A Theory of Blind Trading

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Abstract

Differently sophisticated and informed investors coexist in most asset markets. At the same time, differently opaque trading avenues also coexist in most markets. We describe a simple environment where the second-best allocation calls precisely for this juxtaposition. Informed investors are useful because their presence provides the right incentives to generate the optimal volume and distribution of investment opportunities. The optimal opacity design serves to eliminate superfluous rents that would otherwise accrue to informed investors. The model makes precise predictions for the composition of different subsegment of a given asset markets and we argue that these predictions are consistent with the pertinent evidence.

Keywords: market design, opacity, asymmetric information

JEL codes: D47; D82

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1 Introduction

The recent financial crisis has been blamed in significant part on the lack of transparency of increasingly complex financial markets. Intuitively, opacity fosters moral hazard frictions by making it easier for financial intermediaries to take advantage of the superior knowledge they have about the securities they produce and market. Not surprisingly then, much of the legislation enacted in the wake of the crisis has centered on imposing more stringent disclosure and accounting standards on intermediaries and on aligning their interests with those of the investors they serve.

Ever since the seminal work of Hirshleifer (1971, e.g.) however, it is well understood that in second best environments the optimal level of disclosure is typically not full. This idea has been revived in recent work by Deng et. al (2013), Andolfato et. al (2013), Monnet and Quintin (2013) and Pagano and Volpin (2012) among many others. The latter paper, in particular, shows that in a world with differently informed investors, opacity can serve to mitigate the winner’s curse that naturally arises when less knowledgeable investors must bid for assets alongside expert investors with a superior ability to interpret fundamental information. The same idea is at the core of this paper but our goal is to fully characterize the optimal disclosure design in primary markets with differently informed investors. To that end, we follow a pure mechanism design approach by specifying frictions that preclude the first-best allocation from prevailing in a canonical primary asset market. We also insist that those frictions, in the first place, be such that the fraction of informed investors is generically interior. After all, since opacity only plays a potential role in markets where uninformed investors compete with informed investors, arguing that opacity may be useful requires arguing, first, that informed investors play a useful role and yet that informing everyone is not optimal.

In our static model, risk-neutral agents (“prospectors”) have the ability to generate pro-
productive assets by expanding some effort. Assets are of heterogeneous quality drawn from a known distribution. Investors are endowed with funds at the start of the period which they can either store or invest in the risky assets created by prospectors. Each investor can also become informed at a given utility cost which means that they become able to distinguish high expected payoff assets from lower expected payoff assets based on their observable characteristics. When prospector effort is unobservable, a social planner finds it optimal to inform a positive fraction of investors on whom she can then rely to reward prospectors for producing productive assets. However, because informing agents is costly, the planner economizes on the number of informed agents as much as possible. The second-best fraction of informed investors, it follows, is always strictly interior. We show that, in turn and if prospectors can enter into side-deals with investors, informed investors must earn rents that exceed what is strictly necessary to offset the cost they incurred in becoming informed. That friction, in fact, can be such that the second-best allocation cannot be implemented if informed investors have access to all available information about all projects. On the other hand, if the planner is given the option to erase project information the second-best allocation can always be implemented by pooling the projects uninformed investors effectively fund into one blind fund.

The key insight of our paper, therefore, is that in markets where it is constrained-optimal for informed investors to cohabit with uninformed investors, it is also optimal for the market to feature an opaque end and a more transparent end. Transparency makes it possible to provide agents with the incentives they need to supply the optimal volume of investment opportunities. Opacity eliminates the superfluous rents inherent to the winner’s curse problem discussed among many others by Pagano and Volpin (2012.) The optimal information design, in particular, does not involve complete transparency or complete opacity, it involves instead splitting markets into carefully designed trading platforms.
The prediction that markets with differently informed investors should feature differently transparent trading platforms is strongly supported by the evidence, as the next section will illustrate by describing several well studied examples. Our model also makes a host of subsidiary predictions that are consistent with the pertinent evidence. The model predicts for instance that assets that trade in opaque platforms should be cheaper and should be lower-yield assets. The market for Agency MBS is one well-known illustration of this pattern, as we discuss below. In addition, the model predicts that assets sold to higher fraction of sophisticated investors should generate higher rents. The US IPO market, we argue below, provides evidence in support of this other prediction.

