

Information in Financial Markets and Its Real Effects

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Information in Prices

- A basic premise in financial economics: market prices are very informative about assets fundamentals
- This line of thinking goes back to **Hayek (1945)**
 - He argued that prices are key sources of information for guiding production and allocation decisions
 - Prices aggregate information from many different traders, providing information that would be hard to generate otherwise
 - While Hayek was referring to prices of all goods and services in the economy, the argument applies to financial-market prices

The Feedback Effect

- Given the information content in market prices, it is natural to expect that decision makers in the real side of the economy will make use of this information in their decisions
- **What prices** may be useful?
 - Stock prices, futures prices, bond prices; depending on the context
- **Who can learn** from prices?
 - Managers, creditors, regulators, customers, employees, etc.
 - As long as there is *some* information in the price they don't know
- Much of the literature focuses on managers learning from stock prices

Implications for Theory

- **Bond, Edmans, and Goldstein (2012)** highlight two implications:
 - Incorporating the feedback effect into models of trading in financial markets fundamentally changes predictions on price formation in financial markets and helps understanding some observed phenomena
 - Different notions of efficiency which might be in conflict
 - Forecasting Price Efficiency (FPE), or **Market Efficiency**
 - Revelatory Price Efficiency (RPE), or **Real Efficiency**
 - Former is often emphasized, but latter really matters

Layout of the Rest of the Talk

- Reviewing the empirical evidence
- Example of a feedback model helping to understand observed phenomena:
 - The case of trading frenzies
- Example of a feedback model drawing contrast between market efficiency and real efficiency
 - Who learns what
- Thinking about the new information era and its implications

Empirical Evidence

A Recent Anecdote

- On February 4, 2020
 - WSJ reported ICE (owner of NYSE) had made a takeover offer for eBay
 - ICE shares dropped 7.5%
- On February 6, 2020
 - ICE shares dropped almost another 3%
 - “Based on investor conversations following today’s ICE earnings call, ICE has decided to cease exploring strategic opportunities with eBay.”
 - ICE shares rallied roughly 3% in after-hours trading

Empirical Evidence on Firms' Learning

- Empirical Challenge:
 - Correlation between prices and corporate investments are not necessarily indication of active learning
 - They could both be affected by the same underlying fundamental
- Evidence relying on the idea that **investment-price sensitivity** will be stronger in some cases than others:
 - The evidence suggests that firms rely on prices more when they are expected to do so based on informational theories

- **Luo (2005)** – Mergers are more likely to be cancelled when prices react more negatively and managers are trying to learn, i.e., when uncertainty is not about technology and deal is easier to reverse
- **Chen, Goldstein, and Jiang (2007)** and **Bakke and Whited (2010)** – Sensitivity of investment to price is higher when prices are more informative, based on microstructure variables, even when controlling for measures of managerial information
- **Foucault and Fresard (2012)** – Cross-listed firms have stronger investment-price sensitivity since prices become more informative with multiple markets

- **Foucault and Fresard (2014)** – Firms' investments are sensitive to their peers' stock prices when they are more informative; their sensitivity to their own stock prices decreases when their peers' prices are more informative
- **Zuo (2016)** – Firms update earnings forecasts following price reactions in cases where prices are expected to have more information
- **Edmans, Jayaraman, and Schneemeier (2017)** – Investment sensitivity to price increases following greater enforcement of insider-trading laws
- **Jayaraman and Wu (2020)** – Firms use voluntary disclosure on capital expenditure to elicit market feedback and adjust investments accordingly

- Evidence relying on the effect of **non-fundamental shocks** to prices:
 - The evidence suggests that attempting to learn from the price brings noise into investment decisions when managers cannot tell what affects price changes
 - **Edmans, Goldstein, and Jiang (2012)** – Using mutual-fund extreme outflows as a non-fundamental shock to price, it is shown that firms more exposed to the shock are more likely to become takeover targets
 - **Dessaint, Foucault, Fresard, and Matray (2019)** – Using the same non-fundamental shock to prices, it is shown that firms respond to a negative shock for their peers by cutting their own investments

