Financial Market Feedback and Disclosure

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Information in prices

- A basic premise in financial economics: market prices are very informative about assets fundamentals
- They gather information from many different participants, who trade on their own money
- Lots of empirical evidence supporting the idea, e.g., Roll (*AER*, 1984)
- Models of how information gets reflected in the price: Grossman and Stiglitz (*AER*, 1980), Kyle (*Econometrica*, 1985), Glosten and Milgrom (*JFE*, 1985)

The Feedback Effect

- The informativeness of prices is important, since it helps facilitate the efficient allocation of resources:

  An efficient market "has a very desirable feature. In particular, at any point in time market prices of securities provide accurate signals for resource allocation. That is, firms can make production-investment decisions ..." **Fama & Miller (1972)**

- Who learns from the price?
  - Managers, Creditors, Regulators, Customers, Employees, etc.
  - As long as there is *some* information in the price they don't know

Empirical Evidence

- Some Evidence:
  - Luo (*JF*, 2005) – Mergers are more likely to be canceled when prices react more negatively and managers are trying to learn
  - Chen, Goldstein, and Jiang (*RFS*, 2007) – Price informativeness affects investment sensitivity to price
  - Foucault and Fresard (*RFS*, 2012) – Cross listed firms exhibit stronger sensitivity of investment to price

$\longrightarrow$ Financial markets are not a **side show**

Implications for Theory

- A **feedback loop** emerges between market prices and firms' cash flows and fundamentals. Prices reflect *and* affect cash flows:

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

- Traditional models on financial markets do not capture this feedback loop
  - They take firm cash flows as given and study price formation as a result
- The "Feedback Effect" papers break this paradigm and consider the feedback loop between prices and cash flows / fundamentals
  - Modelling can be challenging because of feedback loop

Early Literature Review: Bond, Edmans, and Goldstein (*ARFE*, 2012)

- Review theoretical and empirical literature on the real effect of (secondary) financial markets
- Two channels for real effect (both rely on information):
  - Decision makers on the real side **learn new information** from markets that guides their decisions
  - Compensation contracts for real decision makers are tied to market prices (due to their informativeness) and affect their **incentives**

- Highlight two implications for theoretical research:
  - Incorporating the feedback effect into models of trading in financial markets fundamentally **changes predictions on price formation** in financial markets (with implications for firm cash flows)
    - Giving rise to phenomena that otherwise look puzzling
  - Different notions of efficiency
    - **Forecasting Price Efficiency (FPE)**
    - **Revelatory Price Efficiency (RPE)**
    - Former is often emphasized (Market Efficiency), but latter really matters (Real Efficiency)

Implications for Disclosure

- Literature in accounting and finance studies the implications of disclosure of public information (See recent survey by Goldstein and Yang (*ARFE*, 2017))
  - Disclosure can improve liquidity and market efficiency
  - But, it can crowd out private information, which might generate the opposite effect
  - Ultimately, one should care about real efficiency
  - For this, it is important to consider the interaction between disclosure and feedback effects

Good Disclosure, Bad Disclosure: Goldstein and Yang (*JFE*, forthcoming)

- The paper studies the real-efficiency implications of public disclosure in a model with feedback effect
- The model differentiates between different types of information and shows that implications can be different depending on what is being disclosed, how precise the disclosure is, how efficient the market is, etc.
- Note earlier work exploring the relation between feedback and disclosure, e.g., Gao and Liang (*JAR*, 2013) and Bond and Goldstein (*JF*, 2015)

Model Setup (slightly adjusted)

- A firm has access to an investment technology that needs to be financed by capital providers
- A financial asset whose payoff is tied to the technology's cash flow is traded in the financial market by speculators
- Agents (speculators, capital providers) have access to two types of information: Private information and public disclosure
- Timeline
  - t = 0: Speculators trade and the asset is priced
  - t = 1: Capital providers decide how much capital to provide
  - t = 2: Cash flow is realized; all agents receive their payoffs

Technology and Investment

- The payoff from the investment is $\tilde{A}\tilde{F}k_j$, where k_j is the amount of investment financed by a capital provider; $\tilde{A} \geq 0$ and $\tilde{F} \geq 0$ are mutually independent shocks
- Capital provider must incur a cost $c(k_j)=\frac{1}{2}ck_j^{\,2}$ when investing, and then receive a fraction β of the payoff
- Prior distributions:
  - $\tilde{f} = ln(\tilde{F})$ is normal with mean 0 and variance $\sigma_f^2 \equiv 1/\tau_f$
  - $\tilde{a} = ln(\tilde{A})$ is normal with mean 0 and variance $\sigma_a^2 \equiv 1/\tau_a$