A key comparative static question our model is built to answer involves the consequences of exogenously imposing transparency. In our model, doing so unambiguously lowers welfare since carefully designed opacity serves a useful purpose. Yet, because imposing transparency discourages participation by the uninformed, it may actually lower the rents informed investors earn. This yields an important cautionary message for the empirical literature that seeks to establish a connection between disclosure requirements and rents, say in IPO markets. (See ??, for a review.) The typical finding that more disclosure lowers rents is evidence that disclosure matters (that it has an impact on allocations) and mitigates the winner’s curse problem in a narrow sense, but it cannot inform us on the welfare consequences of pro-transparency policies. Our model predicts that if markets are in fact optimally opaque, imposing transparency will tend to push the volume of investment opportunities below its optimal level.

1Perhaps the most widely known instance of this practice occurs in the market for diamonds which often trade in bundles with only coarse information provided to potential investors. Section 2 discusses several other examples.
2 Motivating examples

Markets where differently informed investors bid for the same category of assets are ubiquitous. This section provides specific illustrations from completely different areas of the investment universe. In each of these cases, different sections of the market feature different fractions of informed/sophisticated investors and, at the same time different degrees of transparency.

2.1 The agency pass-through market

As discussed inter alia by Vickery and Wright (2013) the government-sponsored enterprises (GSEs) create and market mortgage pass-through securities in two distinct ways. The majority of deals are floated in a forward market termed the TBA market. Investors buy pools that have yet to be delivered a few weeks in advance with the GSE having committed only to abiding by a few average pool-wide characteristics. Other pools are marketed in the ‘specified’, spot market. By hiding individual loan characteristics, TBA market enhance liquidity by commoditizing transactions. The specified market, for its part, creates an avenue to market loans which, by law, are not TBA eligible.²

But a non-negligible fraction of TBA-eligible loans are also sold in the specified market. Interestingly given the purpose of this paper, the majority of these loans are loans whose observable characteristics make them low prepayment risk. GSEs provide insurance against default which, despite what GSE prospectuses claim and as we learned in July of 2008 once the US government assumed conservatorship of Fannie Mae and Freddy Mac, is implicitly backed by the full faith of the US government and make Agency securities effectively as safe as US Treasuries. Unlike Treasuries however, pass-throughs are subject to prepayment risk.³

²This included loans whose size exceeds the conventional limit, i.e. jumbo loans.
³This risk includes actual prepayment by collateral loans and the fact that GSEs retire severely delinquent loans from the pool at face value in the practical implementation of their no-default guarantee.
the corresponding yield degradation. GSEs thus recognize that loans with characteristics such as low balances have a higher market value hence finds it profitable to convey that information to investors such as investment banks and mortgage REITs that know how to process that information. On the flip side, TBA investors (which feature comparatively high fractions of foreign central banks and individual investors) understand that they face a “cheapest-to-deliver-problem” which presumably affects their willingness to pay for the pools they purchase.

In summary then, the agency pass-through market features an opaque trading channel and a more transparent platform alongside one another. Higher-value pools tend to trend in the more transparent sub-market and investors who can process pool information more effectively are more highly represented in the specified market.

2.2 The market for institutional real estate

As Baum and Hartzell (2011) explain, institutional real estate refers to the higher-end of the commercial real estate market. These are properties deemed sufficiently liquid and safe that institutions such as pension funds that must abide by stringent investment covenants are willing to own them in part or in full. Baum and Hartzell (2010) estimate that the size of the institutional market was around US$16 trillion in 2007. In this massive market pension funds, sovereign funds and other institutions who want to hold a target level of Real Estate compete for assets with corporations that specialize in Real Estate management and investment such as Real Estate Investment Trusts (REITs). Some pension funds and insurance companies have dedicated Real Estate divisions that make direct purchases but most institutional investment is performed by private equity funds that raise money with a

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4The Manhattan class A office market epitomizes this segment of the Real Estate asset class. The two key players in that market are private equity funds that deploy money on behalf of sovereign and pensions funds or wealth individuals and REITs such as Boston Properties or SL Green.
commitment to broad deployment strategy and a certain time horizon. The passive investors in those funds – or General Partners (GPs) as they are often known in this context – often have limited oversight on the fund’s investment decisions. In their most extreme form, private equity funds are structured as “blind pools” where as long as the fund is in operation the information is limited to distributions and coarse reports. All operational and investment decisions are made by a Limited Partner (LP) with little to no supervision until the fund closes.

