Do Institutional Investors Improve Capital Allocation?[*]

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Abstract

How do delegated portfolio managers influence firms' funding, economic welfare and shareholders' wealth compared to large individual investors? While the finance literature focuses on the inefficiencies generated by delegated portfolio managers' career concerns, I show their positive side: they induce more efficient capital allocation than profit-maximizing individual investors do, thus promoting investment, fostering growth and enriching shareholders. Funding markets require information, but large individuals are sometimes disinclined to acquire it; in contrast, the career-concerns of portfolio managers lead them, endogenously, to embed information into prices and to trade more often. Surprisingly, it is the excessive trading of uninformed delegated portfolio mangers that increases price informativeness and decreases good firms' cost of capital.

1 Introduction

A fundamental role of the economy is to allocate capital and to foster efficient investment. Adverse selection in the funding market may inhibit capital from flowing to good firms, preventing them from investing in positive NPV projects. The stock market mitigates this problem: secondary market prices aggregate information that guides the flow of capital.

In the United States, delegated portfolio managers have replaced individual investors as the main owners of stocks.[1] The literature has demonstrated the negative welfare effects of delegated portfolio managers' agency frictions.[2] In particular, Dasgupta and Prat (2008, 2011), Guerrieri and Kondor

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[1]Michaely and Vincent (2012) find that, by the end of 2009, institutional investors held 70 per cent of the aggregate US market capitalization.

[2]For example, on investors' wealth (Berk and Green (2004)), on corporate governance (Dasgupta and Piacentino (2012)) and on asset prices (Vayanos and Woolley (2013)).

(2012), and Scharfstein and Stein (1990) model fund managers as career-concerned and show their adverse effects on asset prices.[3]

Given that capital allocation is guided by secondary market prices but that fund managers' career-concerns distort them, do career-concerned fund managers cause mis-allocation of capital and thus real investment inefficiency? I contrast their role to that of purely profit-maximizing speculators, the usual actors in finance models.

In a market microstructure model with feedback effects and speculators' endogenous information acquisition, I show that career-concerned speculators (funds) acquire more information and trade more than profit-maximizing speculators (individuals), thus increasing price efficiency when it matters for corporate investment and therefore helping the stock market in its allocative role.

Constrained firms rely on external financing from primary market investors who in turn rely on stock prices to determine firms' costs of capital. I assume that projects have ex ante negative NPV, so that unless speculators impound information into secondary market prices, the adverse selection problem is so severe so as to preclude issuance and hence investment. Low stock prices are self-fulfilling: they inhibit investment leading to low value, a feedback loop that prevents even informed speculators from profiting in down markets.

Dow, Goldstein, and Guembel (2011) explored an analogous mechanism in the guise of managerial learning:[4] when a corporate decision maker determines his firm's direction based on information in market prices, the private information of profit-maximizing speculators loses its speculative value, leading to further under investment in information and less informative prices. In my model, however, a career-concerned speculator obtains signaling value from his trades even if he cannot book profits immediately, which increases his willingness to pay for information and restores price efficiency.

Dasgupta and Prat (2008) show that funds maximize the market's perception of their ability to attract new clients. I take this behavior as an axiomatic definition of a fund and do not model client behavior explicitly. I assume that there are two types of funds: "skilled" that can pay to learn the quality of a firm and "unskilled" that cannot. After a fund trades, the market updates its beliefs about the fund's skills using two pieces of information, the fund's returns and its actions.[5] But returns are uninformative when firms fail to obtain funding, since then they do not invest and thus the market learns neither about their true quality nor about funds' skills.

Skilled funds want to signal their ability. However, they are unable to do so unless firms' invest.

[3]They show that fund managers' career-concerns lead to short-term momentum and long-term reversals of returns, informationally inefficient prices and excessive price volatility.

[4]Subrahmanyam and Titman (2001) also study the feedback from prices to managers' learning, while Baker, Stein, and Wurgler (2003), Fulghieri and Lukin (2001) and Goldstein, Ozdenoren, and Yuan (2012) study their feedback to firms' financing decisions.

[5]While it is rational that the market updates its beliefs using all available information, the assumption that funds' actions are observable is not critical. Without this assumption, the market must be able to distinguish between zero returns due to the fund's inaction and due to the firm's failure to invest.

They can induce firms to invest only by acquiring information and then impounding it into prices, thus slackening good firms' financial constraints. Their incentives contrast with those of profit-maximizing speculators who acquire information only if they can hide it.

Since skilled funds always trade, unskilled funds must trade without information to avoid revealing their type—engaging in what has been termed "churning" by Dow and Gorton (1997). Surprisingly, unskilled funds' churning does not hamper price informativeness but complements it.

While in other churning models unskilled speculators buy and sell with equal probability,[6] in my model they sell relatively more often than they buy, owing to the feedback (between prices and investment) that makes firm value endogenous. By selling, unskilled speculators send a negative signal to the market, which raises firms' cost of capital and prevents projects from being undertaken. By impeding firms' investment, the unskilled avoids revealing his type by shutting down an inference channel: the market learns nothing from observed returns and updates its beliefs based on only the fund's sale. Consequently, buy orders are likely to have come from a positively informed speculator and are thus informative that the firm is good, reducing good firms' cost of capital.

The interaction between feedback effects and career-concerns is also critical for Milbourn, Shockley, and Thakor's (2001) key insight: career-concerned CEOs overinvest in information to alter the market's inference about their ability. As in my paper, when projects are rejected the market cannot learn the manager's type. But critically different is that their model has a single manager who does not know his own ability. By overinvesting in costly information (relative to first best), the CEO can increase the probability that good projects are undertaken and that bad ones are eliminated, and thus that a good reputation forms ex post. Letting the manager know his type introduces signaling. The skilled speculator acquires information and trades to show off his ability, whereas the unskilled sells frequently in order to tilt probabilities to outcomes that are reputationally more favorable, i.e. to outcomes that allow him to pool with the skilled. The behavior of the unskilled drives the main result that career-concerns help firms to raise funds.

My paper extends the career concerns literature in finance, in particular Dasgupta and Prat's 2006 paper. I add endogenous information acquisition and feedback effects to rediscover the positive side of career-concerns. Holmstrom (1982) was the first to model a manager's concern for his career inducing him to exert effort. My model differs substantially from his in that the manager's type is known and determines his ability to understand the state of the world rather than his ability to exert effort.

1.1 Mechanism

I use an extensive game of incomplete information to model an environment with asymmetric information between firms and capital providers. Good firms have positive NPV projects while bad firms have negative NPV ones, but bad firms' managers are willing to undertake them nonetheless because they

[6] See, for example, Dasgupta and Prat (2006) and Dow and Gorton (1997).

gain private benefits from doing so. Firms rely on external finance to undertake their own projects, but projects have ex ante negative NPV so no outsider is willing to fund them. Since with no other information the market breaks down and no investment takes place, firms rely on speculators to acquire information and trade to reduce the asymmetric information in secondary markets.

Secondary markets in my model are populated by a large speculator and a number of liquidity traders. The speculator is either profit maximizing or career concerned and may be either skilled or unskilled. The speculator trades with the liquidity traders; then, after observing the aggregate order flow, competitive risk-neutral market makers set the price while taking into account the effect that the price will have on a firm's ability to raise the required funds.

I assume that firms raise funds via equity. In the baseline model I leave the mechanism by which firms issue equity unmodeled, but this mechanism is modeled explicitly in Section 3. The price set by the market maker determines the success of fund raising because it contains information that allows capital providers to update their beliefs about the firm's quality.

I begin by characterizing two equilibria in which the skilled speculator acquires information: one when he is profit maximizing and one when he is career concerned. I show that career-concerned speculators allocate capital more efficiently than do profit-maximizing speculators, which enables firms to fund a larger fraction of projects that have, on average, positive NPV.

Prices play a crucial role when they reflect information when it is "pivotal" for investment—that is, when the market would break down in the absence of such information. So, when information is pivotal for investment, prices that are more informative make it easier for good firms to raise funds and thus to undertake more expensive projects.

It is critical for price informativeness that the speculator be willing to acquire information when it is reflected by the price. Unlike the skilled profit-maximizing speculator, the skilled career-concerned speculator welcomes high and informative prices because they maximize the firm's investment; recall that only when investment is undertaken can the market learn the firm's true quality, thus allowing a skilled speculator to show off his ability. A profit-maximizer does not benefit from the firm's undertaking good investments when prices are already high.

Whereas an unskilled profit-maximizing speculator does not trade at equilibrium, an unskilled career-concerned speculator always trades. The former suffers a loss from trading fairly priced shares; the latter seeks to avoid revealing his lack of skill and therefore disguises himself as the skilled trader who always trades. Since he has no information about the firm's quality, he randomizes between buying and selling.

A skilled career-concerned speculator is keen for informative prices; he acquires information, follows his signal, and embeds the information into prices. Yet this positive effect on prices may be hindered by the random trading of an unskilled career-concerned speculator. Fortunately, the extra noise so generated in the order flow does not destroy the price's informativeness, but makes prices more informative when it matters for investment. In my model unskilled speculators sell relatively more often than buy owing to the feedback (between prices and investment) that makes firm value endogenous. When the firm does not invest speculators' types are indistinguishable. Since the skilled speculator is always correct and since selling increases the possibility of investment failure, and thus of the unskilled pooling with the skilled, it follows that the feedback effect induces an unskilled speculator to sell frequently. Because the unskilled speculator is usually selling, buy orders are likely to have come from a positively informed speculator and are thus more informative that the firm is good, reducing good firms' cost of capital.

I proceed to explore the effects of career concerns on economic welfare and on firms' wealth. The model predicts that, when prices are noisy, two inefficiencies can arise: bad projects may be funded and good ones may not be. For a wide range of parameters I find that firms invest less, at equilibrium, when career-concerned speculators trade than when profit maximizing speculators do. Since when projects have on average negative NPV undertaking bad projects is more costly than not undertaking good ones, career-concerned speculators reduce total inefficiency by curtailing their investment. At the firm level, a trade-off between profit-maximizing and career-concerned speculators arises when good firms hold less expensive projects. Although good firms are less likely to raise funds through a career-concerned speculator, when they do so it is (on average) at a lower cost of underpricing. Because the latter effect dominates the former, shareholder wealth is higher when career-concerned than when profit-maximizing speculators trade.

The baseline model is extended in Section 3 to accommodate one mechanism by which firms raise funds: a seasoned equity offering. I show that all the results from the baseline model still hold, and I prove the additional result that career-concerned speculators reduce the SEO discount.

This extension builds on the model of Gerard and Nanda (1993), adding a few ingredients to it. Extending the baseline model to incorporate an SEO requires adding some features—mainly, a stage that follows secondary market trading and in which firms choose the price at which to raise funds. The firm sets the SEO price so as to ensure its success and to compensate uninformed bidders for the "winner's curse" (à la Rock (1986)). The result is that SEO prices are often set lower than secondary market prices; the difference is known as the discount.

The SEO mechanism may exacerbate the effect of insufficient information on capital allocation given firms' discounts further inhibit their ability to raise funds. In addition to making market prices more informative, career-concerned speculators reduce the discount firms must offer by mitigating the effects of rationing (via the winner's curse) on capital providers' willingness to pay.

Chemmanur and Jiao (2011) model an SEO theoretically in order to study the effect of institutional investors on underpricing and on the SEO discount. In their model, unlike mine, institutional investors are profit-maximizing individuals who acquire information if they can profit from it. Whereas I study how speculators' preferences affect secondary market prices and discounts, Chemmanur and

Jiao explore good firms' incentives to stimulate institutional investors' information acquisition in both the secondary market stage and the bidding stage.

The SEO model allows me to engage with the literature on price manipulation and show that a speculator does not manipulate prices; in other words, he does not trade against his private information in the secondary market. Contrary to Gerard and Nanda's (1993) result, I show that a positively informed profit-maximizing speculator does not manipulate prices when prices feed back into investment: by selling or not trading, he depresses the price of the good firm; this causes the SEO to fail, in which case the speculator makes no profits. Likewise, by showing that neither does the unskilled speculator manipulate prices, I engage with Goldstein and Guembel's (2008) result that—when projects have ex ante positive NPV—the unskilled profit-maximizing speculator manipulates prices via selling.

