Adverse Selection, Informational Feedback Effect, and the Optimal Disclosure Policy

Pingyang Gao and Pierre Jinghong Liang

Chicago Booth and CMU

FARS mid-year meeting

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Main Idea

Disclosure → Leveled Playing-field → Firm Value
Main Idea

Disclosure → Leveled Playing-field → Liquidity Cost → Firm Value
Main Idea

Disclosure → Leveled Playing-field → Liquidity Cost → Firm Value

Investment Efficiency
Main Idea

Disclosure → Leveled Playing-field

Liquidity Cost

Investment Efficiency

Firm Value
Secondary stock market provides liquidity to investors.
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Information asymmetry among investors leads to adverse selection and illiquidity.
Secondary stock market provides liquidity to investors.

Information asymmetry among investors leads to adverse selection and illiquidity.

Disclosure improves liquidity by preempting informed traders’ information advantage.
Another Traditional View: Informational Feedback

Stock market generates information that guides investment.
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- Hayek and the Socialist Calculation Debate
Another Traditional View: Informational Feedback

Stock market generates *information* that guides investment.

- Hayek and the Socialist Calculation Debate
- Efficient Market Hypothesis
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- Regulatory orientation towards insider trading, short sellers, Regulation FD...
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- **Firms** learn information from stock price to guide investment.
Another Traditional View: Informational Feedback

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- Efficient Market Hypothesis
- Regulatory orientation towards insider trading, short sellers, Regulation FD...
- Proliferation of prediction markets
- Firms learn information from stock price to guide investment.
- Empirical support: Roll (1984), M&A, investment sensitivity to price...
Advantage of information production by market

1. Tacit knowledge: gut feelings, hunches, instinct, six sense...

2. Low search cost: efficient utilization of information production expertise from ex ante unknown sources.

3. Incentive compatible: pure self-interest produces most accurate information in least costly way.
Advantage of information production by market

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Information Structure: Two Features

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Firm Information (Disclosure)
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Firm Information (Disclosure)

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Firm Information (Disclosure)

Overlapping

New Information
Main Results and Contributions

- A positive theory of disclosure that reconciles disclosure with other institutional features.

- New Predictions
  - Growth firms are endogenously opaque.
  - Higher disclosure quality is associated with lower information acquisition cost and better investor protection.

- Provide modeling tools and a framework to study the informational feedback effect.
Related Literatures

- Informational feedback effect to reinterpret corporate finance issues.
- Real effects of disclosure: a new channel
- Noisy rational expectations literature
The Basic Model
## Timeline of the Model

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<thead>
<tr>
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<tbody>
<tr>
<td></td>
<td>Firm commits to a disclosure level and issues shares to original investors.</td>
<td>Speculator acquires a signal; Firm makes disclosure; liquidity shocks realized; Firm shares traded in secondary market.</td>
<td>Firm observes stock price and chooses investment.</td>
<td>Cash flow is realized.</td>
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Figure 1: The Timeline
## Timeline of the Model

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Firm has one asset-in-place and one growth opportunity.
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Asset-in-place

\[ \tilde{A} = A_0 + \tilde{\mu} \]
Firm has one asset-in-place and one growth opportunity.

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Information Structure: Two Features

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Firm Information

| Overlapping | New Information |

Firm and Speculator Information Structures
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Diagram:
- Firm Information
- Speculator’s
Information Structure: Two Features

1. Firm’s information correlates with speculator’s.
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Information Structure

\[ \tilde{\mu} = \tilde{f} + \tilde{m} \]
Information Structure

\[ \tilde{\mu} = \tilde{f} + \tilde{m} \]

- Firm receives \( f \) and could disclose \( x \) with quality \( \beta \).

\[ \tilde{x} = \tilde{f} + \tilde{\epsilon} \]
Information Structure

\[ \tilde{\mu} = \tilde{f} + \tilde{m} \]

- Firm receives \( f \) and could disclose \( x \) with quality \( \beta \).

\[ \tilde{x} = \tilde{f} + \tilde{\epsilon} \]

- Speculator incurs cost \( \frac{\zeta}{2}\gamma^2 \) to receive a signal \( y \).

\[ \tilde{y} = \begin{cases} \tilde{\mu} & \text{with probability } \gamma \\ \emptyset & \text{with probability } 1 - \gamma \end{cases} \]
Reinterpretation of Information Structure

Firm Information

Overlapping

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Liquidity and Learning
FARS mid-year meeting
Reinterpretation of Information Structure

Firm Information

Overlapping

New Information

Gao and Liang (Chicago Booth and CMU)

Liquidity and Learning

FARS mid-year meeting
Speculator: Strategic trading based on her information.
Speculator: Strategic trading based on her information.