Since LPs usually put up little money of their own, an obvious moral hazard problem occurs. For one thing, LPs are often corporations who hold Real Estate in the same market. This leads to a cheapest-to-deliver problem much like in the Agency MBS. For another thing and at least in the short-run, LPs are typically better off if the money raised gets deployed regardless of whether market conditions warrant it. Closing the fund early, which may be optimal from the point of view of GPs, typically means less compensation for the LP.

In sum, the market for institutional real estate feature an opaque end where passive investors with little knowledge of market specifics are in dominant fraction and a more transparent direct purchase end where specialists play the largest role.

2.3 The IPO market

The global market for IPOs is enormous (see Ritter and Welsh, 2002 for a review) and features an underpricing regularity that has generated a large literature: the closing price on the first day of trading exceeds the primary price by almost a quarter on average. Theoretical explanations for the IPO discount typically involve asymmetric information. Issuers may be more informed than investors producing a traditional lemons problem and forcing issuers

\footnote{The incentive misalignment problem is partially mitigated by compensation contracts that include “promote” clauses whereby the LP gets an increasing participation in profits as various targets are met.}
to use primary prices that deviate from fundamental values by way of signaling their type. On the other hand, underpricing may result from the fact that some investors are better informed than issuers about fundamental values. Most related to the environment we lay out in this paper however is the view closely associated with Rock (1986) that less informed or sophisticated investors face a winner’s curse in the IPO market and are therefore only willing to participate if issues are under-priced on average. By the same argument, informed investors must earn rents in the IPO market since they can distinguish ex-ante between positive-return and negative-return issues.

As we will discuss, the model we lay out predicts that underpricing should be higher in segments of the IPO market where informed investors are in higher fraction. Direct support for this prediction is contained in Caseres and Lowry (2009) who show that IPOs that are subscribed primarily by institutional investors (financial intermediaries, e.g.) produce significantly higher discounts than IPOs where individual investors participate more heavily.

Since the IPO market like most markets features differentially informed and sophisticated investors, our model strongly predicts that issuers should control the flow of information about specific issues or should pre-commit to selling certain assets to certain types of investors. Support for this includes the frequent use of blind auctions in Europe which pre-allocates a fraction of any deal to non-institutional investors. More generally, there should be a connection between transparency and rents. The fact that economies with more stringent disclosure standards feature lower IPO discounts (see Pagano and Lombardo, 2000) provides some support for that prediction.

2.4 Equity bundling

Kajavecz and Klein (2005) provide evidence that a significant fraction of equity trade in the US are performed via sealed bid auctions of stock bundles about which investors only
know a limited set of broad characteristics such as the percentage of stocks from specific exchanges and the average correlation of each component with the S&P 500. Arguments to explain this practice is that it lowers average trading cost (see again Kajavecz and Kleim, 2005) or discourages front-running by investors with advanced knowledge of upcoming large trades. But those broad arguments can only go so far since alongside this opaque end of the market one observes myriad transparent of individual stocks or fully specified bundles. This co-existence is exactly what our model predicts.

3 The environment

Consider an environment with two dates $t = 0, 1$. (Later we will introduce an intermediate date to study the role of secondary markets for investment projects.) The economy contains two types of risk-neutral agents who value a unique consumption goods and prospectors. Prospectors are in arbitrarily large number. Most will do nothing but free entry will bite, they will serve as an intermediary of sort.

All investors are endowed with one unit of the unique good at $t = 0$. They can individually invest all or part of that endowment in a risk-free storage technology with a zero net return. Prospectors are small, have no endowment but can create an investment project (one per prospector) at a utility cost $g(k)$ that increases with the aggregate mass $k$ of prospectors and with $g(k) = 0$. (With more prospectors around, it becomes harder to find new projects.) We will write $G(k) = kg(k)$ for the total utility cost of prospecting and assume that $G$ is strictly convex and differentiable. Prospectors eat at date 0 only, so they must be compensated for engaging in prospection by consuming part of the date 0 endowment.