The results reported here hold also for cases other than firms raising funds via outside equity. In fact, if prices are more reflective of fundamentals with career-concerned than with profit-maximizing speculators, then investment responds more when those of the former type trade, and the firm's cost of capital should decrease irrespective of how funds are raised. In Section 4.1 I show that, conditional on issuing debt, career-concerned speculators loosen firms' financial constraints.

In the baseline model the speculator is one of two extremes: he can be either profit maximizing or career concerned. In Section 4.2, the baseline model is extended to incorporate a speculator who cares about profits *and* reputation. The results of the baseline model obtain in the limits (i.e., as the speculator cares about only profits or only reputation). I also extend the baseline model so that career-concerned and profit-maximizing speculators can trade together: Section 4.3 identifies a sufficient condition for the main result—that career-concerned speculators relax firms' financial constraints—to hold.

1.2 Empirical Evidence

Is there evidence that institutional investors lessen firms' under-investment by decreasing their cost of capital? Is it plausible that unskilled fund managers sell too much to hide their type? Do funds' clients react to both returns and holdings? How do institutional investors behave in equity offerings compared to individual investors?

Lev and Nissim (2003) find that institutional investors' stock ownership, gathered using 13F data, mitigates firms' under-investment, measured in terms of capital expenditures, business acquisitions, and research and development. They show, consistent with my model, that institutions mitigate under-investment, primarily by reducing information asymmetries, which in turn reduce the wedge between the cost of internal and external funds.

My model is stylized, yet it seems to match some of the empirically observed behavior of career-concerned institutions. For example, Wermers (1999) analyzes mutual funds' trading between 1975 and 1994 to discern whether funds churn and finds funds' churning behavior on the sell-side. According to his definition, funds churn when stocks have large imbalances between buys and sells. In my model, stocks would show imbalances only on the sell-side, due to the unskilled fund's excessive selling.

While I do not model client behavior explicitly, I interpret funds' payoffs as the inflow of new client wealth. In equilibrium, clients chase fund returns, a well-established empirical regularity first documented by Chevalier and Ellison (1997). They also invest in funds that have bought successful firms at fair prices in the model, investor behavior that Solomon, Soltes, and Sosyura (2012) document—they show that money flows to funds with high past returns only after the firms they own have been in the news.

This paper is closely related to recent empirical literature investigating the role of institutional investors in SEOs, which has uncovered positive effects of institutional investors on SEOs that are in line with my theoretical results. Chemmanur, He, and Hu (2009) analyze a sample of 786 institutions (mutual funds and plan sponsors) who traded between 1999 and 2005. They find that greater secondary market institutional net buying and larger institutional share allocations are associated with a smaller SEO discount—consistent with my finding that the discount is larger when individual than when institutional investors trade. They also find that institutional investors do not engage in manipulation strategies before the SEO. In particular, more net buying in the secondary market is associated with more share allocations in the SEO and more post-offer net buying. These results accord with my finding that there is no price manipulation at equilibrium. Gao and Mahmudi (2008) highlight the substantial monitoring role of institutional investors in SEOs, finding that firms with higher proportions of institutional shareholders have better SEO performance and are more likely to complete announced SEO deals. This evidence supports my model's prediction that firms whose SEO is subscribed to by institutional investors can invest in more expensive projects and thus, on average, perform better post-SEO than do those subscribed to by individual investors. It also supports the idea that institutional investors reduce the probability that bad projects are undertaken.

1.3 Structure of the paper

The rest of the paper is organized as follows. Section 2 introduces the baseline model and finds the two equilibria where the profit-maximizing and career-concerned speculators acquire information. Section 2.3 compares the benefits created by career-concerned speculators with those created by profit-maximizing ones, and Section 3, solves for the seasoned equity model. Section 4 extends the baseline model to include the firm's issuance of debt, preferences of a more general nature, and simultaneous trading of profit-maximizing and career-concerned speculators. Section 5 concludes.

2 Baseline Model

2.1 Model

2.1.1 Firms and Projects

In my model economy there are two types of firms $\Theta \in \{\mathrm{G}, \mathrm{B}\}$, where G stands for "good" and B for "bad". A firm of type Θ is endowed with a project that costs I and pays off V_Θ. The firm's type is private information, and outsiders hold the prior belief θ that the firm is good. Only good firms' projects are profitable; in fact, $V_\mathrm{G} - I > 0 > V_\mathrm{B} - I$. Managers are in charge of the investment decision. Whereas the incentives of good firms' managers are aligned with those of shareholders, bad firms' managers secure private benefits when projects are implemented and so create an agency problem. Managers of bad firms are thus willing to undertake negative NPV projects.[7]

For simplicity, I assume that firms have no cash or any other assets in place.[8] The only exception is an old project $\tilde{\chi}$ that will pay off I with (small) probability ϵ[9]—thus, $\mathbb{P}(\tilde{\chi} = I) = \epsilon$—and will otherwise pay off zero. So, unless this project succeeds, the firm cannot self-finance its project. Furthermore, each firm holds a project that is viewed by the market as having negative NPV:

$$\bar{V} - I := \theta V_\mathrm{G} + (1-\theta) V_\mathrm{B} - I < 0; \tag{1}$$

hence this project cannot be mortgaged to raise funding.

Firms are publicly traded with a number n of shares outstanding.

2.1.2 The Speculator and Liquidity Traders

The firm's equity is traded by a risk-neutral speculator and liquidity traders. The speculator is one of two types, $\tau \in \{\mathrm{S}, \mathrm{U}\}$, where $\mathbb{P}(\tau = \mathrm{S}) = \gamma \in (0,1)$.[10] The skilled speculator ($\tau = \mathrm{S}$) can acquire information at a finite cost whereas the unskilled one ($\tau = \mathrm{U}$) faces an infinite cost of acquiring information. The skilled speculator can acquire information $\eta = 1$ at cost c to observe a perfect signal $\sigma \in \{\sigma_\mathrm{G}, \sigma_\mathrm{B}\}$ of the underlying quality of the firm, namely $\mathbb{P}(\Theta \mid \sigma_\Theta) = 1$. Whether skilled or unskilled, the speculator can either buy ($a = +1$), not trade ($a = 0$), or sell ($a = -1$) a unit of the firm's equity. Liquidity traders submit orders $l \in \{-1, 0, 1\}$ each with equal probability.

[7] This is in line with Jensen's 1986 overinvestment and empire building.

[8] In fact, my results depend only on the non-pledgeability of any assets in place—in other words, on the assumption that firms can no longer mortgage their assets to fund themselves.

[9] This asset adds uncertainty to players' payoffs and thus refines away unreasonable equilibria even as $\epsilon \to 0$.

[10] This restriction guarantees the existence of reputation concerns. If speculators are all either skilled or unskilled then none will be career concerned since there is no possibility of affecting clients' beliefs about their type.

2.1.3 Timing and Prices

If $\tilde{\chi} = 0$ then firms can invest only by raising I. Firms in my model raise capital through issuing equity. Section 4.1 shows that, conditional on a firm's raising capital by issuing debt, my analysis remains unchanged.

For simplicity, I assume that firms raise equity at the market price. The mechanism by which firms issue equity is temporarily left unmodeled. I address this issue in Section 3 by modeling explicitly an SEO.

There are four dates: $t = 0, 1, 2, 3$. At $t = 0$ the firm decides whether to raise I; then the skilled speculator decides whether to acquire information ($\eta = 1$) and thus to observe a signal of the firm's quality. At $t = 1$, the speculator trades $a = \{-1, 0, 1\}$ with liquidity traders and prices are set by a competitive market maker. After observing the total order flow $y = a + l$, the market maker sets the price $p_1(y)$ in anticipation of the effect that this price will have on the firm's ability to raise the required funds from capital providers. Competitive capital providers invest I in the firm by buying a proportion α of its shares that makes them break even. Capital providers are uninformed about the quality of the firm, but observing prices enables them to update their beliefs about that quality to $\hat{\theta}(y)$. When prices indicate that the firm is more likely to be good than bad, capital providers may be willing to fund it at $t = 2$. If not, then the issue fails and the project is not undertaken.

At $t = 2$, the firm can raise the required funds I from capital providers whenever it can issue a proportion α of shares such that competitive capital providers break even:

$$\alpha \, \mathbb{E}\left[V_{\tilde{\Theta}} + \tilde{\chi} \,|\, y\right] = I. \tag{2}$$

Because the firm cannot issue more than 100 per cent of its shares, a necessary condition for the issue to succeed is that $\alpha \leq 1$; put another way, we must have

$$\mathbb{E}\left[V_{\tilde{\Theta}} + \tilde{\chi} \,|\, y\right] - I \geq 0. \tag{3}$$

The manager is willing to invest whenever the issue is successful so inequality 3 is also a sufficient condition for the issue to succeed. In fact, by investing, a bad firm's manager earns private benefits whereas a good firm's manager maximizes shareholder wealth. Therefore,

$$\iota \equiv \iota(\alpha) := \begin{cases} 0 & \text{if } \alpha > 1 \\ 1 & \text{otherwise;} \end{cases} \tag{4}$$

here $\iota = 1$ signifies a firm's successful fund raising and $\iota = 0$ its failure.

Anticipating the effect of prices on the firm's fund raising and hence on investment, the market maker sets the price as

$$p_1^y := p_1(y) = \iota(1-\alpha) \cdot \mathbb{E}\left[V_{\tilde{\Theta}} + \tilde{\chi} \,|\, y\right] + \epsilon(1-\iota)\mathbb{E}\left[V_{\tilde{\Theta}} \;\middle|\; y\right]. \tag{5}$$

If the firm's fund raising is successful, then it raises a proportion α of shares and the secondary market price takes into account the dilution $(1-\alpha)$ as well as the new capital. If fund raising is unsuccessful, then the price is just the expected value of project $\tilde{\chi}$. Substituting α from (2) and ι from (4), we can write (5) equivalently as

$$p_1(y) = \mathbb{E}\left[\tilde{v} \,\middle|\, y, \iota\right], \tag{6}$$

where $\tilde{v} \in \{V_{\mathrm{B}}, V_{\mathrm{B}} - I, 0, V_{\mathrm{G}} - I, V_{\mathrm{G}}\}$ is the firm's endogenous payoff. The price setting is similar to the discrete version of Kyle (1985) due to Biais and Rochet (1997). Unlike in those models, here the final realization of the firm's value depends on its ability to raise funds via prices. In other words, that value is endogenous: there is a feedback effect from prices to realized asset values.

2.1.4 A Speculator's Payoff

Speculators' payoffs take different forms in different parts of the paper, reflecting the speculators' different preferences. For example, speculators can be personified in reality as hedge funds, mutual funds, or individual investors.

Today most equity holders are delegated portfolio managers who invest on behalf of clients and are subject to different types of compensation contracts. This compensation typically consists of two parts: a percentage of the returns earned by the manager (the *performance fee*) and a percentage of the assets under management (the *fixed fee*). These percentages vary from fund to fund and sometimes are zero; for example most mutual funds do not charge a performance fee.[11]

Whereas the ability to make profits is key to obtaining the performance fee, the ability to build a good reputation is key to obtaining the fixed fee. That is, one way for funds to expand their compensation is to increase assets under management by retaining old clients and winning new ones. Contracts based on fixed fees drive delegated asset managers to behave differently from purely profit-maximizing speculators, whose rewards depend entirely on portfolio returns.