- The literature is still growing
 - Active debates on measurements of informativeness or mispricing
 - New empirical settings to identify feedback effects
- Large evidence points to an active role of the market
 - The information in prices affects firms' decisions
 - As a byproduct, noise in prices might also have a real effect

"In certain circumstances, financial markets can affect the so-called fundamentals which they are supposed to reflect." **George Soros**

Recent Survey Evidence

- **Goldstein, Liu, and Yang (2021):**
 - Survey of 3,626 Chinese public firms
 - Response rate close to 100%
 - Direct evidence from the “horse’s mouth” of feedback effects and learning
 - Vast majority of firms say **they care about stock prices**
 - Most common reasons are **learning and financing**
 - Empirical analysis relates firms’ characteristics to survey responses

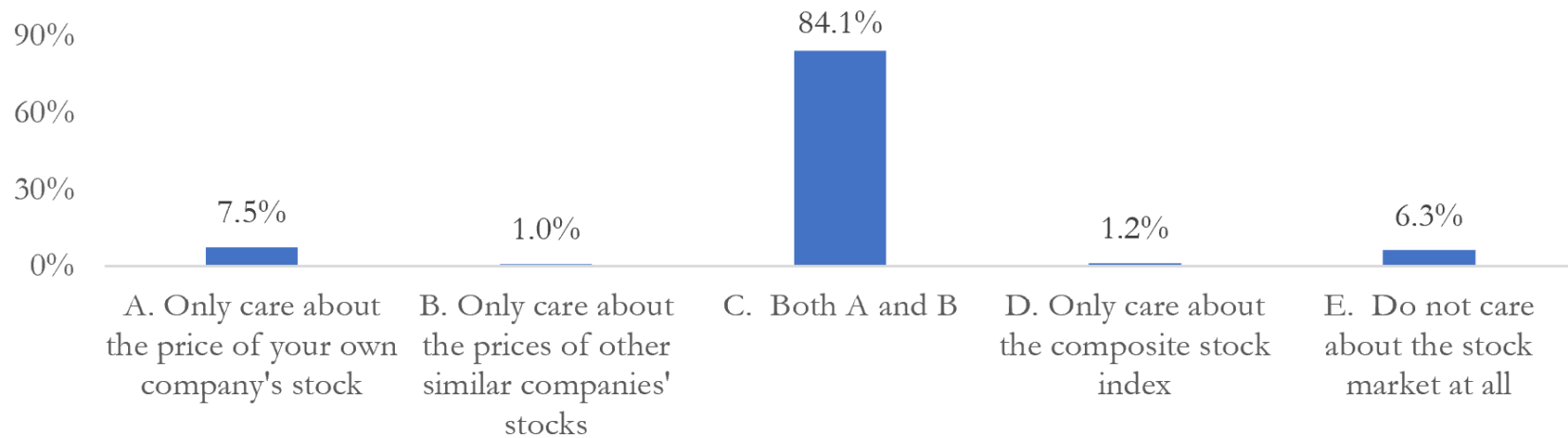


Figure 2: Responses to survey question I

This figure plots the frequencies by which each choice is chosen by the 3,626 responding firms in survey question I (“*How does your company pay attention to the stock market?*”).