Once found, projects require one unit of capital to be activated. The unit of capital is recovered at the end of the period so that, in gross terms and once created, projects dominate
storage at least weakly. Furthermore, projects are heterogeneous in quality. Specifically, they
are characterized by a probability \( \lambda \in [0, 1] \) of success drawn from a distribution \( F \) with a
continuous density function. A strong law of large numbers holds: regardless of the mass of
projects created, the distribution of quality is always \( F \). Projects of type \( \lambda \in [0, 1] \) yield a net
payoff \( r > 0 \) at date 1 with probability \( \lambda \), nothing otherwise. The fact that \( r > 0 \), as we will
see below, guarantees that a positive mass of projects is created at the first-best outcome.

A given investor can become informed at a utility cost \( \kappa \geq 0 \) which must be borne out of
endowments at date zero. Informed investors – and only they – observe the quality \( \lambda \) of any
given project. Investors who remain uninformed cannot distinguish one project type form
another.

4 First-best

Consider a social planner that can allocate resources however they wish as long as all agents’
consumption is non-negative. For concreteness, we will assume throughout that the planner
wants to maximize the welfare of investors. In addition, we focus on type-symmetric
allocations. Denote by \( c^U \geq 0 \), \( c^I \geq 0 \) and \( c^P \geq 0 \) the consumption of uninformed agents,
informed agents and active prospectors, respectively, while \( k \) is the mass of projects created
by prospectors and \( a^U \), \( a^I \) are the storage choices by the two types of investors. The planner
also selects what fraction \( \mu \in [0, 1] \) of investors become informed at date 0.

Physical constraints include the fact that storage choices lie in \([0, 1]\). In addition, at date
1, we must have

\[
\mu^U c^U + \mu^I c^I = \mu^U a^U + \mu^I a^I + k \int \lambda(1 + r) dF, \quad (4.1)
\]
while resource feasibility at date 0 implies:

\[ k + kc^P + \mu^U a^U + \mu^I a^I \leq 1. \] (4.2)

Furthermore, we will impose the minimal participation constraints that prospectors should be compensated for the effort they put in:

\[ c^P \geq g(k) \] (4.3)

and that, likewise, investors should be better off under the proposed allocation than in autarky:

\[ \mu^U c^U \geq \mu^U, \quad \mu^I c^I \geq \mu^I. \] (4.4)

Put more simply, when investor types do exist in positive mass\[^6\] they must receive at least 1 in expected utility in order to participate in the social plan.

Looking ahead, it is clear that a planner who wants to maximize the welfare of investors will make sure that constraint [4.3] binds. This is independent justification for studying a social objective specification that puts no weight on prospectors since free entry by prospectors and the type-symmetric requirement would lead to the exact same outcome. Given this minimal set of constraints, what is the best the planner can do? The planner solves:

\[
SP1 = \max_{c^U, c^I \geq 0, (a^U, a^I, \mu^U, \mu^I) \in [0, 1]^4} \mu^U c^U + \mu^I (c^I - \kappa)
\]

subject to (4.1), (4.2), (4.3) and (4.4).\[^6\] In principle the planner could elect to have only informed investors \((\mu^I = 1 = 1 - \mu^U)\) or, conversely, not to create any positive mass of informed investors.
Proposition 4.1. The first best allocation satisfies $\mu^I = 0$, $1 - a^U = 1 + G(k)$, and

$$G'(k) = \int \lambda rdF.$$  

Since information is costly to acquire and serves no purpose absent any friction, it is optimal for all agents to remain uninformed. In addition, the first-best allocation simply equates the expected marginal return of creating projects with the opportunity cost of the required investment at date 0.

5 Moral hazard

In order to justify committing resources to informing some investors, information must be useful. Information enables at least some agents to distinguish bad projects from good ones. In particular and loosely speaking, it makes some agents willing to pay more for certain projects than others. This means that prospectors can be rewarded for producing better projects.