The following expected utility function captures these two main features of the speculators' preferences—namely, the performance and reputation components:

$$U = w_1 \Pi + w_2 \Phi - c\eta; \tag{7}$$

here $w_1 \geq 0$ is the weight that a speculator assigns to expected net returns on investment and $w_2 \geq 0$ is the weight that the speculator assigns to his expected reputation. Note that $\eta = 1$ whenever the speculator acquires information at cost c (and $\eta = 0$ otherwise). Explicitly, expected net returns are

$$\Pi := \mathbb{E}\left[a\tilde{R} \,|\, \tau, \sigma\right] \equiv \mathbb{E}\left[a(\tilde{v} - \tilde{p}_1) \,\middle|\, \tau, \sigma\right]; \tag{8}$$

[11]Elton, Gruber, and Blake (2003) find that, in 1999, only 1.7 per cent of all bond and stock mutual funds charged performance fees.

here the net return R is computed as the firm's net value v minus the price p, and expected reputation is

$$\Phi := \mathbb{E}\left[\tilde{r}\,|\,\tau,\sigma\right] \equiv \mathbb{E}\left[\mathbb{P}(\mathrm{S}\,|\,\Theta\iota, a, y)\,|\,\tau,\sigma\right]. \tag{9}$$

I define *reputation* r as the probability $\mathbb{P}$ that the speculator is skilled. In other words, reputation consists of a fund's client's posterior belief about the manager's type based on all observables;[12] these include the firm's type, which is observable only if $\iota = 1$, in addition to the fund's action a and the order flow y.[13] The speculator maximizes his reputation and returns conditional on knowing his type τ and his signal σ.

I export funds' career concerns from the dynamic setting of Dasgupta and Prat (2008) to a static one.[14] Reputation concerns usually arise in a repeated setting: a fund will seek to influence clients' beliefs about its type toward the end of increasing the fund's future fees, and clients seek to employ skilled funds that will earn them higher future returns. By considering career concerns in a static setting, I implicitly assume an unmodeled continuation period. In so doing I abstract from the relationship of the fund with its clients, which I take as given, to concentrate on the fund's relationship with firms.

For most of the analysis I study only the two limiting cases of a pure profit maximizer ($w_2 = 0$) and a pure careerist ($w_1 = 0$). In Section 4.2 I study the case in which the speculator cares both about profits and reputation.

2.2 Equilibria

2.2.1 No Information Acquisition: The Impossibility of Firms' Financing

Lemma 2.1 *When the speculator cannot acquire information about the firm's quality, the firm is unable to raise I.*

Proof. If the speculator cannot acquire information about the firm's quality, then the firm's price at $t = 0$ is

$$p_0 = \epsilon\,\bar{V}.$$

Given inequality (1) and given capital providers' posterior belief about the quality of the firm being equal to the prior belief θ, inequality (3) is not satisfied. In fact,

$$\mathbb{E}\left[V_{\tilde{\Theta}} + \tilde{\chi}\,\middle|\,y\right] - I = \mathbb{E}\left[V_{\tilde{\Theta}} + \tilde{\chi}\right] - I = \bar{V} + \epsilon I - I = \bar{V} - (1-\epsilon)I$$

[12] Clients are randomly matched to fund managers at $t = 0$ and update their beliefs about the fund at $t = 1$.

[13] The order flow is a sufficient statistic for the price because the price is determined by the market maker according to that order flow.

[14] For a microfoundation of these payoffs, see Dasgupta and Prat (2008).

is less than zero (for small ϵ) because the project's NPV is strictly negative by assumption, which causes fund raising to fail. Therefore, in this case firms can invest only when $\tilde{\chi} = I$. ■

Because acquiring information is essential, I next study the effect of speculators' preferences on information acquisition.

2.2.2 Information Acquisition: Firms' Financing with Profit-Maximizing Speculators

I characterize the equilibrium where a speculator is profit-maximizing and acquires information if he is skilled. Here the speculator's payoff takes the form of equation (7) with $w_1 = 0$.

Lemma 2.2 *For*

$$I \leq \frac{\theta V_{\mathrm{G}} + (1-\theta)(1-\gamma)V_{\mathrm{B}}}{[\theta + (1-\theta)(1-\gamma)](1-\epsilon)} =: \bar{I}_{\mathrm{pm}} \tag{10}$$

and

$$c \leq \bar{c}_{\mathrm{pm}}, \tag{11}$$

there exists a unique perfect Bayesian equilibrium in which the unskilled speculator does not trade, the skilled speculator acquires information and follows his signal, and the firm chooses to issue equity. Formally, the following statements hold.

- *The unskilled speculator never trades:*

$$s^{\mathrm{U}}(\sigma = \emptyset) = 0. \tag{12}$$

- *The skilled speculator acquires and follows his signal:*

$$\eta^* = 1;$$
$$s^{\mathrm{S}}(\sigma) = \begin{cases} +1 & \textit{if} \quad \sigma = \sigma_{\mathrm{G}}, \\ -1 & \textit{if} \quad \sigma = \sigma_{\mathrm{B}}. \end{cases}$$

- *Secondary market prices are*

$$p_1^{-2} = \epsilon\, V_{\mathrm{B}} =: \epsilon\, p_\epsilon^{-2},$$
$$p_1^{-1} = \epsilon\, \frac{\theta(1-\gamma)V_{\mathrm{G}} + (1-\theta)V_{\mathrm{B}}}{\theta(1-\gamma) + 1 - \theta} =: \epsilon\, p_\epsilon^{-1},$$
$$p_1^{0} = \epsilon\, \bar{V} =: \epsilon\, p_\epsilon^{0},$$
$$p_1^{1} = \frac{\theta V_{\mathrm{G}} + (1-\theta)(1-\gamma)V_{\mathrm{B}}}{\theta + (1-\theta)(1-\gamma)} - (1-\epsilon)I,$$
$$p_1^{2} = V_{\mathrm{G}} - (1-\epsilon)I.$$

- *All firms' types choose to raise I at $t = 0$.*

Appendix 6.1.1 shows that this is an equilibrium; here I review the steps of the proof. Appendix 6.1.2 shows that this is the unique equilibrium in strictly dominant strategies.

At equilibrium, the feedback between prices and investment implies that the equity issue succeeds only when the order flow is $y \in \{1, 2\}$ (provided 10 holds). For all order flows below $y = 1$, the market's posterior about the quality of the firm is so low that the capital provider is unwilling to pay I in exchange for anything less than all of the shares; consequently the issue fails. When $y \in \{-2, -1, 0\}$ the project is not undertaken, so profits are zero provided $\epsilon = 0$.

At equilibrium, no speculator has any incentive to deviate. A skilled and positively informed speculator has no incentive to deviate from buying when he observes a positive signal since selling (or not trading) would decrease the odds that a good firm invests and thus would reduce his chances of making a profit. A skilled and negatively informed speculator prefers selling because, with small probability ϵ, he can profit from his short position. Finally, an unskilled speculator avoids trading fairly priced shares so as not to incur a loss. Skilled speculators, conditional on having acquired information, will find it optimal to follow their signal, and likewise, anticipating this optimal course of action, they find it optimal to acquire information for $c \leq \bar{c}_{\text{pm}}$.

Finally, all firms' types choose to issue equity at $t = 0$ because, with positive probability, they can raise I and invest. These actions lead the manager of a good (resp., bad) firm to maximize shareholder wealth (resp., private benefits).

Corollary 2.2.1 *If prices are sufficiently informative, then there is no perfect Bayesian equilibrium in which a skilled profit-maximizing speculator acquires information.*

The proof is given in Appendix 6.1.2. Intuitively, when prices are sufficiently informative, the skilled speculator has little room to profit and so his information loses its speculative value. This is what happens when investment fails given $y = 1$ (i.e., when (10) is not satisfied). If investment succeeds only when $y = 2$ then, since prices reveal the skilled speculator's private information, he has no room to profit (for sufficiently low ϵ) and thus no incentive to acquire costly information.

2.2.3 Information Acquisition: Firms' Financing with Career-Concerned Speculators

I now characterize the equilibrium where a speculator is career concerned and acquires information if he is skilled. Here the speculator's payoff takes the form of equation (7) with $w_1 = 0$.

Lemma 2.3 *For*

$$I \leq \frac{\theta[\gamma + (1-\gamma)\mu^*]V_{\text{G}} + (1-\theta)(1-\gamma)\mu^* V_{\text{B}}}{[\theta\gamma + (1-\gamma)\mu^*](1-\epsilon)} =: \bar{I}_{cc} \tag{13}$$

and

$$c \leq \bar{c}_{\text{cc}}, \tag{14}$$

there exists a perfect Bayesian equilibrium in which the skilled speculator acquires and follows his signal, the unskilled speculator randomizes between buying and selling (where μ^* is the probability with which he buys) and the firm chooses to issue equity. Formally, the following statements hold.

- *The unskilled speculator plays according to*

$$s^{\mathrm{U}}(\sigma=\emptyset)=\begin{cases}+1 & \textit{with probability } \mu^*,\\ -1 & \textit{with probability } 1-\mu^*,\end{cases} \tag{15}$$

  where $\mu^* \in [0,\theta)$.

- *The skilled speculator plays according to*

$$\eta^* = 1; \tag{16}$$

$$s^{\mathrm{S}}(\sigma)=\begin{cases}+1 & \textit{if} \quad \sigma=\sigma_{\mathrm{G}},\\ -1 & \textit{if} \quad \sigma=\sigma_{\mathrm{B}}.\end{cases} \tag{17}$$

- *Secondary market prices are*

$$\begin{aligned}
&p_1^{-2}=p_1^{-1}=\epsilon\,\frac{\theta(1-\gamma)(1-\mu^*)V_G+(1-\theta)[\gamma+(1-\gamma)(1-\mu^*)]V_B}{(1-\theta)\gamma+(1-\gamma)(1-\mu^*)}=:\epsilon\,p_\epsilon^{-1},\\
&p_1^0=\epsilon\,\bar{V}=:\epsilon\,p_\epsilon^0,\\
&p_1^1=p_1^2=\frac{\theta[\gamma+(1-\gamma)\mu^*]V_{\mathrm{G}}+(1-\theta)(1-\gamma)\mu^* V_{\mathrm{B}}}{\theta\gamma+(1-\gamma)\mu^*}-(1-\epsilon)I.
\end{aligned}$$

- *All firms' types choose to raise I at $t=0$.*

The proof is given in Appendix 6.1.3 and may be sketched as follows. Given the strategies of the skilled and the unskilled speculators, investment succeeds whenever $y\in\{1,2\}$ provided inequality (13) is satisfied. Prices when the order flow is $y=1$ or $y=2$ contain the same information about firm quality because, since speculators always trade, each order flow occurs only when a speculator buys; as a result, the only distinction between these events is that noise is absent when $y=1$ but noise is ubiquitous when $y=2$. An analogous argument applies when the order flow is $y=-1$ or $y=-2$.

The payoff of the career-concerned speculator is linear in his ability—that is, in the client's posterior about his type. Clients observe the hired fund's action a and the firm's type Θ (if the firm invests) and then update their beliefs about the fund's ability.[15] If the firm's fund raising fails ($\iota=0$) then the value of the firm is endogenously zero (unless $\chi=I$) and thus an inference channel is shut: clients'

[15] The order flow does not provide any information to the client beyond that contained in the fund's action and the firm's type.

inferences are limited to the hired fund's action. In fact, because of the feedback between prices and investment, the value of the firm is zero whenever it does not invest; in that case, clients cannot observe neither the firm's type Θ nor the correctness of the speculators' trade. Note that a fund's selling results in failure to raise capital from the market because the order flow is $y = -2$, $y = -1$, or $y = 0$. I call selling "the pooling action" because it pools skilled and unskilled speculators on the selling action. I call buying "the separating action" because it can lead either to the fund's being right (buying a good firm) or wrong (buying a bad firm).

In an equilibrium where the skilled speculator acquires and follows his signal, the unskilled career-concerned speculator must trade or else reveal his type. He therefore randomizes between buying and selling; μ^* is the buy probability at which he is indifferent between buying and selling. The probability μ^* is always less than θ at equilibrium, which means that the unskilled speculator is more likely to sell than to buy. Selling allows him to pool with the skilled speculator, whereas buying may reveal that he is unskilled. It might thus seem that the unskilled speculator should always sell, but this is not always true because the probability with which he sells feeds back into his utility. If the client believes that the fund always sells, then her posterior upon observing such action is that the fund is most likely to be unskilled. Hence the unskilled may have an incentive to deviate.