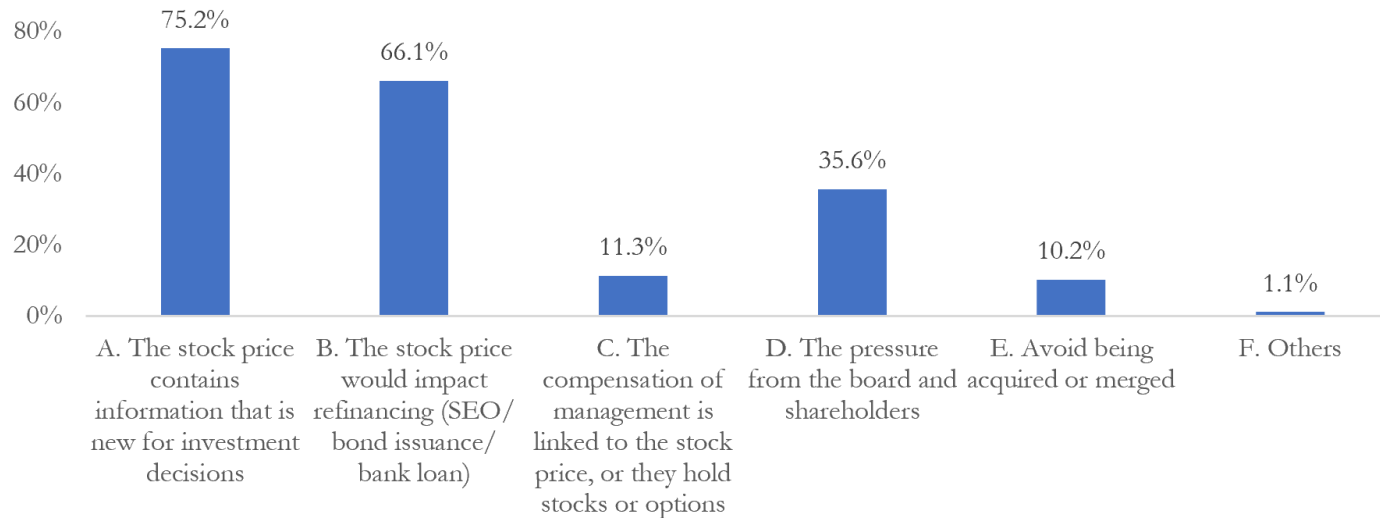


Figure 3: Responses to survey question II

This figure plots the frequencies by which each choice is chosen by the 3,320 responding firms choosing A or C in survey question II (“If you choose A or C in I: Which of the following is the reason that your company CAREs about the stock price of your OWN company?”).

Feedback Models Helping to Explain Market Phenomena: Trading Frenzies

Strategic Complementarities and Trading Frenzies

- Studied by **Goldstein, Ozdenoren, and Yuan (2013)**
- Trading Frenzies arise when speculators rush to trade in the same direction causing large pressure on price
 - Think of **meme stocks** on the upside or **bear raids** on the downside
- What causes trading frenzies?
 - Markets usually feature strategic substitutes due to price mechanism, not complementarities

- Feedback effect turns out to be source of complementarities
 - Consider capital providers deciding how much capital to provide for a new real investment in the firm
 - Decisions of capital providers depend on assessment of investment productivity, based on private information and financial market price
 - Due to **feedback effect**, speculators tend to act like each other and use **correlated information** (say from online forums) as opposed to their own information: **trading frenzy**
 - A higher price improves the firm's access to capital, increasing firm value, and increasing incentive to buy

Relation to Recent Events

- Such frenzies rattled financial markets recently, generating calls for big changes in market regulation due to market volatility
- Maybe more interesting are the effects such frenzies might have on **capital allocation** in the real economy
- Recent events demonstrated the fast feedback effects frenzies might have on capital allocation:
 - **AMC** and later **GameStop** actively raised new capital based on attractive prices

- This was critical for AMC's survival enabling it to avoid bankruptcy
- **American Airlines** had a similar, perhaps less dramatic, experience
- **Information structure** is key for the emergence of frenzies:
 - “A large volume of activity in such [internet] forums could suggest that speculators have more common information than private information and so trading frenzies become more likely to occur”
- **Feedback effects** are also key:
 - Feedback effects provide fuel to trading frenzies, pushing prices further away from fundamentals with damaging real effects

Real Efficiency vs. Market Efficiency: Who Learns What

Who Learns What?