To create a natural role for information then, assume that prospectors can choose to expand no effort and that this decision is unobservable. When they do not actually search for projects, the draw they receive is $\lambda = 0$ with probability one, i.e. they produce a worthless project. It follows that no efficient solution can direct resources to prospectors without incentivizing them to produce. This, in turn, requires that prospector consumption $c^P$ be made contingent on the quality $\lambda \in [0, 1]$ of the project they produce in such a way that:

$$\int c^P(\lambda)dF \geq g(k) + c^P(0).$$  \hspace{1cm} (5.1)$$

But the quality $\lambda$ of specific projects is known only to prospectors and to informed agents.
The planner and uninformed agents only understand that the economy-wide distribution of quality is $F$. Using uninformed agents, the planner can only implement $\lambda$–independent transfers $q^U$ to prospectors. But the planner can instruct informed agents to transfer $q^I(\lambda)$ to prospectors with projects of type $\lambda \in [0, 1]$. Since the goal is to discourage the creation of worthless projects, we can immediately impose $q^I(\lambda) = 0$. We will also require

$$k \int q^I(\lambda)dF \leq \mu^I (1 - a^I)$$

(5.2)

so that informed agents cannot borrow resources from other agents. As is well known, (see assumptions A2 and A3 in Rock, 1986, or p2426 in Pagano and Volpin, 2012, for a discussion) the information problem becomes trivial if informed agents can deploy all available resources. Here, specifically, the planner would create a set of negligible mass of informed agents and have them make fully informed transfers on behalf of all agents. One specific friction that leads to exact equation [5.2] is to assume that the planner cannot enforce strictly positive ex-post transfers, as in Koeppel et al. (2013) or Sappington (1983).

This set-up makes prospector consumption

$$c^P(\lambda) = q^U + q^I(\lambda)$$

As a matter of accounting then,

$$k \int c^P(\lambda)dF = k \int (q^U + q^I(\lambda))dF = 1 - \mu^U a^U - \mu^I a^I - k.$$  

(5.3)

In this version of the model, the planner solves:

$$SP2 = \max_{c^U, c^I \geq 0, (a^U, a^I, \mu^U, \mu^I) \in [0, 1]^4} \int \mu^U c^U + \mu^I (c^I - \kappa)$$
subject to (5.2), (4.4), (5.1) and (5.3). The introduction of moral hazard will cause investment and consumption to fall because it is costly to inform investors. It is optimal therefore to economize on the number of informed. It follows (and we prove below) that given $k$, the planner will pick $\mu^I$ so that $\mu^I = G(k)$. Indeed, by making the payment from investors to prospectors contingent on delivering a successful project, it is incentive compatible for prospector to comply as long as their reward offsets the cost of effort. These considerations immediately imply:

**Proposition 5.1.** With unobservable effort, optimal allocation satisfies $\mu^I = G(k)$, $a^I = 0$, $1 - \mu^U a^U - \mu^I a^I = 1 + G(k)$, and

$G'(k)(1 + \kappa) = \int \lambda r dF$.

**Proof.** Feasibility of the transfer scheme requires among other things that:

$$k \int q^I(\lambda)dF = \mu^I(1 - a^I)$$

and

$$\int (q^U + q^I(\lambda))dF \geq q^U + g(k).$$

Multiplying both sides of the inequality by $k$ implies:

$$k \int q^I(\lambda)dF = \mu^I(1 - a^I) = G(k)$$

But economizing on the number of informed agent is accomplished by setting $a^I = 0$ and the result follows. \hfill \Box
A similar marginal condition thus dictates the quantity of investment as before but the new condition recognizes the fact that the marginal cost of creating a new project is augmented by the need to inform more agents in order to reward prospectors for working. This social arrangement, as we will discuss at length in section 7, can be implemented via simple securities. Uninformed fully fund the bottom tier of projects. Informed agents contribute to projects above a certain threshold together with uninformed agents who basically write a loan to informed agents secured by the certain part of the project, i.e. secured by the capital. As long as only capital is pledgeable, this is the maximum co-funding informed agents can receive, and they get an equity claim to any residual proceeds after the secured loan as been paid.

6 Informational rents and optimal opacity

To deal with moral hazard, the planner is constrained to create some informed agents but because doing so is costly, the planner only creates as many informed agents as it needs. Therefore, the second best solution above naturally features a juxtaposition of informed and uninformed investors. Since informed investors understand the full allocation, they have the knowledge and, as we will now show, incentives to enter into profitable side-trades with prospectors.