Financial Market

- A continuum of risk neutral speculators indexed by $i \in [0,1]$ trade a security, whose payoff is cash flow from the investment $(1-\beta)\int \tilde{A}\tilde{F}k_j$
- Speculator *i* can buy or short up to a unit of the asset: $d(i) \in [-1,1]$
- Noisy supply in the financial market with underlying normally-distributed shock $\tilde{\xi}$ with precision τ_ξ
- Price *P* is set by market clearing condition, so that speculators' demand is equal to noisy supply:
    - Speculators do not condition on price, but noise is sensitive to price

Information

- Speculators observe private noisy signals about fundamental shocks:
  - $\tilde{x}_i = \tilde{a} + \tilde{\varepsilon}_{x,i}$, where $\tilde{\varepsilon}_{x,i}$ is normally distributed with precision: τ_x
  - $\tilde{y}_i = \tilde{f} + \tilde{\varepsilon}_{y,i}$, where $\tilde{\varepsilon}_{y,i}$ is normally distributed with precision: τ_y
- Capital providers know $\tilde{a}$; they want to learn $\tilde{f}$
  - They partly rely on the information in the price P
- Public disclosure about shocks available to all: $\tilde{\omega} = \mu_a \tilde{a} + \mu_f \tilde{f} + \tilde{\varepsilon}_\omega$
  - $\tilde{\varepsilon}_\omega$ is normally distributed with precision τ_ω

Trading Equilibrium

- A linear monotone equilibrium where speculators buy one unit when a linear combination of their signal is above a threshold, and sell one unit otherwise; i.e., they buy if and only if:

$$\tilde{x}_i + \phi_y \tilde{y}_i + \phi_\omega \tilde{\omega} > g$$

  - The constants ϕ_y, ϕ_ω, and g are determined in equilibrium which is pinned down by the "guess and verify" approach
  - The value of ϕ_y is key to the equilibrium: It is the extent to which speculators put weight on what capital providers want to learn

Disclosure and Real Efficiency

- How does quality of disclosure τ_ω affect the real efficiency
  - Real efficiency is defined as the expected surplus from real investment: $RE = E\left[\int \tilde{A}\tilde{F}k_j - C\left(k_j\right)\right]$
- Real efficiency boils down to the quality of information available to capital providers about $\tilde{f}$:
  - $RE \propto \frac{1}{Var(\tilde{f}|\tilde{a},\tilde{P},\tilde{\omega})}$.

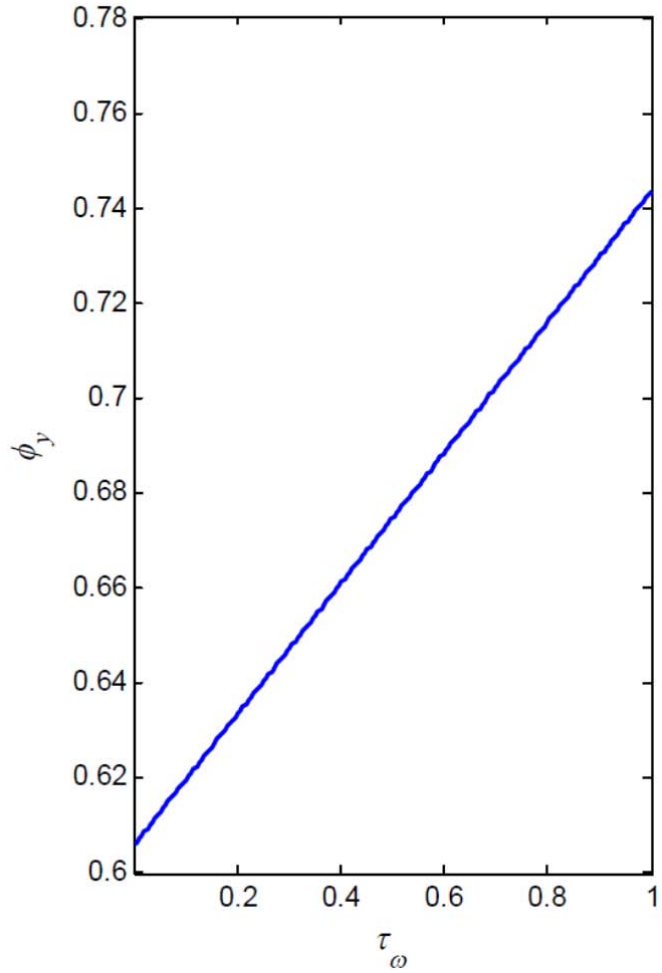
Direct and Indirect Effect of Disclosure

