and  $\pi_H + \pi_L \uparrow 2.6\%$  (noise traders are harmed)

## Proposition

*From no info sharing to info sharing:*

- (1) L's profit  $\uparrow$ , H's profit  $\downarrow$ , and the combined profit  $\uparrow$*
- (2) Market liquidity  $\downarrow$ , and market efficiency  $\uparrow$ . Trading volume  $\uparrow$  iff L owns imprecise info.*

H trading against error  $\Rightarrow$  Less error in the aggregate order flow

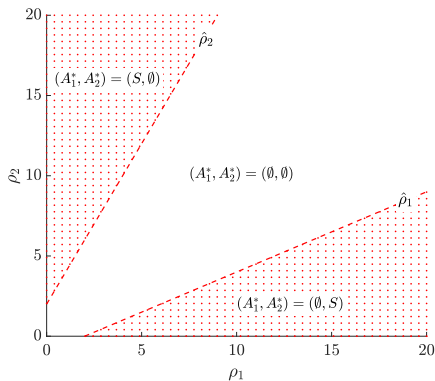
1. Market liquidity  $\lambda$
2. Price efficiency  $Var^{-1}(\tilde{v}|\tilde{p})$
3. Trading volume:  $TV = \frac{1}{2} \left( E[|\tilde{x}_H| + |\tilde{x}_L| + |\tilde{\omega}| + |\tilde{u}|] \right)$

## **Extensions and Variations**

# Extensions and variations

1. Imperfectly informed H-investor
  - Result: L still shares if H is well informed
2. Ex-post info sharing
  - Result: That L shares information with H is always an equilibrium
3. H: "I am not listening"
  - Result: That all Hs commit not to listen cannot be sustained in equilibrium
4. Publicly shared info
  - Result: L still shares if market makers have low ability to interpret the shared info
5. Other extensions
  - Endogenous info acquisition by L
  - Multiple Hs and Ls
  - Three differentially informed investors

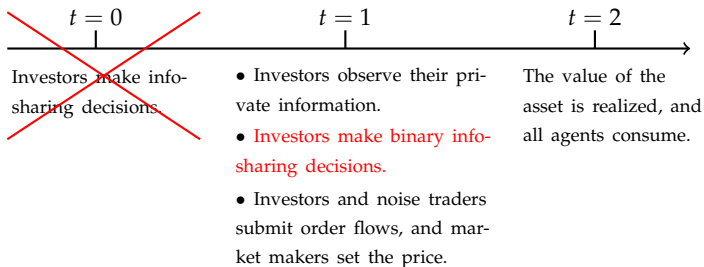
# 1. Imperfectly informed H-investor



- Investor  $i$ 's info:  $\tilde{y}_i = \tilde{v} + \tilde{e}_i$ ,  $\tilde{e}_i \sim N(0, \rho_i^{-1})$  and  $\rho_i \in (0, +\infty]$
- WLOG, assume  $\rho_1 \geq \rho_2$  and 2 shares info with 1

$$\tilde{x}_1 = \underbrace{\alpha_y}_{>0} \tilde{y}_1 + \underbrace{\alpha_2}_{<0 \text{ iff } \rho_1 > \hat{\rho}_1 \equiv 2(1+\rho_2)} \tilde{y}_2$$

## 2. Ex-post info sharing



### Results:

- (1) *Neither L nor H shares info in equilibrium?* No, "someone must share info in equilibrium"
- (2) *H shares info in equilibrium?* No, "H never shares info in equilibrium"
- (3) There exists an equilibrium in which L always shares whereas H does not share.

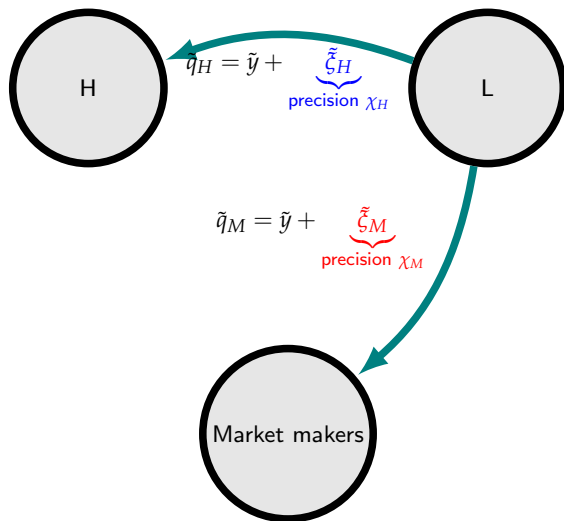
### 3. H: “I am not listening”

- $L$  observes  $\tilde{y}$  and a number  $M$  of  $H$ s observe  $\tilde{v}$
- $H$ s can commit not to receiving the shared info

#### Proposition

- (1) *When  $M \geq 3$ ,  $L$  shares and every  $H$  commits not to use the shared info*
- (2)  $\exists \hat{M} > 0$  such that when  $M > \hat{M}$  the following equilibrium always exists:
  - $L$  shares her info and all  $H$ s use  $L$ 's shared information
  - $H$ s' profits would be higher had they all committed not to use the shared info.

## 4: Publicly shared information

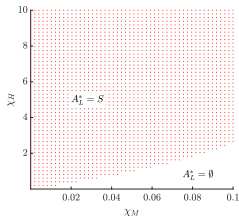


- Info may be leaked to market makers in the communication process.
- Baseline model:  $\chi_H = \infty$  and  $\chi_M = 0$

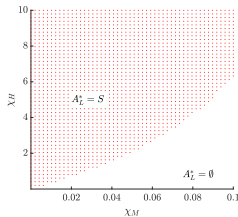


## 4: Publicly shared information

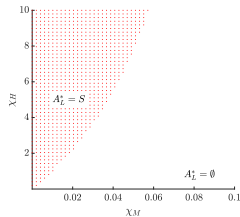
L's sharing decisions:



(a)  $\rho = 3$



(b)  $\rho = 5$



(c)  $\rho = 10$

# Applications

# Application 1: Market chatters: private communication among investors

- Private communication/ Market chatters: Zaloom (2003)
  - Shiller and Pound (1986), Hong et al. (2005), Pool et al. (2015)
  - Private investment communities: SumZero, Value Investors Club
- Consistent evidence
  1. Crawford et al. (2017): predominantly small hedge fund managers share in Value Investors Club
    - ~ coarsely informed investors more likely to share
  2. Cowgill and Zitzewitz (2015): more experienced traders trade against optimism bias in Google's prediction markets
    - ~ trade against error

## Application 2: Public communication on social media

- Mapping to our model
  - L: representative social media posters
  - H: hedge funds who analyze tweets or r/wallstreetbets
  - MM has low ability to read the public info
- So, social media opinions can be truthful but noisy. We thus explain
  - Why info sharing is so prevalent?
  - Why investment posts contain fundamental info (Chen et al, 2014),
  - but noisy at the same time (Antweiler and Frank, 2004)?
- The merit of sentiment trading strategy? If H is already well informed, trading against social media sentiment can backfire

# Conclusion

1. A coarsely informed investor has a strategic incentive to share her info with the well informed.
  - **Trading against order flow/ error**
2. After info sharing, sender profit  $\uparrow$  but receiver profit  $\downarrow$ . Noise traders  $\downarrow$ .
3. Market liquidity  $\downarrow$ , price efficiency  $\uparrow$ , and trading volume may  $\uparrow$  or  $\downarrow$ .