I give here an intuitive proof that $\mu^* < \theta$ (the formal proof is in the Appendix). Suppose by way of contradiction that μ^* is greater than θ, and suppose that the client beliefs are (i) that the skilled speculator follows his signal and (ii) that the unskilled speculator mixes between buying and selling. Then, since $\mu^* > \theta$, upon observing a sale the client thinks it more likely that she is matched to a skilled speculator while the unskilled speculator obtains a payoff greater than γ from selling and being pooled with the skilled speculator. If the unskilled speculator buys instead, then it is possible that he is revealed to be right and also that he is revealed to be wrong; overall, then, he should expect a lower payoff than the one he obtains from selling. Hence this speculator is no longer indifferent between buying and selling and therefore sells all the time—a contradiction.

The key element of this proof is that μ^* is the *unique* probability that makes the unskilled speculator indifferent between buying and selling because that probability affects the payoff from either buying or selling: the less likely he is to sell, the higher is the payoff from selling (and vice versa).

Given the unskilled speculator's strategy, it is optimal for the skilled speculator to follow his signal conditional on having acquired information. Anticipating this optimal course of action, this speculator finds it optimal to acquire for $c \leq \bar{c}_{\text{cc}}$.

Finally, all firms' types always choose to issue equity at $t = 0$ since with positive probability they can raise I and invest. In so doing, the manager of a good firm maximizes shareholder wealth, whereas the manager of a bad firm maximizes his private benefits.

Corollary 2.3.1 *As long as the cost of acquiring information is not too high, there is always an equilibrium in which a skilled career-concerned speculator acquires information and follows his signal—*

even when prices are perfectly informative.

Proof. Perfectly informative prices obtain when $\mu^* = 0$ and $\epsilon = 0$. In Lemma 2.3 I show that, for sufficiently low costs, a skilled speculator acquires information and follows his signal whenever $\mu^* = 0$. ■

Corollary 2.2.1 shows that a profit-maximizing speculator does not acquire information when prices are sufficiently informative. According to Corollary 2.3.1, however, a skilled career-concerned speculator is willing to acquire information even in those circumstances.

2.3 Results: Benefits of Career Concerns

In this section, for simplicity, I focus on the $\epsilon = 0$ limit because ϵ is relevant only for equilibrium selection.

2.3.1 Career Concerns and Firms' Financial Constraints

Proposition 2.1 *Firms can obtain funding for a larger fraction of projects when speculators are career concerned. In other words: there is a range of projects with funding costs $I \in (\bar{I}_{\mathrm{pm}}, \bar{I}_{\mathrm{cc}}]$ that can be undertaken only with career-concerned speculators, where*

$$\bar{I}_{\mathrm{cc}} = \frac{\theta[\gamma + (1-\gamma)\mu^*]V_{\mathrm{G}} + (1-\theta)(1-\gamma)\mu^* V_{\mathrm{B}}}{\theta\gamma + (1-\gamma)\mu^*}$$

and

$$\bar{I}_{\mathrm{pm}} = \frac{\theta V_{\mathrm{G}} + (1-\theta)(1-\gamma)V_{\mathrm{B}}}{\theta + (1-\theta)(1-\gamma)}.$$

Proof. Since $\bar{I}_{\mathrm{cc}}$ is decreasing in μ and $\bar{I}_{\mathrm{cc}} = \bar{I}_{\mathrm{pm}}$ whenever $\mu = 1$, it follows that $\bar{I}_{\mathrm{cc}} > \bar{I}_{\mathrm{pm}}$ for any $\mu < 1$. Note that μ is always less than 1 because it is less than $\theta \in (0, 1)$ by Lemma 2.3. Hence, there is a range of projects with costs $I \in (\bar{I}_{\mathrm{pm}}, \bar{I}_{\mathrm{cc}}]$ that can be undertaken only when career-concerned speculators trade. ■

I now present two remarks that build the intuition for the main result of Proposition 2.1.

Remark 2.1 *Skilled speculators acquire information if and only if the equity issue succeeds at $y = 1$, which makes $y = 1$ the "pivotal" order flow for investment.*

An order flow is *pivotal* if it is the minimum order flow such that the market breaks down unless investment is undertaken at that order flow.

At equilibrium, if $y < 1$ then the equity issue fails and investment is not undertaken; this is shown in Lemmata 2.2 and 2.3. To prove that $y = 1$ is pivotal we need only demonstrate that, unless investment is undertaken in $y = 1$, the market breaks down and no capital flows to firms. I shall prove that a skilled speculator does not acquire information if the cost of capital is so high that investment succeeds only when $y = 2$. This is true both for skilled profit-maximizing and for skilled career-concerned speculators, but for different reasons.

The skilled profit-maximizing speculator is unwilling to acquire information at any cost when investment succeeds only if $y = 2$. When $y = 2$ the price reflects his private information, which then loses its speculative value (see Corollary 2.2.1): he is therefore unwilling to pay its cost.

When speculators are career concerned, order flows $y \in \{1, 2\}$ contain the same information about firm quality. Because such speculators always trade, each order flow occurs only when speculators buy; hence the distinction between these events is that only when $y = 2$ is there noise. Thus, the skilled career-concerned speculator acquires information if and only if investment succeeds in both order flows 1 and 2.

Remark 2.2 *The cost of capital in the pivotal order flow is always lower when career-concerned than when profit-maximizing speculators trade.*

Having identified in Remark 2.1 that $y = 1$ is the pivotal order flow for investment, I show that, conditional on information being acquired, when career-concerned speculators trade, the cost of capital in this order flow is always lower than when profit-maximizing speculators trade.

Observe that low cost of capital is equivalent to high secondary market prices that are more informative about the firm's being good.

Conditional on acquiring information, the actions of liquidity traders and of the skilled speculator are identical in the two models—the model where only career-concerned speculators trade and that in which only profit-maximizing speculators do. Therefore, the key to the result of Remark 2.2 is the different behavior of *unskilled* speculators in the two models. In particular: when the order flow is 1, do prices reveal more of the skilled speculator's private information in the model where career-concerned speculators trade?

Unskilled profit-maximizing speculators never trade and so noise is exogenously determined by liquidity traders, who confound the skilled speculator's private information. In contrast, an unskilled career-concerned speculator always trades—and thereby generates endogenous noise in the order flow—in order to avoid revealing his type and to emulate skilled traders who always follow their signal. But why is it that, if career-concerned speculators trade, the price when $y = 1$ then reveals more of the skilled's speculator private information?

The confounding of a skilled speculator's buy order occurs: (i) in the career-concerned model, when an unskilled speculator buys, and liquidity traders don't trade or (ii) in the profit-maximizing model, when an unskilled speculator doesn't trade, and liquidity traders submit a buy order. Because the likelihood of liquidity traders submitting any type of order is independent of whether the speculator is profit maximizing or career concerned, the only difference is the probability with which an unskilled speculator trades. An unskilled profit-maximizing speculator does not trade with probability 1, whereas a career-concerned speculator buys with probability $\mu^* < 1$.

2.3.2 Project Quality and Career-Concerned Speculators

Career-concerned speculators allow both good and bad firms to undertake their projects, so one may ask whether the economy would be better-off without such speculators. I show that the gains of allowing good firms to undertake their projects outweigh the costs of allowing bad firms to undertake theirs, which establishes that the overall effect of career concerns is indeed positive.

Proposition 2.2 *Career concerns allow firms to undertake, on average, positive NPV projects.*

Proof. If $\epsilon = 0$ and $\tilde{v} \in \{V_{\mathrm{B}} - I, 0, V_{\mathrm{G}} - I\}$, then

$$\mathbb{E}(\tilde{v}) = \theta\mathbb{P}(\iota = 1 \mid \mathrm{G})(V_{\mathrm{G}} - I) + (1-\theta)\mathbb{P}(\iota = 1 \mid \mathrm{B})(V_{\mathrm{B}} - I) \geq 0.$$

In the model,

$$\mathbb{E}(\tilde{v}) = \frac{2}{3}\theta(\gamma + (1-\gamma)\mu^*)(V_{\mathrm{G}} - I) + \frac{2}{3}(1-\theta)(1-\gamma)\mu^*(V_{\mathrm{B}} - I) \geq 0; \tag{18}$$

this follows because the expectation is a decreasing function of I and because the equilibrium where career-concerned speculators acquire information exists if and only if (13) is satisfied—that is, iff

$$I \leq \frac{\theta[\gamma + (1-\gamma)\mu^*]V_{\mathrm{G}} + (1-\theta)(1-\gamma)\mu^* V_{\mathrm{B}}}{\theta\gamma + (1-\gamma)\mu^*}.$$

Since inequality (18) holds for the largest I, the proposition follows. ■

2.3.3 Additional Effects of Career Concerns

2.3.4 Notation

The threshold $\mu^*(\theta, \gamma) = \frac{1}{2}$ is crucial for results to follow—so much so that the two regions of parameters for which μ^* is less (greater) than one half merit their own notation.

Define $\Gamma(\theta)$ implicitly by $\mu^*(\theta, \Gamma(\theta)) = \frac{1}{2}$. Then the first region is defined as

$$R_{\mathrm{cc}} = \{(\theta, \gamma) \in [0,1]^2; \gamma \geq \Gamma(\theta)\}$$

and the second region, R_{pm}, as the complement of R_{cc} in $[0,1]^2$. These regions are illustrated graphically in Figure 1.

A sufficient condition for μ^* to be lower than $\frac{1}{2}$ is that θ be lower than $\frac{1}{2}$ (recall that $\mu^* < \theta$)—in other words, that the median firm in the industry be bad. This condition is realistic. In fact bad managers undertake only those negative NPV projects that destroy relatively little value. A

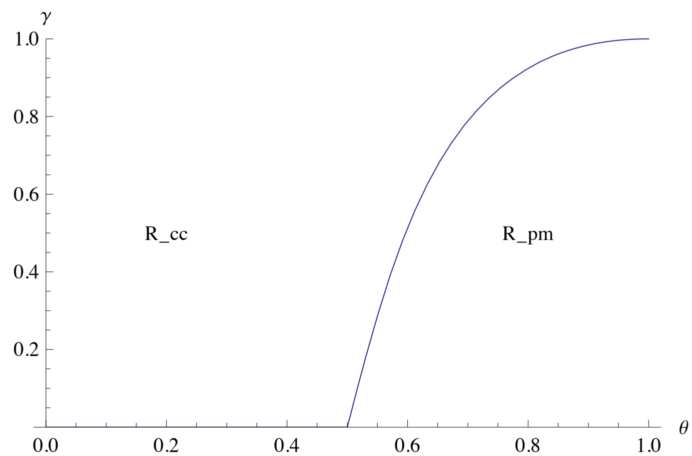

Figure 1: Regions

manager who destroyed too much value—by undertaking excessively negative NPV projects—would invite unwanted scrutiny from the Board of Directors. Therefore,

$$\left|V_{\mathrm{G}} - I\right| > \left|V_{\mathrm{B}} - I\right|.$$

This condition, when combined with the assumption that the average industry NPV is negative (inequality (1)), implies that

$$\theta < \frac{1}{2}.$$

2.3.5 Total Inefficiency

Proposition 2.3 *For $(\theta, \gamma) \in R_{\mathrm{cc}}$, total inefficiency resulting from over- and under- investment is lower when speculators are career concerned than when they are profit maximizing.*

Proof. Two economic inefficiencies arise in my model,[16] one from not funding good projects and the other from funding bad ones. These two inefficiencies have an asymmetric effect on the economy because, by (1), the average losses that result from not funding good projects are smaller than those that result from funding bad ones. In fact, condition (1) can be re-written as

$$\theta|V_{\mathrm{G}} - I| < (1-\theta)|V_{\mathrm{B}} - I|. \tag{19}$$

I define *total inefficiency* as the weighted average of these two inefficiencies weighted by the probability that each of them is realized. Thus,

$$\text{total inefficiency} = \theta\mathbb{P}(\iota = 0 \,|\, \mathrm{G})|V_{\mathrm{G}} - I| + (1-\theta)\mathbb{P}(\iota = 1 \,|\, \mathrm{B})|V_{\mathrm{B}} - I|. \tag{20}$$

[16] Ignoring the deadweight loss caused by forgoing private benefits.