- Economic decisions are complex and involve multiple dimensions of information
- This is important to consider when thinking about market feedback, as the market may not always provide the relevant information, as in **Goldstein and Yang (2019)**
- A recent paper by **Goldstein, Schneemeier, and Yang (2021)** provides analysis endogenizing information choice for firm and market to further understand market efficiency vs. real efficiency

- Consider two dimensions of information
 - Market has comparative advantage in one and firm in the other
 - Optimal allocation is that both sides focus on their specialty
- However, equilibrium outcomes might be different:
 - Firm always has an incentive to produce different information from the market, trying to have **maximum information for decision**
 - However, market participants sometimes want to produce the same information as the firm

- Knowing what the firm knows increases the **sensitivity of final cash flows to produced information**
- Incentives depend on ex-ante profitability of the investment under considerations, and so do equilibrium outcomes
- Analysis reveals the disconnect between different efficiency notions:
 - **Market efficiency** – correlation between prices and final cash flows – is high when market produces same information as firm
 - **Real efficiency** – expected firm value – is high when they produce different information

New Information Technologies

FinTech, Big Data, and Information

- FinTech and Big Data are changing the landscape of the financial industry and of research in finance
 - See two recent special issues at *RFS*
- A big part of these phenomena involves changes in information
 - Existing information can be processed, analyzed, and aggregated much more quickly and effectively: **Big data, machine learning**
 - There are **new sources of information**, including real-time information about consumer transactions, satellite images, etc.

What are the Implications?

- Instinct says that all the information will improve the efficiency of markets and resource allocation. However, caution is required
- Improvement in market efficiency is not guaranteed
 - New sources of information crowd out old ones; **Dugast and Foucault (2018)**: fast imprecise signals replace slow precise signals
- Market efficiency does not automatically translate to real efficiency
 - Market can focus on what managers know: **Goldstein and Yang (2019)**

Previous Experience with Information Technology

- To understand the effects of information technology, we can look to past experiences
- The implementation of electronic filing **EDGAR** system from 1993 to 1996 offers a unique setting
 - Significant change in costs of accessing firm disclosures
 - Staggered mandatory implementation
 - Exogenously determined timing

- **Gao and Huang (2020)** provide an interesting study about market information: The introduction of EDGAR brings on more informed trading and improves price efficiency
- **Goldstein, Yang, and Zuo (2021)** study implications for firms' investments and real efficiency and find subtle effects
 - See also **Bird, Karolyi, Ruchti, and Truong (2021)** for some related analysis
- Results show that EDGAR leads to increased **investment**, but decreased **investment-to-price** sensitivity