- Direct effect: More disclosure entails higher precision of information about $\tilde{f}$

- Indirect effect: More disclosure changes the precision of the price signal about $\tilde{f}$, denoted as τ_p
  - Precision of the price signal about $\tilde{f}$ is determined by ϕ_y, which is the weight speculators put on their signal about $\tilde{f}$ when they trade
  - This effect can be positive or negative

Public Signal is Mostly about *A*

- Indirect effect is positive:
  - When public signal provides more precise information about $\tilde{a}$, speculators put more weight on their information about $\tilde{f}$
  - Price provides more precise signal about $\tilde{f}$
  - This is amplified via feedback effect; real value is affected more by $\tilde{f}$, encouraging speculators to put even more weight on this signal
- Both direct and indirect effects are positive; disclosure clearly improves real efficiency (see picture on next slide)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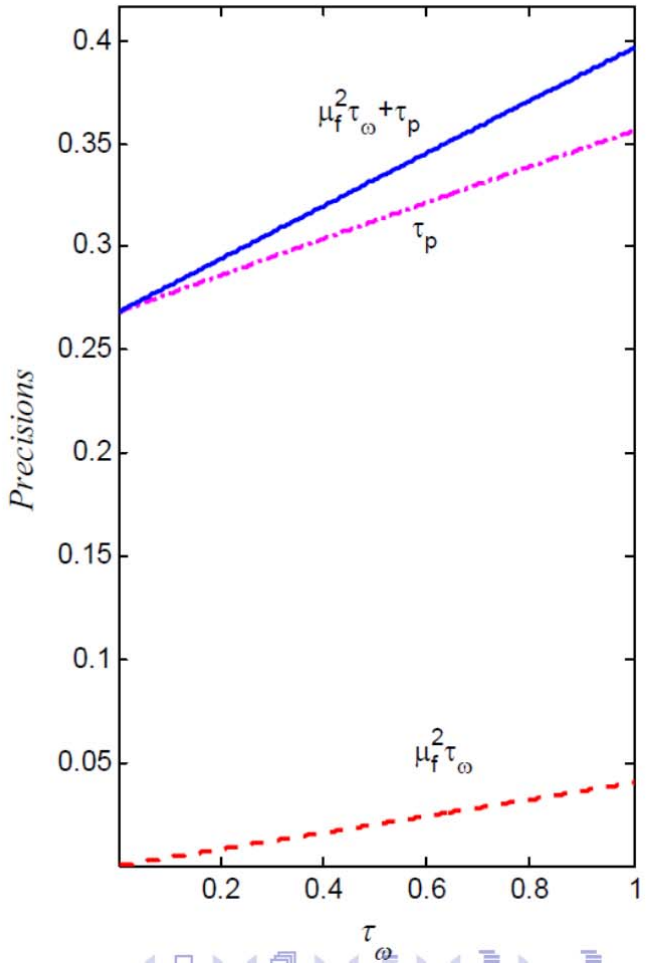
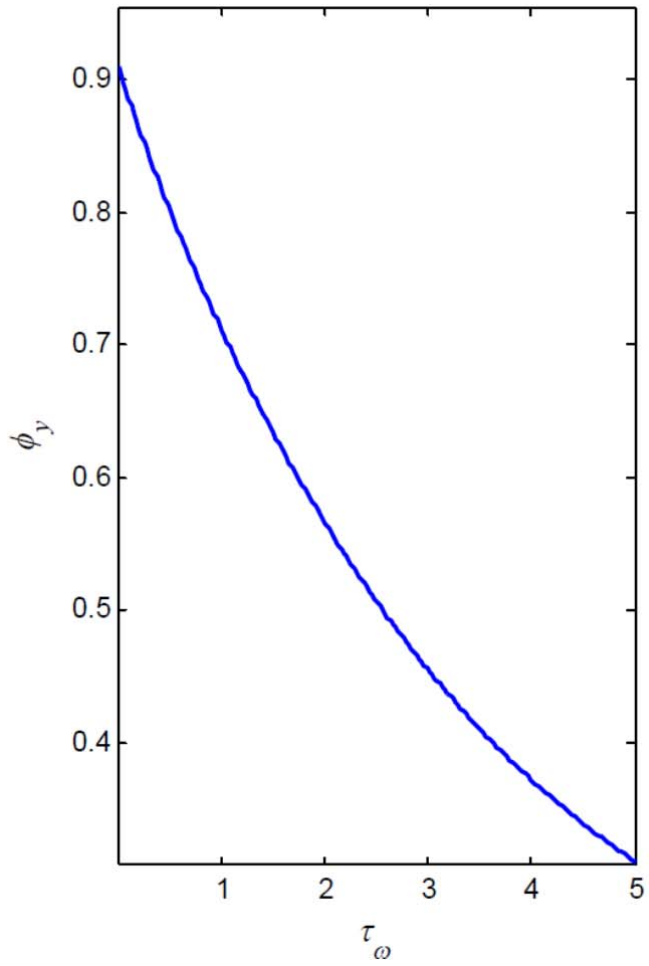
0.72
0.7
0.68
0.66
0.64
0.62
0.6
ϕ_y
0.2
0.4
0.6
0.8
1
τ_ω