The question is whether total inefficiency is greater with career-concerned or with profit-maximizing speculators.

The probability that a good project is not undertaken is

$$\mathbb{P}(\iota = 0 \,|\, \mathrm{G}) = \begin{cases} \left(1 - \frac{2}{3}(\gamma + (1-\gamma)\mu^*)\right) & \text{with career-concerned speculators,} \\ \left(1 - \frac{2}{3}\gamma - \frac{1}{3}(1-\gamma)\right) & \text{with profit-maximizing speculators;} \end{cases} \tag{21}$$

the probability that a bad project is undertaken is

$$\mathbb{P}(\iota = 1 \,|\, \mathrm{B}) = \begin{cases} \frac{2}{3}(1-\gamma)\mu^* & \text{with career-concerned speculators,} \\ \frac{1}{3}(1-\gamma) & \text{with profit-maximizing speculators.} \end{cases} \tag{22}$$

When $\mu^* < \frac{1}{2}$, underinvestment always occurs with career-concerned speculators: the probabilities of a good or a bad project being undertaken, $\mathbb{P}(\iota = 1 \,|\, \mathrm{G})$ and $\mathbb{P}(\iota = 1 \,|\, \mathrm{B})$, are always lower with career-concerned than with profit-maximizing speculators. Since (19) holds and since $\mathbb{P}(\iota = 0 \,|\, \mathrm{G}) + \mathbb{P}(\iota = 1 \,|\, \mathrm{B})$ is the same in both models, it follows that the average economic losses generated by undertaking bad projects are greater than those generated by not undertaking good ones and that both loss types are minimized when underinvestment occurs (i.e., when $\mu^* < \frac{1}{2}$). So if $\mu^* < \frac{1}{2}$ then inefficiency is minimized with career-concerned speculators.

More formally, when profit-maximizing speculators trade, I can substitute (21) and (22) in equation (20) and obtain

$$\theta\left(1 - \frac{2}{3}\gamma - \frac{1}{3}(1-\gamma)\right)|V_{\mathrm{G}} - I| + \frac{1}{3}(1-\theta)(1-\gamma)|V_{\mathrm{B}} - I|;$$

when career-concerned speculators trade, I obtain

$$\theta\left(1 - \frac{2}{3}\gamma - \frac{2}{3}(1-\gamma)\mu^*\right)|V_{\mathrm{G}} - I| + \frac{2}{3}(1-\theta)(1-\gamma)\mu^*|V_{\mathrm{B}} - I|.$$

Subtracting the second expression from the first, then yields

$$\begin{aligned} &-\theta\frac{(1-\gamma)}{3}(1-2\mu^*)(V_{\mathrm{G}} - I) - \frac{(1-\theta)(1-\gamma)}{3}(1-2\mu^*)(V_{\mathrm{B}} - I) = \\ &\qquad = -\frac{(1-\gamma)}{3}(1-2\mu^*)\left(\bar{V} - I\right), \end{aligned} \tag{23}$$

which is greater than zero if and only if $\mu^* < \frac{1}{2}$ because the average project has negative NPV. This proves Proposition 2.3: in region R_{cc} total inefficiency is greater with profit-maximizing than with career-concerned speculators. ■

2.3.6 Shareholder Wealth

Proposition 2.4 *For $(\theta, \gamma) \in R_{cc}$, the trading of career-concerned speculators maximizes good firms' shareholders' wealth.*

Proof. Conditional on investment being undertaken, in good firms we have

$$\text{shareholder wealth} = \mathbb{E}\left[(1-\tilde{\alpha})V_G\right]\iota.$$

In firms traded by career-concerned speculators this wealth is equal to

$$\frac{2}{3}(\gamma + (1-\gamma)\mu^*)\left(1 - \frac{I}{p_c^1 + I}\right)V_{\mathrm{G}}; \tag{24}$$

in firms traded by profit-maximizing speculators, it is equal to

$$\frac{1}{3}\gamma\left(1 - \frac{I}{V_G}\right)V_{\mathrm{G}} + \frac{1}{3}\left(1 - \frac{I}{p_p^1 + I}\right)V_{\mathrm{G}}. \tag{25}$$

Here

$$p_c^1 = \frac{\theta[\gamma + (1-\gamma)\mu^*]V_{\mathrm{G}} + (1-\theta)(1-\gamma)\mu^* V_{\mathrm{B}}}{\theta\gamma + (1-\gamma)\mu^*} - I, \tag{26}$$

$$p_p^1 = \frac{\theta V_{\mathrm{G}} + (1-\gamma)(1-\theta)V_{\mathrm{B}}}{\theta + (1-\gamma)(1-\theta)} - I. \tag{27}$$

Normalizing $V_{\mathrm{B}} = 0$ and then subtracting (25) from (24) reveals the condition under which shareholders' wealth is higher when career-concerned speculators trade: when

$$(1-\gamma)(2\mu - 1) - I\left\{\frac{-2[\theta\gamma + (1-\gamma)\mu^*]}{\theta V_{\mathrm{G}}} + \frac{\gamma}{V_{\mathrm{G}}} + \frac{\theta + [(1-\gamma)(1-\theta)]}{\theta V_{\mathrm{G}}}\right\} > 0;$$

simplifying, I obtain

$$(1-\gamma)(2\mu^* - 1) > \frac{I}{\theta V_G}(1-\gamma)(2\mu^* - 1).$$

The last inequality holds if and only if $\mu^* < \frac{1}{2}$ because projects have negative average NPV ($I > \theta V_G$). ∎

A trade-off between profit-maximizing and career-concerned speculators arises when good firms hold cheap projects. Although it is ex ante less likely that good firms raise I with career-concerned speculators when $\mu^* < \frac{1}{2}$, these firms do so at a significantly lower cost of underpricing when $y = 1$. Because, on average, the latter effect dominates the former, shareholder wealth is greater with career-concerned speculators.

3 A Seasoned Equity Offering

3.1 Model

Until now I have assumed that secondary market prices determine a firm's ability to raise funds, and I have refrained from explicitly modeling a firm's equity issue. A popular way for public firms to raise capital is through a seasoned equity offering, which I model by building on Gerard and Nanda's 1993 model.

I focus on equity finance because it is the most relevant form of funding for the firms I model: listed corporations that have projects with negative average NPV, no cash, and no assets in place.[17] The relevance of a well-functioning equity market is emphasized by DeAngelo, DeAngelo, and Stulz (2010); these authors report that, without the capital raised via SEOs, 62 per cent of issuers would run out of cash in the year after the offering. Nevertheless, results derived from the baseline model apply to more general settings than that of an SEO, as I show in Section 4.1.

Key to my model is the interaction between the secondary market price and the issuing price, which is typical of SEOs and central to Gerard and Nanda's paper: the issuer usually sets the SEO price lower than the secondary market price, where the difference in prices is referred to as the *discount*. Although my aim is different, their model is well suited to my analysis. Whereas Gerard and Nanda show that a skilled speculator manipulates prices around an SEO with the intention of concealing his information before the equity offering (his secondary market losses can be recouped through the purchase of shares in the SEO at lower prices), I study the effect of speculators' preferences on the SEO price when prices feed back into investment. Even so, I can address manipulation by engaging directly with Gerard and Nanda's message. I further engage with the literature on manipulation with feedback effects (see, e.g., Goldstein and Guembel (2008)) by also showing that an unskilled speculator has no incentive to manipulate prices—that is, to trade in the absence of information.

Extending the model to incorporate an SEO requires adding a few assumptions to the baseline model of Section 2. First, at $t = 0$, the firm announces the SEO and the number n' of shares to be offered in the SEO; second, after the trading date and prior to realization of the payoffs, the issuer sets the SEO price and bidding occurs. Finally, at the time of the SEO, uninformed bidders (retail investors) bid for the firm's equity along with the speculator.

3.1.1 Timing and Prices

At $t = 0$, the firm announces the SEO, the timing, and the number of shares (n') to be issued; then the skilled speculator decides whether or not to acquire information, $\eta \in \{0, 1\}$. At $t = 1$, the speculator who is skilled (resp., unskilled) with probability γ (resp., $1 - \gamma$), submits an order in the secondary market: he either buys, sells, or does not trade, so $a \in \{-1, 0, 1\}$. He trades with liquidity traders who submit orders $l \in \{-1, 0, 1\}$ with equal probability. The market maker observes the aggregate order flow and sets the price p_1^y in anticipation of the effect that the price will have on the firm's ability to raise the required funds in the SEO. At $t = 2$, the firm sets the SEO price and bidding takes place; at

[17] Equity, as Myers and Majluf (1984) predict, is the financing instrument of last resort. Recent empirical evidence (see, e.g., DeAngelo, DeAngelo, and Stulz (2010) and Park (2011)) suggests a strong correlation—in line with my assumption of negative NPV projects—between a firm's decision to issue equity and financial distress.

$t = 3$ uncertainty resolves.

At $t = 2$, the issuer sets the SEO price p_2^y to ensure that enough bidders subscribe to the SEO while taking into account public information—the order flow. In the trading stage, the speculator trades with liquidity traders; in the bidding stage, uninformed bidders and the speculator submit bids.[18] Uninformed speculators have no information about the firm and may refrain from bidding if they expect losses (conditional on their available information), which is especially harmful because they are crucial for the SEO's success. The speculator cannot absorb the entire issue since $N_\tau < n' < N_\mathrm{N}$, where the total number of shares bid by each group is fixed and known: N_τ denotes the shares held by the speculator (where $\tau \in \{\mathrm{S}, \mathrm{U}\}$) and N_N denotes the shares held by uninformed bidders. Once the SEO price is set, a speculator and the uninformed bidders bid. If the offering is oversubscribed, then shares are distributed to participants on a pro rata basis. The uninformed bidders end up with the following proportion of shares:

$$\alpha_\mathrm{N} = \begin{cases} 1 & \text{if the speculator does not trade,} \\ \dfrac{N_\mathrm{N}}{N_\tau + N_\mathrm{N}} = \dfrac{1}{\beta} & \text{if the speculator trades;} \end{cases} \tag{28}$$

$1/\beta$ is the proportion of SEO shares allocated to the uninformed bidders when both the speculator and the uninformed bidders bid.

Prices in the SEO stage are set differently from prices in the secondary market trading stage. Recall that the issuer must set the SEO price so as to ensure the success of the equity offering and compensate the uninformed investors for the winner's curse. Thus the SEO price p_2^y is set according to

$$\mathbb{E}\left[\tilde{\alpha}_\mathrm{N}\left(\tilde{v} + I - p_2^y\right) \,\middle|\, y\right] = 0, \tag{29}$$

where $\tilde{v} \in \{V_\mathrm{B}, V_\mathrm{B} - I, 0, V_\mathrm{G} - I, V_\mathrm{G}\}$. In other words, it is set such that uninformed bidders break even conditional on public information.

The SEO price is often lower than the trading price, and the difference is a function of the secondary market price's informativeness and the rationing that occurs at $t = 2$. Prices in the secondary market ($t = 1$) are set in anticipation of the firm's successful fund raising and investment at $t = 2$. That investment succeeds if the firm can raise I by issuing n' new shares—that is, if

$$\frac{n'}{n + n'}\, p_2^y \geq I.$$

A necessary and sufficient condition for the success of the SEO is that

$$p_2^y > I. \tag{30}$$

[18] Although both the unskilled speculator and uninformed bidders are unaware of the firm's underlying value, at $t = 1$ the latter has less information than the former—who knows whether or not the order flow is a consequence of his own trade.

Hence,

$$\iota = \begin{cases} 1 & \text{if } p_2^y > I, \\ 0 & \text{otherwise.} \end{cases} \tag{31}$$

Anticipating the effect of prices on firms' fund raising and subsequent investment, the market maker sets the secondary market price as

$$p^y := p_1(y) = \mathbb{E}\left[\tilde{v} \mid y, \iota\right]; \tag{32}$$

this is similar to p_1^y in equation (6).