Figure 1: Dynamic Test of the Investment Level

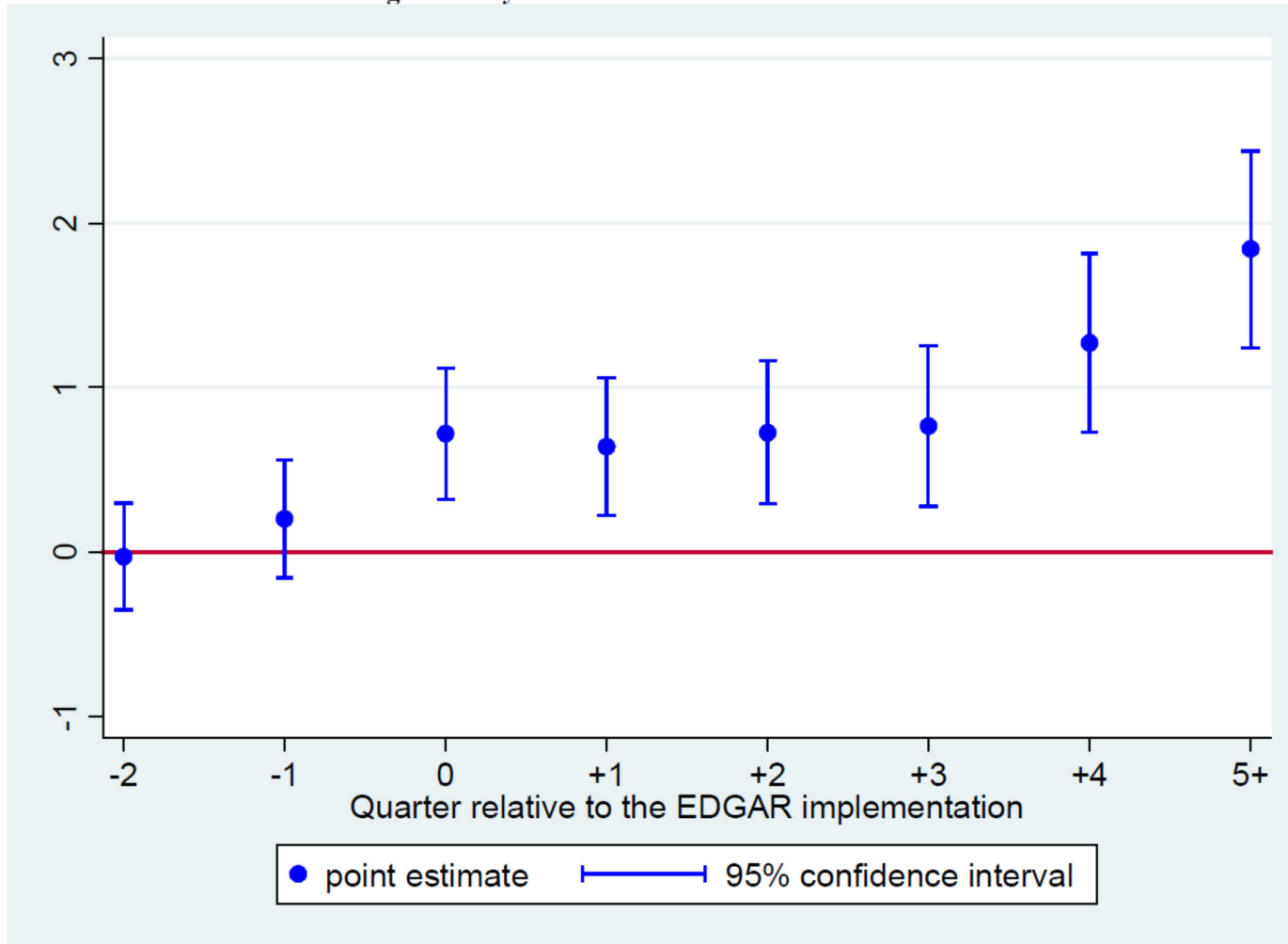
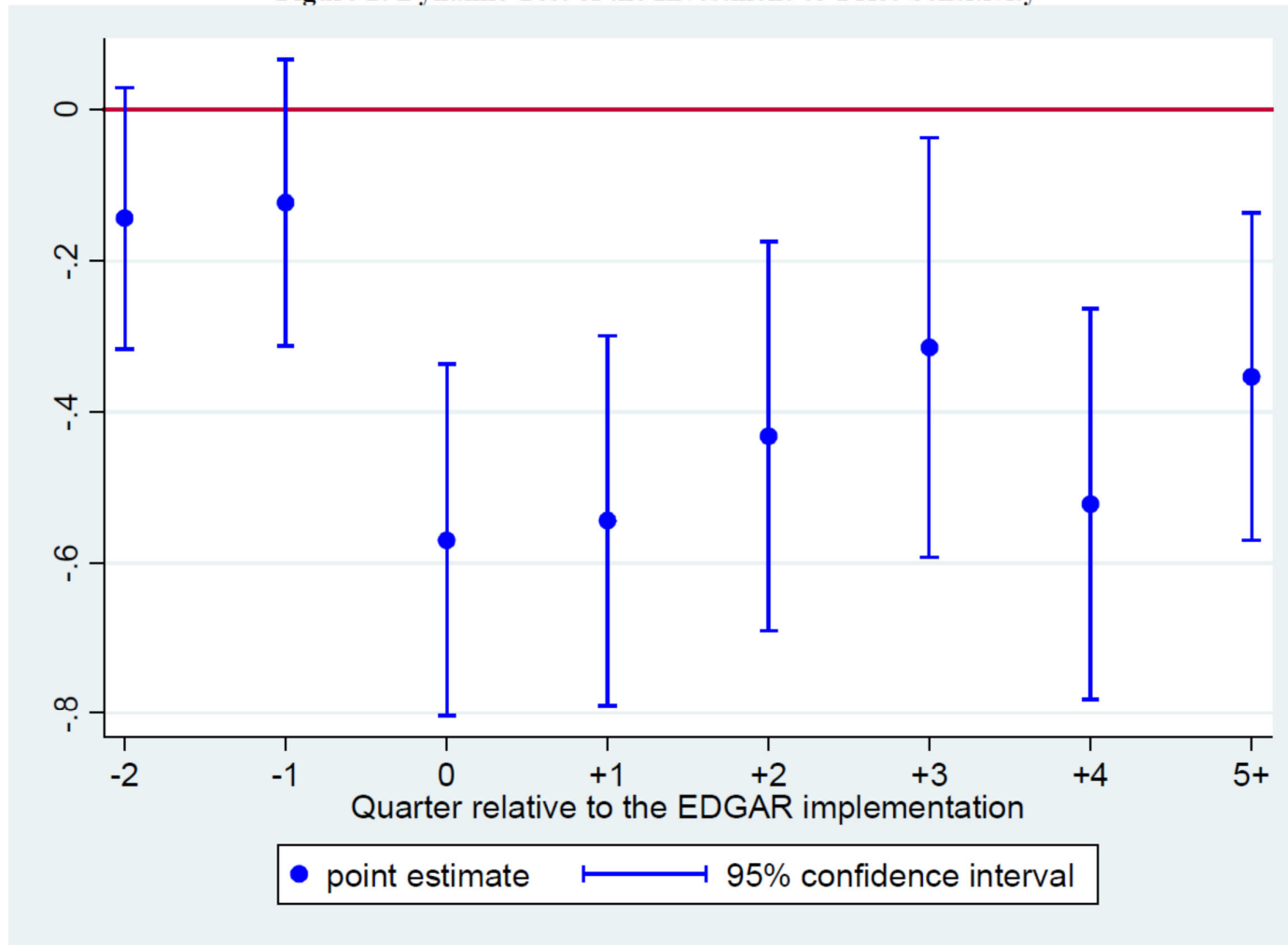


