Limited Disclosure and Hidden Orders in Asset Markets

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Motivation

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  1. Hidden Orders (Bolton et. al. 2014)
  2. Limited disclosure (Pagano and Volpin, 2012)

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- We argue that it is essential for both forms of opacity to co-exist . . .
- . . . as long as it is costly for investors to process fundamental information about assets
- We also argue that many typical arrangements in financial markets implement the optimal information design

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Put another way, transparent markets would feature a suboptimal fraction of unsophisticated investors

Constrained optimal market design

- Markets should feature expert-only dark platforms where orders are hidden
- They should also feature a platform accessible to everyone but where disclosure about asset quality is highly limited

The market for Mortgage Pass-Through Securities

- Most agency MBS' are issued in TBA markets (see Vickery, 2013)
- Investors buy pools before they exist with the GSE having only committed to a few pool-wide characteristics
- The market also features a "specified market" where existing pools with favorable characteristics are sold
- In other words, primary MBS markets feature an opaque end and a more transparent end
- The more transparent market features investors that can process finer pool information
- This creates a "cheapest-to-deliver" problem

Literature

- Hirshleifer (1971,1973 . . .)
- Dang, Holmstrom and Gorton (2012), Monnet and Quintin (2014)
- Bolton, Santos and Scheinkman (2014)
- Rock (1986), Pagano and Volpin (2012)
- Grossman and Stiglitz (1980), Kyle (1985)

The model

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- We assume

$$\int \lambda r dF > k$$

but

$$H\left(\int \lambda r dF - k\right) \int \lambda r dF < 1$$

Expert investors

- Investors can become experts at a utility cost γ
- They can see and interpret project types (λ)

Due-diligence is public information

- Consider a planner who wants to maximize total welfare by choosing:
  1. How many prospectors to activate ($\Longleftrightarrow$ a threshold $\bar{k}_0$)
  2. A fraction μ of investors to train
  3. Consumption profiles: $c^n \geq 0$, $c^e \geq 0$ and $c^o \geq 0$
  4. Storage amounts: s^n, s^e
- The planner does not observe prospector types . . .
- . . . but does observe whether prospectors bore the effort cost k

First-best

$$\max \quad (1-\mu)c^n + \mu(c^e - \gamma) + \int_0^{\bar{k}_0} (c^o - k_0 - k)dH(k)$$

subject to:

$$\begin{aligned}
\int_0^{\bar{k}_0} c^o dH(k_0) + (1-\mu)s^n + \mu s^e &\leq 1 && (1)\\
c^e - \gamma, c^n &\geq 1 && (2)\\
c^o &= \bar{k}_0 - k && (3)\\
(1-\mu)(c^n - s^n) + \mu(c^e - s^e) &= H(\bar{k}_0)\int \lambda r dF && (4)
\end{aligned}$$

No need for experts at the first-best

Proposition

The first best allocation satisfies $\mu = 0$, $s^n = 1 - H(k_0^*)(k_0^* + k)$, $c^n = 1$, *and* $c^o = k + k_0^*$ *where*

$$\int \lambda r dF = k_0^* + k.$$

Due diligence is private information

- Assume that effort is private information
- Now the planner needs a positive mass of experts
- Experts can make $\lambda-$dependent transfers, $q^e(\lambda)$, while other agents only make blind transfers q^n to active prospectors
- IC requires $\int c^o(\lambda)dF - k - k_0 \geq c^o(0) - k_0$

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- Feasibility requires

$$H(\bar{k}_0)q^n \leq (1-\mu)(1-s^n)$$

and

$$H(\bar{k}_0)\int q^e(\lambda)dF \leq \mu(1-s^e).$$

Constrained-optimal solution with moral hazard

Proposition

With unobservable effort, the optimal allocation satisfies $s^e = 0$ *and*

$$\mu = kH(\bar{k}_0),$$

where $\bar{k}_0$ *solves*

$$\int \lambda r dF = \bar{k}_0 + k + \gamma k.$$

Markets

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- All investors can participate in the first one, only expert investors participate in the second one
- Projects sell for p_n on non-expert market, $p_e(\lambda)$ on expert market
- Let $V(\lambda) = \max\left[p_n, p_e(\lambda)\right]$
- Originators exert effort provided

$$\int V(\lambda) dF(\lambda) - k \geq p_n$$

- They become active provided

$$\max\left\{\int V(\lambda) dF(\lambda) - k, p_n\right\} \geq k_0$$

Non-expert investors

- Non-experts form expectations about the set Λ_n of projects sold in the first market
- In equilibrium, $\Lambda_n = \{\lambda : p_n \geq p_e(\lambda)\}$

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- In equilibrium, $\Lambda_n = \{\lambda : p_n \geq p_e(\lambda)\}$
- Then non-expert investors solve

$$V_n = \max_{s^n \in [0,1]} s^u + \theta^n \int_{\Lambda_n} \lambda r \frac{dF(\lambda)}{F(\Lambda_n)}$$

subject to

$$1 - s^n = \theta^n p_n.$$

Expert investors

- Expert investors solve the following problem

$$V_e = \max_{s^e, \theta^e(\lambda)} s^e + \int_{\Lambda_e} \theta^e(\lambda)\lambda r d\lambda$$

subject to

$$1 - s^e = \int_{\Lambda_e} \theta^e(\lambda) p_e(\lambda) d\lambda.$$

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- Since investors can choose whether to become experts, $\mu \in (0, 1)$ if and only if