To make this concrete, assume that, once the proposed allocation is announced, prospectors have the option to run a uniform price auction for the project they generated. At the proposed allocation, uninformed agents earn a net return of $R^U \equiv c^U$ on their date 0 assets while informed agents earn $R^I \equiv c^I$. Participation requires that these returns exceed 1 for the uninformed and $1 + \kappa$ for the informed. Associated with those rates of transformation are the willingness to pay by each type for date 1 promises. All agents know that each project
will return its unit of capital, but only informed agents know the distribution of the uncertain portion of the return. Informed investors know $\lambda$ hence are willing to pay $\frac{\lambda r}{R_I}$ for the risky part of the project. Uninformed investors do not know or cannot interpret $\lambda$ but they understand that they face a cheapest-to-deliver problem. If they are willing to pay $\tilde{q} > 0$ say, for the risky portion of a project, their offer prevails if $\frac{\lambda r}{R_I} \leq \tilde{q}$ from which they can back out the expected quality $E(\lambda | \tilde{q}, R^I)$ of the projects they do get. Their willingness to pay for risky returns thus solves:

$$\tilde{q} = \frac{E(\lambda | \tilde{q}, R^I)r}{R^U}.$$  

For simplicity, we will assume that for any pair of transformation rates $(R^U, R^I)$, $\tilde{q}$ is uniquely defined.$^7$

These implicit willingness to pay for projects introduce a new participation constraint for prospectors. Specifically, in order for a prospector that generated a project of type $\lambda$ to prefer selling their projects to the planner it must be that

$$\max \left( \frac{1}{R^U}, \frac{1}{R^I} \right) + \max \left( \frac{\lambda r}{R^I}, \tilde{q} \right) \leq 1 + c'(\lambda) \quad (6.1)$$

This section’s key insight is that it is possible for all second-best allocations to violate this constraint. In other words, if the planner cannot prevent agents from trading freely with one another, welfare must fall vis-a-vis the second best outcome.

**Proposition 6.1.** Allocations that achieve $SP^2$ may all violate condition $[6.1]$  

*Proof.* Consider the following problem:

$$SP^3 = \max_{c^U, c^I \geq 0, (a^U, a^I, \mu^U, \mu^I) \in [0, 1]^4, \mu^U c^U + \mu^I (c^I - \kappa)}$$

$^7$This holds as we will prove later - if the expression $\frac{E(\lambda|A \leq \lambda)}{\lambda}$ is monotonic in $\lambda$ which, in turn, holds for instance if $F$ is a Pareto distribution.
subject to (4.4), (5.1), (5.3) and (6.1). We will first show that any solution $SP_3$ is such that the no side-trade conditions binds for almost all project types. [To be written up.] This implies that planner $SP_3$, given the two transformation rates, must give each project type exactly the price they would receive in competitive markets. In passing, this paves the way for the implementation we will propose in section 7. For now, note first that we must have $R^I \geq R^U$ since otherwise prospectors would deal with informed agents only which cannot be since the second best economizes on the fraction of informed agents so that, in particular, that fraction is strictly interior. Knowing this, further note that any ratio $\frac{R^U}{R^I}$ implies a quality threshold $\bar{\lambda}$ past which projects are sold to informed rather than uninformed agents.

Now, by way of contradiction, let us try to find an allocation that satisfies the conditions of proposition 5.1 and also solves $SP_3$. Any proposal must satisfy the following conditions:

\[
\mu^U c^U = \mu^U (1 - k) + k \int_{0}^{\bar{\lambda}} \lambda (1 + r) dF = \mu^U R^U \quad (6.2)
\]

\[
\mu^I c^I = k \int_{\lambda}^{1} \lambda r dF = \mu^I R^I \quad (6.3)
\]

\[
\frac{R^I}{R^U} = \frac{\bar{\lambda}}{E(\lambda|\lambda < \bar{\lambda})} \quad (6.4)
\]

\[
R^U \geq 1, R^I \geq 1 + \kappa \quad (6.5)
\]

The $\bar{\lambda}$ in condition (6.4) is the threshold past which projects are sold to informed rather than uninformed investors. The point here is that the final condition gives us a feasible interval for informational rents $\frac{R^I}{R^U}$. No solution in that interval may satisfy the value for that ratio implied by the other condition. A trivial example of this occurs when $F$ is the uniform distribution. Then (6.4) pins down informational rents very simply at $\frac{R^I}{R^U} = 2$. Since $R^U$ is at
least one, the first two conditions imply when summed that

\[ \mu^U(1 - k) + k \int \lambda(1 + r) dF = \mu^U c^U + \mu^I c^I \geq \mu^U + 2\mu^I, \]

which may fail. Basically, the informational rents needed to accommodate a market where both informed and uninformed agents are active are too high.