Figure 2: Dynamic Test of the Investment-to-Price Sensitivity



- Interpretations:

- Improved information environment reduces frictions among investors, allowing easier access to capital and higher investment
- But, it crowds out information that would be unknown to the firm, and thus leads to less reliance on prices for firm investments

- Overall Outcomes:

- Positive effects dominate for **value firms**, who see greater performance
- Negative effects dominate for **high growth firms**, who see worse performance

Current Information Environment

- An important aspect of the current trends in the information environment is that a lot of the information is processed by machines.

Recent papers explore the implications empirically:

- **Weller (2018)**: Algorithmic trading facilitates the incorporation of existing information into prices, but reduces the amount of new information available
- **Abis (2020)**: Increased reliance on machines leads to less flexibility in trading as economic conditions evolve

- **Cao, Jiang, Yang, and Zhang (2021)**: How do corporate disclosures evolve when their audience are machines?
- Other papers explore the implications of the abundance of data sources:
 - **Zhu (2019)**: Firms more affected by access to new sources of data see an increase in price efficiency and investment efficiency
 - **Dessaint, Foucault, and Fresard (2021)**: Alternative data sources encourage focus on short-term information at the expense of long-term information

Takeaways and Future Directions

- All these papers and others demonstrate the complexities involved with newly introduced technologies
- The tensions highlighted above – potential for crowding out and tension between market and real efficiency – are reflected in this work
- There are many more opportunities to explore these issues, given the mixed messages and the abundance of new data sources and technologies

Conclusion

- Understanding the real effects of information in financial markets, and the feedback loop that results from it, is important for several reasons:
 - Obtain new insights on the price formation process to understand **observed market phenomena**
 - Connect financial-markets research with corporate-finance research for more **unified frameworks** in our field
 - Analyze the implications of the current **information revolution** for financial markets and the real economy