3.1.2 Payoff to the Speculator

The speculator's payoff is similar in substance to the one introduced in equation (7). Here that equation is adjusted to account for the model's new ingredients. Thus,

$$U = w_1\Pi + w_2\Phi - c\eta. \tag{33}$$

Here

$$\Pi = \mathbb{E}\left[a(\tilde{v} - \tilde{p}_1) \mid \tau, \sigma\right] + \alpha_\tau \mathbb{E}\left[\tilde{v} + I - \tilde{p}_2 \mid \tau, \sigma\right] \tag{34}$$

because now, in addition to profiting from trades in the secondary market, the speculator can profit from acquiring the proportion α_τ of shares in the equity issue; and

$$\Phi = \mathbb{E}\big(\mathbb{P}(\mathrm{S} \mid \Theta\iota, a_1, a_2, y) \mid \tau, \sigma\big), \tag{35}$$

because the fund's clients now have an additional updating variable—namely, the fund's action at $t = 2$.

3.2 Equilibria

3.2.1 Information Acquisition: SEO with Profit-Maximizing Speculators

Lemma 2.4 below characterizes the equilibrium in which the skilled speculator acquires information and follows his signal at both $t = 1$ and $t = 2$ and in which the unskilled speculator does not trade at either $t = 1$ or $t = 2$. This is the most economically reasonable equilibrium and the only one satisfying a refinement. The proof consists of two steps: (i) showing that each speculator follows his signal at $t = 1$ independently of $t = 2$ strategies (this is proved in Appendix 6.2.2); and (ii) showing that, at $t = 2$, it is a strictly dominant strategy for each speculator to follow his signal given the refinement.

In Appendix 6.2.2 I argue that, at $t = 1$, neither a skilled nor an unskilled speculator profit from manipulating prices. *Manipulation* is defined as a speculator's trading against his private information. Gerard and Nanda (1993) show that a positively informed speculator may want to sell or not trade at $t = 1$ if his secondary market losses can be recouped by purchasing shares in the SEO at lower prices. In my model, prices feed back into investment and so a positively informed speculator does not manipulate prices: by selling or not trading he would push the good firm's price down; this would cause the SEO to fail and so he would make no profits.

I also find that the unskilled speculator does not manipulate prices. This result is contrary to Goldstein and Guembel (2008), who show that—in a dynamic model with feedback effects—the unskilled profit-maximizing speculator has an incentive to manipulate the price by selling at the first trading stage. There are three main differences between their paper and my SEO application, apart from their examining a managerial learning channel and not a financing channel.[19] First, Goldstein and Guembel study positive NPV projects. Second, at $t = 2$ their speculator has a wider action space in that he can buy, sell, or stay out; since I model an SEO, at $t = 2$ the speculator has only two options: either participate or not in the SEO. Third, they consider a secondary market price setting at $t = 2$ whereas I consider a price setting à la Rock (1986). Goldstein and Guembel argue that selling has a self-fulfilling nature: it depresses prices and leads firms to relinquish investment projects. In their model, the uninformed can profit by establishing a short position in the stock and subsequently driving down the firm's stock price by further sales. Such a strategy is not profitable in my model for two reasons. First, in the bidding stage, speculators can only either buy or stay out. Second, I assume average negative NPV projects and so selling always pushes prices to zero, leaving no room for manipulation.

At $t = 2$, both the skilled and unskilled speculator may be indifferent between buying and staying out if: (i) upon observing the order flow, they anticipate an SEO failure; or (ii) the private information of the skilled speculator is fully reflected by the price. Nevertheless, it is possible to break the indifference and so obtain the equilibrium of Lemma 2.4 as the unique one.[20] This equilibrium is the most reasonable; under it, a skilled speculator follows his signal and an unskilled one never trades—as is the case for equilibria in which speculators are profit maximizing and there are no gains from manipulating prices.

Lemma 2.4 *Let*

$$I \leq \frac{\theta[\gamma + (1-\gamma)\beta]V_G + (1-\theta)(1-\gamma)\beta V_B}{[\theta\gamma + (1-\gamma)\beta](1-\epsilon)} =: \mathcal{I}_{\text{pm}}, \tag{36}$$

$$c \leq \mathcal{C}_{\text{pm}}. \tag{37}$$

[19] The effects of these two channels are identical.

[20] To do so, one must allow the speculator to be "confused", to anticipate observing the wrong SEO price with vanishingly small probability; this is similar to what Rashes (2001) has shown empirically. The following refinement breaks the indifference: The positively informed speculator will always face the possibility of buying underpriced shares, whereas a negatively informed or unskilled speculator will always face the possibility of buying shares in an overpriced firm.

Then there exists a unique (refined) perfect Bayesian equilibrium in which the unskilled speculator does not trade at $t = 1$ and stays out at $t = 2$, the skilled speculator acquires information and follows his signal, and firms issue the number of shares that maximizes the probability that investment succeeds. Formally, the following statements hold.

- *The unskilled speculator plays according to the following strategies:*

$$s_1^{\mathrm{U}}(\sigma = \emptyset) = 0,$$
$$s_2^{\mathrm{U}}(\sigma = \emptyset,\, y) = 0.$$

- *The skilled speculator acquires information and plays according to following strategies:*

$$\eta^* = 1,$$
$$s_1^{\mathrm{S}}(\sigma) = \begin{cases} +1 & \text{if} \quad \sigma = \sigma_{\mathrm{G}} \\ -1 & \text{if} \quad \sigma = \sigma_{\mathrm{B}} \end{cases}$$
$$s_2^{\mathrm{S}}(\sigma,\, y) = \begin{cases} +1 & \text{if} \quad \sigma = \sigma_{\mathrm{G}} \\ -1 & \text{if} \quad \sigma = \sigma_{\mathrm{B}}. \end{cases}$$

- *At $t = 1$, prices are*

$$\begin{aligned}
p_1^{-2} &= \epsilon\, V_{\mathrm{B}} =: \epsilon\, p_\epsilon^{-2}, \\
p_1^{-1} &= \epsilon\, \frac{\theta(1-\gamma)V_{\mathrm{G}} + (1-\theta)V_{\mathrm{B}}}{\theta(1-\gamma) + 1 - \theta} =: \epsilon\, p_\epsilon^{-1}, \\
p_1^{0} &= \epsilon\, \bar{V} =: \epsilon\, p_\epsilon^{0}, \\
p_1^{1} &= \frac{\theta V_{\mathrm{G}} + (1-\theta)(1-\gamma)V_{\mathrm{B}}}{\theta + (1-\theta)(1-\gamma)} - (1-\epsilon)I, \\
p_1^{2} &= V_{\mathrm{G}} - (1-\epsilon)I.
\end{aligned} \tag{38}$$

- *At $t = 2$, the equity issue succeeds only if $y \in \{1, 2\}$; the SEO prices are then*

$$\begin{aligned}
p_2^{1} &= \frac{\theta[\gamma + (1-\gamma)\beta]V_{\mathrm{G}} + (1-\theta)(1-\gamma)\beta V_{\mathrm{B}}}{\theta\gamma + (1-\gamma)\beta} + \epsilon I, \\
p_2^{2} &= V_{\mathrm{G}} + \epsilon I.
\end{aligned} \tag{39}$$

- *All firms' types issue n' shares such that the equity issue succeeds when $y = 1$.*

The proof is given in Appendix 6.2.1.

Observing the equilibria of Lemma 2.2 and Lemma 2.4 immediately yields the following corollary.

Corollary 2.4.1 *Given funding at $y = 1$ in the baseline and SEO models, the baseline's strategies are restrictions of the SEO's strategies to $t = 1$.*

All results depending only on $t = 1$ quantities and $t = 2$ funding are unchanged provided funding occurs in $y = 1$. Observe that $y = 1$ implying successful investment imposes different restrictions on projects in the two models. The reason is that rationing concerns increase the cost of capital in the SEO model.

3.2.2 Information Acquisition: SEO with Career-Concerned Speculators

Here I characterize the equilibrium in which a skilled career-concerned speculator acquires information.

Lemma 2.5 *Let*

$$\begin{aligned} I &\leq \frac{\theta[\gamma + (1-\gamma)\mu^*]V_{\mathrm{G}} + (1-\theta)(1-\gamma)\mu^* V_{\mathrm{B}}}{[\theta\gamma + (1-\gamma)\mu^*](1-\epsilon)} =: \mathcal{I}_{\mathrm{cc}}, \\ c &\leq \mathcal{C}_{\mathrm{cc}}. \end{aligned}$$

Then there exists a perfect Bayesian equilibrium in which the following statements hold.

- *The unskilled speculator plays according to the following strategies:*

$$s_1^{\mathrm{U}}(\sigma = \emptyset) = \begin{cases} +1 & \textit{with probability } \mu^*, \\ -1 & \textit{with probability } 1-\mu^*; \end{cases}$$

$$s_2^{\mathrm{U}}(\sigma = \emptyset,\, y) = \begin{cases} +1 & \textit{if} \quad a_1^{\mathrm{U}} = 1, \\ 0 & \textit{if} \quad a_1^{\mathrm{U}} = -1. \end{cases}$$

  Here $\mu^* \in [0, \theta)$.

- *The skilled speculator plays according to the following strategies:*

$$\eta^* = 1;$$

$$s_1^{\mathrm{S}}(\sigma) = \begin{cases} +1 & \textit{if} \quad \sigma = \sigma_{\mathrm{G}}, \\ -1 & \textit{if} \quad \sigma = \sigma_{\mathrm{B}}; \end{cases}$$

$$s_2^{\mathrm{S}}(\sigma) = \begin{cases} +1 & \textit{if} \quad \sigma = \sigma_{\mathrm{G}}, \\ 0 & \textit{if} \quad \sigma = \sigma_{\mathrm{B}}. \end{cases}$$

- *At $t = 1$, prices are*

$$p_1^{-2} = p_1^{-1} = \epsilon \, \frac{\theta(1-\gamma)(1-\mu^*)V_{\mathrm{G}} + (1-\theta)[\gamma + (1-\gamma)(1-\mu^*)]V_{\mathrm{B}}}{(1-\theta)\gamma + (1-\gamma)(1-\mu^*)} =: \epsilon \, p_\epsilon^{-1},$$
$$p_1^0 = \epsilon \, [\theta V_{\mathrm{G}} + (1-\theta)V_{\mathrm{B}}] =: \epsilon \, p_\epsilon^0,$$
$$p_1^1 = p_1^2 = \frac{\theta[\gamma + (1-\gamma)\mu^*]V_{\mathrm{G}} + (1-\theta)(1-\gamma)\mu^* V_{\mathrm{B}}}{\theta\gamma + (1-\gamma)\mu^*} - (1-\epsilon)I.$$

- *At $t = 2$, the equity issue succeeds only if $y \in \{1, 2\}$, the SEO prices are then*

$$p_2^1 = p_2^2 = \frac{\theta[\gamma + (1-\gamma)\mu^*]V_{\mathrm{G}} + (1-\theta)(1-\gamma)\mu^* V_{\mathrm{B}}}{\theta\gamma + (1-\gamma)\mu^*} + \epsilon I.$$

- *All firms' types n' shares such that the equity issue succeeds when $y \in \{1, 2\}$.*

The proof is provided in Appendix 6.2.3.

Corollary 2.4.1 is now an immediate consequence of comparing Lemma 2.3 and Lemma 2.5.

3.3 Results: Benefits of Career Concerns

There are two main differences between the baseline model and the SEO model, and both arise at $t = 2$: the participants in the equity offering, and the issuer's price setting. In the baseline model, only uninformed capital providers participate in the capital raising. They all have the same information at the funding stage—namely, the public information contained in the price. In the SEO model, both uninformed capital providers and the speculator participate at the bidding stage, and the speculator may have private information. This additional asymmetric information may distort the $t = 2$ prices, which must be set to make the uninformed bidders break even. This distortion affects prices only when speculators are profit maximizing, which leads to the following result.