The ability of informed agents to see inside the portfolio of assets uniformed agents create opportunities for side-trades once projects are created. Assume then that the planner is equipped with a technology that can hide the type of any given subset of projects ex-post. That is, the planner can select ex-ante any Borel subset \( \Lambda \) of \([0, 1]\) and erase the \( \lambda \)-marker of all these projects. As will become clear soon, there is no need for the planner to employ a more intricate obfuscation technology than this binary message function: reveal \( \lambda \) or erase it.

Agents know the information technology hence understand that projects about which there is no information all belong to \( \Lambda \). But even informed agents do not know anything beyond that. Then:

**Proposition 6.2.** If the planner has the ability to select an opaque set \( \Lambda \) at will, then she can achieve SP2 even when side-trades cannot be precluded.

**Proof.** Take the same set of conditions as in the previous proof. Drop condition (6.4) and take any solution to the other equations. Then make \( \Lambda = [0, \bar{\lambda}] \). Condition 3 need no longer be imposed. Indeed, all agents now have the same beliefs about any project in the bottom interval. Since \( R^I \geq R^U \) can be imposed for instance by imposing \( R^u = 1 \), prospectors are perfectly willing to sell their lower-end projects to uniformed agents as needed.

Several comments are in order. While some opacity is optimal – that is, full transparency is usually suboptimal – full opacity is never optimal either. The planner needs to reveal
enough information to induce prospectors to produce good projects. The optimal solution, in other words, always entails juxtaposing two submarkets. Informed agents operate in the transparent end of the market where their ability to interpret project information earns them rents that justifies their becoming informed in the first place. But opacity keeps them from exacerbating the winner’s curse uninformed agents know they must confront.

7 Decentralization

While the mechanism design approach we have adopted is natural given our interest in characterizing the optimal level of transparency in environments with differently informed investors, it is helpful for interpretation purposes to verify that the allocation the model delivers can be achieved through contractual arrangements we typically observe in financial markets. One implementation that delivers this involves the following elements:

1. At the beginning of the period and before making prospection decisions but having formed expectations about primary project prices \( \{q(\lambda) : \lambda \in [0, 1]\} \), prospectors collectively decide on a disclosure policy, and commit to it.

2. Given this disclosure policy and beliefs about the outcome of uniform price auctions in primary markets, prospectors decide on an effort level.

3. Having formed expectations about primary market values as as well, investors decide whether or not to become informed. If they do not become informed, they do not know the quality of projects for which they bid hence are cannot base bids on any project-specific characteristic.

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A similar argument as in Monnet and Quentin (2013) can be used argue that the coalition of prospectors can commit to this disclosure policy by delegating transaction decisions to a risk-neutral agent with a carefully designed compensation scheme but not projects of their own.
4. Investors bid for projects. Here it is convenient to have investors bid separately for the safe part of the project (the unit of capital is returned with probability one once production is done) and for the other, risky part.

5. Claims to project proceeds are allocated and, once fruits are collected, consumption takes place.

In equilibrium in this environment we require that all agents take all prices as given and that prospectors expect zero net utility since they are in large numbers. At the transformation rate implicit in the second best allocation and the associated willingness to pay hence market value for projects, the decentralized environment described above implements the desired allocation.

**Proposition 7.1.** In the decentralized environment described in steps 1–5 above, prospectors opt for an optimal level of opacity and all second best allocations can be implemented with the project prices associated with each investor type’s transformation rate.

**Proof.** As discussed in previous section, at the second best allocation, projects implicitly sell for their value in a first price uniform auction given the willingness to pay for marginally more consumption by both investors.

The implementation described above suggests that uninformed investors directly finance the safe part of all projects. A completely equivalent interpretation however is that informed investors issue a loan to the uninformed investors secured by the capital in place which, again, is returned with probability one. Under the assumption that project payoffs are unpledgeable (unverifiable by an enforcement agency, say), this is the maximum amount of financing uninformed investors can raise. But this is also all they implicitly need at the constrained optimal allocation.
8 Testable predictions

This section uses the IPO data made available by Ritter to test our model’s key predictions.

[To be continued.]

9 Conclusion

[To be added]
10 References