$$V_e - \gamma = V_n$$

Market equilibrium

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Lemma

In any equilibrium where a positive mass of projects is activated,

$$R_e = 1 + \gamma.$$

If both markets are active,

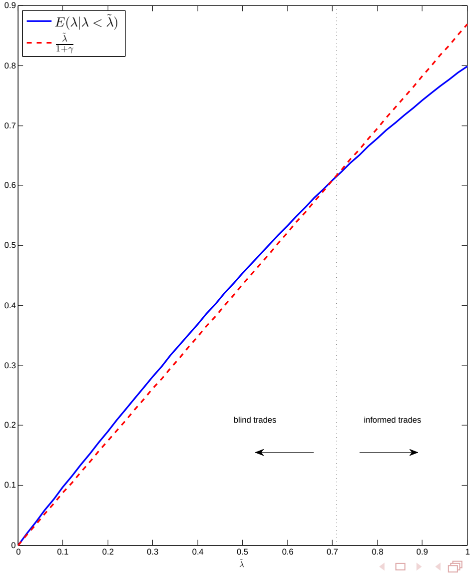
$$R_n = 1.$$

Project quality threshold

In an equilibrium with both types of investors, a threshold $\tilde{\lambda}^M$ exists with

$$E(\lambda|\lambda \leq \tilde{\lambda}^M)r = \frac{\tilde{\lambda}^M r}{1+\gamma}$$

Project quality threshold



Incentive compatibility

In an equilibrium with both types of investors,

$$\int_{\tilde{\lambda}^M}^{1} \left(\frac{\lambda r}{1+\gamma} - E(\lambda | \lambda \leq \tilde{\lambda}^M) r \right) dF \geq k$$

Proposition

At a market equilibrium, fewer projects are activated than at the second best and the ratio of experts to projects is higher.

Intuition

$$\int_0^{\tilde{\lambda}^M} E(\lambda|\lambda \leq \tilde{\lambda}^M) r dF + \int_{\tilde{\lambda}^M}^1 \frac{\lambda r}{1+\gamma} dF = k_0^M + k.$$

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so $\displaystyle\int_{\tilde{\lambda}^M}^1 \frac{\gamma \lambda r}{1+\gamma} dF > k\gamma.$

hence $\displaystyle\int \lambda r dF > k_0^M + k(1+\gamma).$

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so $$\int_{\tilde{\lambda}^M}^1 \frac{\gamma \lambda r}{1+\gamma} dF > k\gamma.$$

hence $$\int \lambda r dF > k_0^M + k(1+\gamma).$$

whereas $$\int \lambda r dF = k_0^{SB} + k(1+\gamma).$$

Optimal disclosure

- Assume that he planner can set up a technology that sends a public message m once λ is realized
- The planner can choose any message function in the following set:

$$\{m : [0,1] \mapsto \mathcal{B}([0,1]) : \lambda \in m(\lambda) \text{ for almost all } \lambda \in [0,1]\}$$

Optimal disclosure

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Proposition

The optimal message function is binary and partitions the set of types in two subsets $\Lambda_n^* = [0, \lambda^B]$ *and* $\Lambda_e^* = [\lambda^B, 1]$ *where*

$$\int_{\lambda^B}^{1} \left(\frac{\lambda r}{1+\gamma} - E(\lambda | \lambda \leq \lambda^B) r \right) dF = k.$$

Projects in Λ_n^* *are sold to non-experts while projects in* Λ_e^*. *are sold to experts.*

Key consequences

With limited disclosure:

1. An equilibrium with both types of investors always exists
2. Welfare can only improve . . .
3. . . . and generally does

Implementation

- Originators want to commit to the optimal disclosure designs
- This can be done via standard arrangements:
  1. Proportional fee underwriting
  2. Forward contracts
  3. Blank-check underwriting

Proportional fee underwriting

- Originators delegate market decisions to an underwriting intermediary who gets paid a fraction $\delta > 0$ of the average surplus
- The underwriter control all information flows pause
- It solves:

$$\max_{\lambda^U \in [0,1]} \delta \left(\int_0^{\lambda^U} E(\lambda | \lambda \leq \lambda^U) r dF + \int_{\lambda^U}^1 \frac{\lambda r}{1+\gamma} dF \right)$$

subject to:

$$\int_{\lambda^U}^1 \left(\frac{\lambda r}{1+\gamma} - E(\lambda | \lambda \leq \lambda^U) r \right) dF \geq k.$$

Forward contracts

- Originators commit to delivering quantity $H\left(k_0^B\right)\int_0^{\lambda^B} dF$ for unit price $p_n^F = E(\lambda|\lambda \leq \lambda^B)r$ …
- …and a quantity $H\left(k_0^B\right)\int_{\lambda^B}^1 dF$ of projects of quality $\lambda \geq \lambda^B$ for price $p_e^F = \frac{E(\lambda|\lambda \geq \lambda^B)r}{1+\gamma}$
- Second market can be spot under some conditions
- Resembles TBA markets

Blank-check underwriting

- Originators raise

$$H\left(k_0^B\right)\int_0^{\lambda^B} dF \times E(\lambda|\lambda \leq \lambda^B)r$$

  and commit to delivering quantity $H\left(k_0^B\right)\int_0^{\lambda^B} dF$ of projects
- They sell the rest to experts

Implications for IPO markets

Our model is consistent with the following IPO market facts:

1. IPOs tend to be underpriced
2. IPOs that feature more institutional investors tend to be more underpriced
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Key, distinguishing prediction: more transparency causes more underpricing

Summary

- Financial markets naturally feature a juxtaposition of expert and non-expert investors . . .
- which makes opacity essential
- Imposing transparency, in our model, is a bad idea