Proposition 2.5 *The SEO price may be set at a discount only if the speculator is profit maximizing, not if he is career concerned.*

The proof is in Appendix 6.2.4. The intuition behind this result is that career-concerned speculators mitigate the effect of the winner's curse: by participating in the SEO, even if unskilled, they reduce the likelihood of uninformed bidders ending up with too many shares in overpriced firms or, equivalently, of being rationed only when the firm is good.

Corollary 2.5.1 *When profit-maximizing speculators trade, the cost of capital may be higher in an SEO than in the baseline model.*

It follows from Proposition 2.5 that the winner's curse exacerbates the effect of underprovision of information on capital allocation in an SEO, since firms' discounts further inhibit their ability to raise funds. But the winner's curse rationing takes effect at equilibrium only when speculators are profit-maximizing; therefore, when speculators are career concerned, the cost of capital is as high in the SEO as in the baseline model. Finally, although differences between the baseline model and the SEO model affect prices at $t = 2$, they affect neither prices at $t = 1$ nor speculators' behaviors (cf. Corollary 2.4.1).

3.3.1 Loosening Firms' Financial Constraints

I show here that Proposition 2.1 holds, and is even starker when firms raise funds via an SEO. As in Section 2.3, I set $\epsilon = 0$ to prove the results.

Proposition 2.6 *Firms can obtain funding for a larger fraction of projects when speculators are career concerned. In other words, there is a range of projects with funding costs $I \in (\mathcal{I}_{\text{pm}}, \mathcal{I}_{\text{cc}}]$ that can be undertaken only with career-concerned speculators, where*

$$\mathcal{I}_{\text{cc}} = \frac{\theta[\gamma + (1-\gamma)\mu^*]V_G + (1-\theta)(1-\gamma)\mu^* V_B}{\theta\gamma + (1-\gamma)\mu^*},$$
$$\mathcal{I}_{\text{pm}} = \frac{\theta[\gamma + (1-\gamma)\beta]V_G + (1-\theta)(1-\gamma)\beta V_B}{\theta\gamma + (1-\gamma)\beta}.$$

Proof. Since $\mathcal{I}_{\text{cc}}$ and $\mathcal{I}_{\text{pm}}$ are decreasing functions of μ and β (respectively) and since these functions are equal when $\mu = \beta$, it follows that $\mathcal{I}_{\text{cc}} < \mathcal{I}_{\text{pm}}$ for any $\mu < \beta$. This inequality is always satisfied because $\beta > 1$ and $\mu < 1$. ■

Remarks 2.1 and 2.2 build the intuition of Proposition 2.1 in Section 2.3. Remark 2.1 proves that $y = 1$ is pivotal for investment, and Remark 2.2 proves that the cost of capital (given $y = 1$) is lower with career-concerned speculators than with profit-maximizing ones.

The argument that $y = 1$ is pivotal remains unchanged by virtue of Corollary 2.4.1. The intuition behind the lower cost of capital with career-concerned than with profit-maximizing speculators is similar to that for Remark 2.2. In an SEO, however, the winner's curse rationing—which arises when profit-maximizing speculators trade—increases firms' cost of capital (see Corollary 2.5.1). Hence there is an even wider range of projects that can be undertaken only with career-concerned speculators.

3.3.2 Other Benefits

It remains to show that Propositions 2.2–2.4 all hold also in the SEO model. Only the proof of Proposition 2.4 depends on $t = 2$ prices and therefore changes from the baseline model. That proposition states that career-concerned speculators maximize shareholder wealth for a range of parameters $(\theta, \gamma) \in R_{\text{cc}}$. In the case considered here of an SEO, there is a wider region of parameters (θ, γ) in which career-concerned speculators maximize good firms' shareholder wealth. This claim follows directly from Corollary 2.5.1 because, in an SEO when profit-maximizing speculators' trade, good firms face a higher cost of capital and thus a greater underpricing than in the baseline model.

4 Extensions

4.1 Raising Capital via Debt

I have shown that career-concerned speculators—more so than profit-maximizing ones—reduce a firm's financial constraints when they acquire information and embed it into prices in anticipation of an equity issue. The reader may wonder whether this beneficial effect of career concerns persists when speculators acquire information in anticipation of a debt issue. Here I establish that, conditional on issuing debt or equity, the beneficial effect does persist. However, it is beyond the scope of this paper to identify the conditions under which a firm chooses debt versus equity. (That question is addressed in a different setting by Fulghieri and Lukin (2001) for the case of profit-maximizing speculators.)

For simplicity, I set $\epsilon = 0$. Prices must now be set at $t = 1$ in anticipation of a debt issue. At $t = 2$ the firm is able to raise successfully the required funds I whenever it can issue debt with face value $F > I > V_{\mathrm{B}}$ such that capital providers break even:

$$\hat{\theta}(y)F + \big(1 - \hat{\theta}(y)\big)V_{\mathrm{B}} = I,$$

where $\hat{\theta}(y)$ is the market posterior upon observing y. Thus,

$$F = \frac{I - \big(1 - \hat{\theta}(y)\big)V_{\mathrm{B}}}{\hat{\theta}(y)}. \tag{40}$$

Note that I assume (for simplicity) that a good and a bad firm pay off V_{G} and V_{B}, respectively, for certain.

A necessary condition for the debt issue to succeed is that

$$\mathbb{E}\left[V_{\tilde{\Theta}} \,|\, y\right] - I = \hat{\theta}(y)V_{\mathrm{G}} + \big(1 - \hat{\theta}(y)\big)V_{\mathrm{B}} - I \geq 0; \tag{41}$$

in fact, if this inequality is not satisfied then there is no F that satisfies equation (40), since F must be less than or equal to V_{G}.

Inequality (41) is also a sufficient condition for the debt issue to succeed. A good firm issues debt as long as its shareholders gain, which they do if

$$V_{\mathrm{G}} - F = \frac{\mathbb{E}\left[V_{\tilde{\Theta}}|y\right] - I}{\hat{\theta}(y)} > 0, \tag{42}$$

that is if

$$\mathbb{E}\left[V_{\tilde{\Theta}} \,|\, y\right] - I \geq 0.$$

Since inequalities (41) and (3) are equivalent, it follows that a debt issue succeeds if and only if an equity issue succeeds. As in the equity issue case, I indicate by $\iota = 1$ the success of a debt issue and by $\iota = 0$ its failure.

In anticipation of a debt issue and its success, prices in the secondary market are set according to

$$p_1^y = \left[\hat{\theta}(y)(V_{\mathrm{G}} - F)\right] \iota,$$

which—after plugging in (42)—is equivalent to

$$p_1^y = \left(\mathbb{E}\left[V_\Theta \,\middle|\, y\right] - I\right) \iota = \mathbb{E}\left[\tilde{v} \,\middle|\, y, \iota\right].$$

Secondary market prices in anticipation of a debt issue thus coincide with those in anticipation of an equity issue (i.e., equation (6) when $\epsilon = 0$).

4.2 A Career-Concerned Speculator Who Cares Also about Profits

Let us now study the behavior of a speculator whose payoff is given by equation (7).

I show that the equilibria characterized in Lemmata 2.2 and 2.3 result from the limiting behavior of a speculator who cares both about profits and reputation by letting one of these concerns approach zero. It is interesting that, for sufficiently small w_2 (the weight assigned by the speculator to his reputation) and if $\epsilon = 0$, the skilled speculator never acquires information. This result reinforces the idea that career concerns help firms loosen their financial constraints: absent career concerns, there may be some equilibria in which information is not acquired for any I.

Proposition 2.7 *Depending on the relative degree to which speculators care about profits compared with their reputation, there are three types of equilibria.*

1. *Given vanishing ϵ, for w_2 sufficiently large a speculator behaves as in Lemma 2.3.*

2. *Given vanishing ϵ, for w_2 sufficiently small a speculator never acquires information.*

3. *For fixed $\epsilon > 0$ and w_2 sufficiently small, a speculator behaves as in Lemma 2.2.*

The proof is given in Appendix 6.3.

4.3 Simultaneous Trading by Profit-Maximizing and Career-Concerned Speculators

Let us now suppose that the speculator can be one of four types: he can be either a skilled or unskilled profit-maximizing speculator or a skilled or unskilled career-concerned speculator. There is a proportion r of career-concerned speculators and a proportion $1 - r$ of profit-maximizing ones. A speculator can be skilled or unskilled with respective probabilities γ and $1 - \gamma$. The timing and the other players are as in the baseline model.

Proposition 2.8 *For each r, γ, V_{G}, and V_{B} there is a $\hat{c}_{\mathrm{cc}} > 0$ such that, as long as $c_{\mathrm{cc}} > \hat{c}_{\mathrm{cc}}$, the main result of the baseline model (Proposition 2.1) obtains.*

The proof is in Appendix 6.4. Here I provide a brief intuition. In the baseline model I show that career-concerned speculators loosen firms' financial constraints (compared with profit-maximizing ones) by increasing price informativeness in the pivotal state for investment—that is, in $y = 1$. Here I show that if $y = 1$ is the pivotal state for investment then, as the proportion of career-concerned speculators increases, so does price informativeness and hence the fraction of projects that can be undertaken at equilibrium also increases. In fact, keeping the proportions of skilled and unskilled speculators constant, I show that price informativeness when $y = 1$ increases as the proportion of career-concerned speculators increases.

Proposition 2.8 identifies a sufficient condition for $y = 1$ to be pivotal. Namely, if career-concerned speculators are unwilling to acquire information when investment succeeds in $y = 2$ only (i.e., if $c_{\mathrm{cc}} > \hat{c}_{\mathrm{cc}}$), then profit-maximizing speculators are unwilling to acquire in $y = 2$ and so the market breaks down.

According to Corollary 2.2.1, if investment fails in $y = 1$ then speculators do not acquire information in $y = 2$ because there is no noise in the price. In this case, however, the trade of unskilled career-concerned speculators generates some extra noise in $y = 2$ that may leave some room for the skilled profit-maximizing speculators to profit—even when the equity issue fails in $y = 1$. But as long as $c_{\mathrm{cc}} > \hat{c}_{\mathrm{cc}}$, if investment fails in $y = 1$ then career-concerned speculators will not want to acquire information in $y = 2$. Thus, prices given $y = 2$, are perfectly informative and the skilled profit-maximizing speculator is unwilling to acquire information, just as in Proposition 2.1.

5 Conclusions

Traditional corporate finance theories—including the trade-off theory and the pecking order theory—identify the type of capital (internal funds, debt, equity) as an important determinant of its cost. In this paper I identify another determinant of the cost of capital: the type of market participant. This approach is based on the dichotomy between an individual investor and a delegated portfolio manager, where I represent the former as purely profit oriented and the latter as purely career concerned. I show that delegated portfolio managers reduce firms' cost of capital both indirectly, by participating in the secondary market and, directly, by subscribing to firms' capital in the primary market.

Adverse selection plagues markets; it pools firms with good projects and those with bad ones, thereby increasing good firms' cost of external finance. Speculators trade in stock markets and provide capital to firms. By acquiring information and embedding it into prices via their trades, speculators can reduce firms' costs associated with external financing. They transmit part of their private information through stock market prices, guiding uninformed participants in their capital decisions and thus helping good firms to raise funds more cheaply and to invest.

Yet, individual investors who care only about portfolio returns underprovide information. The reason is that speculators can profit from information only by hiding it. This problem is exacerbated when industry fundamentals are poor and prices feed back into investment.

Nowadays, however, it is not individual investors but rather portfolio managers who are the main market participants. Delegated portfolio managers respond to incentives that differ from those of individual investors; in particular, they are career concerned.

Even when the feedback loop caused by firms' financial constraints lead to a severe underprovision of information, career-concerned speculators provide more information to the stock market than do profit-maximizing ones, so the former are better able to loosen firms' financial constraints. These speculators care about signaling their skills to current and potential clients. However, they can do this only by inducing firms' investment and showing that they traded in the right direction—even if their price impact results in limited returns. Yet, career-concerned speculators trade even when they have no information, which distorts order flows and therefore may hamper the allocative role of prices. But I show that, in equilibrium, the trade of unskilled speculators augments the positive effects of delegated portfolio management on capital allocation.