Investors: Trade for liquidity needs $n$. 
Trading: Kyle Price Formation

- Speculator: Strategic trading based on her information.
- Investors: Trade for liquidity needs $n$.
- Market Maker: Observe total order flow, and set a price $P_2$ to clear market and break even.
Complexity in Learning

\[ \tilde{G} = \tilde{\mu}K - \frac{1}{2g}K^2 \]

is a function of \( \mu \).

\[ E[\tilde{G}] = E[g^2E[\tilde{\mu}\mid \Omega]] \]

is not linear in \( \mu \).

Price is not linear in \( \mu \).

Learning is not tractable.
\[ \tilde{G} = \tilde{\mu} K - \frac{1}{2g} K^2 \]

- \( K|\Omega = gE[\tilde{\mu}|\Omega] \) is a function of \( \mu \).
\[ \tilde{G} = \tilde{\mu}K - \frac{1}{2g}K^2 \]

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Complexity in Learning

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- \( K|\Omega = gE[\tilde{\mu}|\Omega] \) is a function of \( \mu \).
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- Price is not linear in \( \mu \).
- Learning is not tractable.
A Modeling Trick

- Trade two claims. One on asset-in-place, the other on growth opportunity;
A Modeling Trick

- Trade two claims. One on asset-in-place, the other on growth opportunity;

- Prices of two claims have the same informational properties;
Trade two claims. One on asset-in-place, the other on growth opportunity;

Prices of two claims have the same informational properties;

The informational properties of price of claim on AIP is tractable.
Firm maximizes firm value

\[
\max_{\beta} P_1 \equiv E[A] - \pi(\beta) + E[G(\beta)] - \frac{w}{2} \beta^2
\]
Firm maximizes firm value

$$\max_{\beta} P_1 \equiv E[A] - \pi(\beta) + E[G(\beta)] - \frac{w}{2}\beta^2$$

- $E[A]$: Value of AIP is independent of $\beta$. 
Firm maximizes firm value

\[
\max_{\beta} P_1 \equiv E[A] - \pi(\beta) + E[G(\beta)] - \frac{w}{2} \beta^2
\]

- \(E[A]\): Value of AIP is independent of \(\beta\).
- \(\pi(\beta)\): liquidity cost decreases in \(\beta\).
Firm maximizes firm value

\[ \max_{\beta} P_1 \equiv E[A] - \pi(\beta) + E[G(\beta)] - \frac{w}{2} \beta^2 \]

- \( E[A] \): Value of AIP is independent of \( \beta \).
- \( \pi(\beta) \): Liquidity cost decreases in \( \beta \).
- \( E[G(\beta)] \): Value of growth opportunity decreases in \( \beta \).
Main Results
Supporting the Main Idea

Disclosure
Leveled Playing-field
Firm Value
Supporting the Main Idea

Disclosure \rightarrow \text{Leveled Playing-field} \rightarrow \text{Firm Value}
Supporting the Main Idea

Disclosure → Leveled Playing-field → Liquidity Cost → Firm Value
Supporting the Main Idea

Disclosure → Leveled Playing-field → Liquidity Cost → Investment Efficiency → Firm Value
Disclosure levels the playing-field

\[ \gamma^*(\beta) = \frac{\sigma_n^2}{2c} \sqrt{\sigma_m^2 + (1 - \beta)\sigma_f^2} \]
Disclosure levels the playing-field

\[ \gamma^*(\beta) = \frac{\sigma_n}{2c} \sqrt{\sigma_m^2 + (1 - \beta)\sigma_f^2} \]

Speculator acquires less information when the firm discloses more.
Disclosure levels the playing-field

\[ \gamma^*(\beta) = \frac{\sigma_n}{2c} \sqrt{\sigma_m^2 + (1 - \beta)\sigma_f^2} \]

Speculator acquires less information when the firm discloses more.
A leveled playing-field reduces liquidity cost

\[ \pi(\gamma) = \frac{\sigma_n}{2} \gamma^*(\beta) \sqrt{\sigma_m^2 + (1 - \beta)\sigma_f^2} \]
A leveled playing-field reduces liquidity cost

\[ \pi(\gamma) = \frac{\sigma n}{2} \gamma^*(\beta) \sqrt{\sigma_m^2 + (1 - \beta)\sigma_f^2} \]

Liquidity cost is lower when disclosure is of better quality.
A leveled playing-field reduces investment efficiency

\[ K|\Omega = gE[\tilde{\mu}|\Omega] \]

\[ E[G] = \frac{g}{2} \left( \frac{\sigma_m^2}{2} \gamma^*(\beta) + \sigma_f^2 \right) \]
A leveled playing-field reduces investment efficiency

\[ K|\Omega = gE[\tilde{\mu}|\Omega] \]

\[ E[G] = \frac{g}{2} \left( \frac{\sigma^2_m}{2} \gamma^*(\beta) + \sigma^2_f \right) \]

- Investment efficiency increases in informativeness of the price to the firm.
A leveled playing-field reduces investment efficiency

\[ K|\Omega = gE[\bar{\mu}|\Omega] \]

\[ E[G] = \frac{g}{2} \left( \frac{\sigma_m^2}{2} \gamma^*(\beta) + \sigma_f^2 \right) \]

- Investment efficiency increases in informativeness of the price to the firm.