0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
Precisions
$\mu_f^2\tau_\omega+\tau_p$
τ_p
$\mu_f^2\tau_\omega$
0.2
0.4
0.6
0.8
1
τ_ω

Public Signal is Mostly about *F*

- Indirect effect is negative:
  - When public signal provides more precise information about $\tilde{f}$, speculators put less weight on their information about $\tilde{f}$
  - Price provides less precise signal about $\tilde{f}$
  - This is amplified via feedback effect
- Direct and indirect effects are opposite
- Indirect effect dominates when market is efficient; high τ_ξ (see picture)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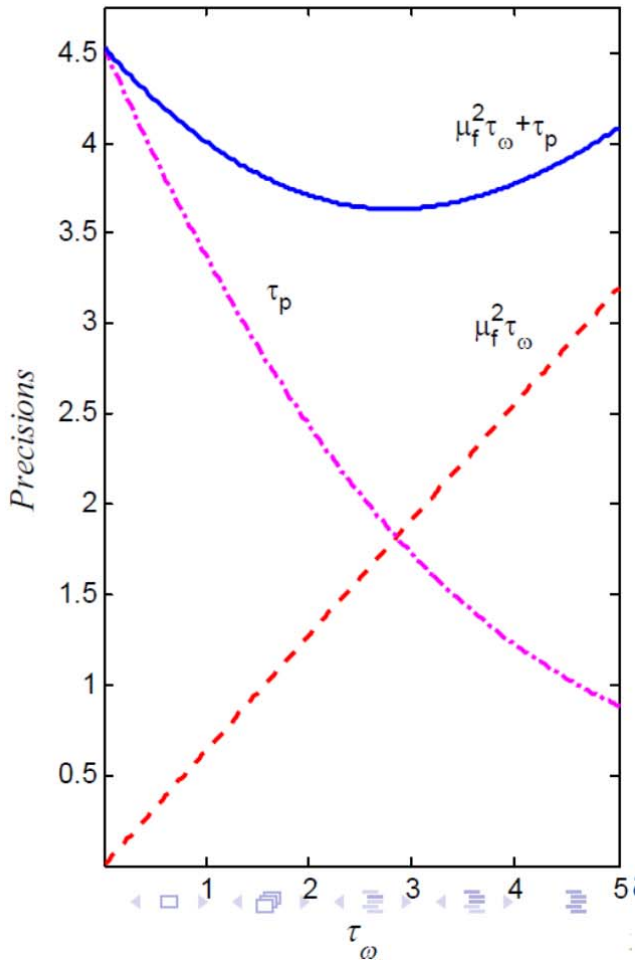
0.7
0.6
0.5
0.4
ϕ_y
1
2
3
4
5
τ_ω


4.5
4
3.5
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2.5
2
1.5
1
0.5
Precisions
$\mu_f^2\tau_\omega+\tau_p$
τ_p
$\mu_f^2\tau_\omega$
1
2
3
4
5
τ_ω

Some Implications

- It is important to pay attention to multiple dimensions of information and consider what disclosure is about when evaluating its desirability
- There is a clear benefit in providing public information about what decision makers already know, as it pushes the market to focus on the information that decision makers care to learn
- Despite the direct benefit of providing public information about something decision makers wish to learn, this might backfire when the market works efficiently and the public disclosure is not super precise

Example

- Capital providers finance a firm's investment in a new line of products
  - They have information about the quality of the technology and the products (easy to verify from the firm), but not about the competition the firm faces with other firms
  - Information about the competitive landscape can be aggregated by financial markets (this information tends to benefit from aggregation)
  - Public disclosure emerges from credit rating agencies or mandatory disclosure requirements from firms

- Having public disclosure focused on the quality of technology and products is always beneficial
- However, providing public disclosure on competition with other firms might not be desirable if the market is efficient and the public disclosure is of low precision (likely when aggregation is beneficial)

- Another example: stress tests
  - Information about loan quality vs. network externalities
- Note difference between cases where information is disclosed by a third party (discussed in the model) and where it is disclosed by the decision maker (no direct effect)