- Price is more informative to the firm when speculator acquires more information.
A leveled playing-field reduces investment efficiency

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- Investment efficiency increases in informativeness of the price to the firm.
- Price is more informative to the firm when speculator acquires more information.
- Profit-driven information acquisition has a positive value for the firm.
**Main Result**

**Proposition 1**

The optimal disclosure policy trades off two countervailing effects of disclosure on liquidity cost and investment efficiency.

\[
\frac{d}{d\beta} P_1(\beta) = \left( -\frac{d\pi(\beta)}{d\beta} \right) - \left( -\frac{dE[G(\beta)]}{d\beta} + \beta w \right)
\]

- **Marginal benefit of disclosure**
- **Marginal cost of disclosure**
Reconcile disclosure policy with other institutional features

Corollary
Firm value increases in the cost of information acquisition if and only if the informational feedback effect is sufficiently small.
Growth and Disclosure Quality

Dissect Market-to-Book Ratio

\[ GROWTH \equiv \frac{E[A] + E[G]}{E[A]} = 1 + \frac{g(\frac{\sigma_m^2}{2} \gamma^* + \sigma_f^2)}{2A_0} \]
Growth and Disclosure Quality

**Dissect Market-to-Book Ratio**

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**Proposition 2**

A firm discloses less if

1. it has higher growth prospect (higher \( g \));
**Growth and Disclosure Quality**

**Dissect Market-to-Book Ratio**

\[
\text{GROWTH} \equiv \frac{E[A] + E[G]}{E[A]} = 1 + g \left( \frac{\sigma_m^2 \gamma^* + \sigma_f^2}{2A_0} \right)
\]

**Proposition 2**

A firm discloses less if

1. it has higher growth prospect (higher \(g\));

2. its growth depends more on New Information \( \tilde{m} \) (higher \(\sigma_m^2\)).
**Proposition 2**

A firm discloses less if

1. it has higher growth prospect (higher $g$);
2. its growth depends more on New Information $\tilde{m}$ (higher $\sigma_m^2$);
3. its growth depends less on Firm Information $\tilde{f}$ (lower $\sigma_f^2$).
Proposition 3

Disclosure quality is higher if

1. Information acquisition cost is lower;
2. Liquidity trade is higher.
Proposition 3

Disclosure quality is higher if

1. information acquisition cost is lower;
Proposition 3

Disclosure quality is higher if

1. information acquisition cost is lower;

2. liquidity trade is higher.
Proposition 3

Disclosure quality is higher if

1. information acquisition cost is lower;
2. liquidity trade is higher.

Investor protection leads to higher disclosure quality by lowering information acquisition cost and increasing liquidity trade.
Who is the most efficient information producer?

Proposition 4

If the firm could use the same technology the speculator has to acquire information about $\tilde{m}$, the firm chooses $\gamma_{FB}$. Compared with this first best the information production in the baseline model is either too low or too high.

The misalignment of social and private value of information

Speculator is interested in trading profit. Both $f$ and $m$ are useful

Firm is interested in New Information $m$

Compare the market solution with the contractual solution

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If the firm could use the same technology the speculator has to acquire information about \( \tilde{m} \), the firm chooses \( \gamma^{FB} \). Compared with this first best the information production in the baseline model is either too low or too high.

- The misalignment of social and private value of information
  - Speculator is interested in trading profit. Both \( f \) and \( m \) are useful
  - Firm is interested in New Information \( m \)
- Compare the market solution with the contractual solution
It does not matter who learns from price.

Other decisions that could rely on information in stock price
It does not matter who learns from price.

Other decisions that could rely on information in stock price

1. Investors price new issuance;
It does not matter who learns from price.

Other decisions that could rely on information in stock price

1. Investors price new issuance;
2. Lenders decide to call a loan;
It does not matter who learns from price.

Other decisions that could rely on information in stock price:

1. Investors price new issuance;
2. Lenders decide to call a loan;
3. Employees make investment in firm-specific human capital;
It does not matter who learns from price.

Other decisions that could rely on information in stock price

1. Investors price new issuance;
2. Lenders decide to call a loan;
3. Employees make investment in firm-specific human capital;
4. Suppliers and customers make relationship investment with the firm.
Disclosure is thought to increase proprietary cost;
Disclosure is thought to increase proprietary cost;

Disclosure also makes competitors learn less from stock price;
Disclosure is thought to increase proprietary cost;

Disclosure also makes competitors learn less from stock price;

Overall, disclosure could reduce proprietary cost.
Take-away

Disclosure → Leveled Playing-field → Liquidity Cost → Firm Value
Take-away

Disclosure → Leveled Playing-field

Liquidity Cost

Firm Value

Investment Efficiency

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