I also show that career-concerned speculators relax firms' financial constraints even when firms raise funds via equity—the most expensive way to raise capital when there is adverse selection. I model an SEO and demonstrate that career-concerned speculators reduce the SEO discount when they provide capital to firms. Direct empirical evidence on the role of institutional investors in SEOs (Chemmanur, He, and Hu (2009), Gao and Mahmudi (2008)) is consistent with my results; it has been shown that institutional investors have beneficial effects on the SEO discount and on the likelihood of a successful SEO.

A large empirical literature studies the correlation between secondary market prices and investment. This literature establishes that the secondary market is not merely a side show (see, e.g., Durnev, Morck, and Yeung (2004), Wurgler (2000))—in other words, that industries with more efficient prices grow more than do industries with less efficient prices. My model's predictions are in line with those in the work cited here and suggest a new test: Are firms that dependent on external finance for their growth relatively better-off in markets with delegated portfolio managers or in those with individual investors?

6 Appendix

6.1 Baseline Model

6.1.1 Proof of Lemma 2.2

I show here that there are no profitable deviations from the equilibrium of Lemma 2.2. Uniqueness is shown in the next section.

Prices: For sufficiently small ϵ, if the order flow is $y \in \{-2,-1,0\}$ then inequality (3) does not hold and firms are unable to raise I from capital providers. For those order flows, the posterior probability of the firm being good is either lower than the prior (when $y \in \{-2,-1\}$) or equal to it (when $y = 0$). Since, by Lemma 2.1, firms are unable to raise I when the market believes that the firm is of average quality, it follow that this will also be the case for any posterior belief lower than the one associated with $y = 0$. Nevertheless, even when $y \in \{-2,-1,0\}$, firms can invest if $\tilde{\chi} = I$.

When the order flow is $y \in \{1,2\}$, the firm is able to raise I and undertake the project as long as inequality (10) is satisfied.

Unskilled speculator: The unskilled speculator has no information on the underlying value of the firm. He prefers not to trade rather than to buy if his payoff from not trading is higher than that from buying—that is,

$$\Pi(a^{\mathrm{U}} = 0) > \Pi(a^{\mathrm{U}} = +1). \tag{43}$$

This inequality is satisfied since the speculator's buying moves the price and since it is never profitable for him to buy into a firm of only average quality at a price that is higher than the average price. In fact, inequality (43) can be rewritten as

$$0 > \frac{1}{3}(\bar{V} - I + \epsilon I - p_1^2) + \frac{1}{3}(\bar{V} - I + \epsilon I - p_1^1),$$

which is satisfied because $p_1^y > \bar{V} - (1-\epsilon)I$ for $y \in \{1,2\}$.

The unskilled speculator prefers not to trade rather than to sell if

$$\Pi(a^{\mathrm{U}} = 0) > \Pi(a^{\mathrm{U}} = -1). \tag{44}$$

Given the feedback effect between prices and investment, selling always triggers a firm's funding failure because $y \in \{-2,-1,0\}$ and inequality (3) is never satisfied. However, $\chi = I$ with probability ϵ. Thus, by selling, the unskilled speculator incurs the loss of selling a firm at a price below the average with probability ϵ. He therefore prefers not to. That inequality can be rewritten as

$$0 > \frac{\epsilon}{3}\left(p_\epsilon^{-2} - \bar{V}\right) + \frac{\epsilon}{3}\left(p_\epsilon^{-1} - \bar{V}\right),$$

which is satisfied since $p_\epsilon^y < \bar{V} - I$ for $y \in \{-2,-1\}$.

Skilled negatively informed speculator: A skilled negatively informed speculator prefers to sell rather than to buy or not to trade. He prefers selling to not trading because he can profit from his short position with probability ϵ when $\tilde{\chi} = I$. In fact,

$$\Pi(a^{\mathrm{S}} = -1,\, \sigma = \sigma_{\mathrm{B}}) > \Pi(a^{\mathrm{S}} = 0,\, \sigma = \sigma_{\mathrm{B}})$$

or

$$\frac{\epsilon}{3}\left(p_{\epsilon}^{-1} - V_{\mathrm{B}}\right) + \left(p_{\epsilon}^{0} - V_{\mathrm{B}}\right) > 0,$$

since $p_{\epsilon}^{y} > V_{\mathrm{B}}$ for $y \in \{-1, 0\}$.

A skilled negatively informed speculator prefers to sell than to buy a bad firm:

$$\Pi(a^{\mathrm{S}} = -1,\, \sigma = \sigma_{\mathrm{B}}) > \Pi(a^{\mathrm{S}} = +1,\, \sigma = \sigma_{\mathrm{B}}),$$

or

$$\frac{\epsilon}{3}\left(p_{\epsilon}^{-1} - V_{\mathrm{B}} + p_{\epsilon}^{0} - V_{\mathrm{B}}\right) \quad > \quad \frac{1}{3}\left(V_{\mathrm{B}} - I + \epsilon I - p_{1}^{2}\right) \;+\; \frac{1}{3}\left(V_{\mathrm{B}} - I + \epsilon I - p_{1}^{1}\right) \;+\; \frac{\epsilon}{3}\left(V_{\mathrm{B}} - p_{\epsilon}^{0}\right),$$

since $p_{1}^{y} > V_{\mathrm{B}} - I$ and $p_{\epsilon}^{y} > V_{\mathrm{B}}$ for $y \in \{-1, 0, 1, 2\}$.

Skilled positively informed speculator: This type of speculator has no incentive to deviate from buying when observing a positive signal. Not trading or selling would decrease the chances that a good firm invests and would thus reduce his chances of making profits.

The skilled positively informed speculator prefers to buy rather than to sell since

$$\Pi(a^{\mathrm{S}} = +1,\, \sigma = \sigma_{\mathrm{G}}) > \Pi(a^{\mathrm{S}} = -1,\, \sigma = \sigma_{\mathrm{G}})$$

or

$$\frac{1}{3}\left(V_{\mathrm{G}} - I + \epsilon I - p_{1}^{1}\right) + \frac{\epsilon}{3}\left(V_{\mathrm{G}} - p_{\epsilon}^{0}\right) > \frac{\epsilon}{3}\left(p_{\epsilon}^{-2} - V_{\mathrm{G}}\right) + \frac{\epsilon}{3}\left(p_{\epsilon}^{-1} - V_{\mathrm{G}}\right) + \frac{\epsilon}{3}\left(p_{\epsilon}^{0} - V_{\mathrm{G}}\right),$$

which is satisfied since $p_{\epsilon}^{y} < V_{\mathrm{G}} - I$ for $y \in \{-2, -1, 0\}$ and $p_{1}^{1} > V_{\mathrm{G}} - I$. He prefers buying to not trading becuase

$$\Pi(a^{\mathrm{S}} = +1,\, \sigma = \sigma_{\mathrm{G}}) > \Pi(a^{\mathrm{S}} = 0,\, \sigma = \sigma_{\mathrm{G}})$$

or

$$\frac{1}{3}\left(V_{\mathrm{G}} - I + \epsilon I - p_{1}^{1}\right) + \frac{\epsilon}{3}\left(V_{\mathrm{G}} - p_{\epsilon}^{0}\right) > 0.$$

Information acquisition: Finally, let us look at the skilled speculator's incentives to acquire information. A skilled speculator who acquires information and plays according to the equilibrium strategy just described receives:

$$\begin{aligned}\Pi(s^{\mathrm{S}}(\sigma),\, \eta^{*} = 1) - c = {}& \theta\left[\frac{1}{3}\left(V_{\mathrm{G}} - I + \epsilon I - p_{1}^{1}\right) + \frac{\epsilon}{3}\left(V_{\mathrm{G}} - p_{\epsilon}^{0}\right)\right] + \\ & + (1-\theta)\left[\frac{\epsilon}{3}\left(p_{\epsilon}^{-1} - V_{\mathrm{B}} + p_{\epsilon}^{0} - V_{\mathrm{B}}\right)\right] - c.\end{aligned}$$

If this speculator has not acquired information, it is optimal for him to behave like the unskilled speculator and not trade. He therefore acquires information and follows his signal only if his payoff from doing so is positive or if

$$c < \frac{1}{3}\left\{\frac{\theta(1-\theta)(1-\gamma)\Delta V}{\theta+(1-\theta)(1-\gamma)} + \epsilon\theta(1-\theta)\Delta V\left[2+\frac{1-\gamma}{\theta(1-\gamma)+(1-\theta)}\right]\right\} := \bar{c}_{\mathrm{pm}}.$$

Good firms: A firm that does not issue equity cannot invest, and its shareholders earn zero profits. Thus, shareholders are better off if the firm invests whenever it has the opportunity because

$$(1-\alpha)V_{\mathrm{G}} \geq 0,$$

where $\alpha \leq 1$ at equilibrium.

Since at $t = 0$ there is a positive probability that the equity issue will succeed, the manager of the good firm will always choose to raise I.

Bad firms: Managers of bad firms receive a private benefit from investing; hence they always choose to issue equity at $t = 0$ because doing so maximizes the likelihood of their of raising I.

6.1.2 On the Uniqueness of the Equilibrium of Lemma 2.2

If $\epsilon = 0$ then there are multiple equilibria—that is, the equilibrium of Lemma 2.2 is not unique. However, none of these equilibria is strict, and the equilibrium of Lemma 2.2 is the only one surviving a refinement. In fact, it is an equilibrium in strictly dominant strategies. To refine away the equilibria, I assume that with some probability ϵ the firm ends up undertaking the project independently of market prices; for example it may obtain some unexpected cash at $t = 2$.

I shall argue that, conditional on the skilled speculator's acquiring information, the equilibrium of Lemma 2.2 is unique. I show this by iterative deletion of strictly dominated strategies.

Observe that

$$\mathbb{E}\left[\tilde{p}_1 \middle| \iota,\, \Theta,\, a\right] \in (\epsilon V_{\mathrm{B}}, V_{\mathrm{G}} - I + \epsilon I)$$

since, after any action, there is at least one order flow that is not fully revealing. In particular, $y = 0$ is never fully revealing and $\mathbb{P}(y = 0|\iota, \Theta, a) > 0$. Now a positively informed speculator strictly prefers to buy because

$$\mathbb{E}\left[\tilde{p}_1 \middle| \iota,\, \Theta = \mathrm{G},\, a\right] < V_{\mathrm{G}} - I + \epsilon I,$$

and a negatively informed speculator strictly prefers to sell because

$$\mathbb{E}\left[\tilde{p}_1 \middle| \iota,\, \Theta = \mathrm{B},\, a\right] > \epsilon V_{\mathrm{B}}.$$

From these inequalities it follows that the unskilled speculator prefers not trading rather than buying or selling fairly priced shares. Even if fund raising fails with probability 1—which makes the speculator indifferent between buying, selling and staying out—firms can invest when $\tilde{\chi} = I$ and thereby break this indifference.

Proof of Corollary 2.2.1

Suppose there exists an equilibrium in which the strategies of the players are as described in Lemma 2.2 but inequality (10) is not satisfied. Then secondary market prices are

$$\begin{aligned}
p_1^{-2} &= \epsilon\, V_{\mathrm{B}} =: \epsilon\, p_\epsilon^{-2},\\
p_1^{-1} &= \epsilon\, \frac{\theta(1-\gamma)V_{\mathrm{G}} + (1-\theta)V_{\mathrm{B}}}{\theta(1-\gamma)+1-\theta} =: \epsilon\, p_\epsilon^{-1},\\
p_1^{0} &= \epsilon\, \bar{V} =: \epsilon\, p_\epsilon^{0},\\
p_1^{1} &= \epsilon \left[\frac{\theta V_{\mathrm{G}} + (1-\theta)(1-\gamma)V_{\mathrm{B}}}{\theta + (1-\theta)(1-\gamma)} - I\right] =: \epsilon p_\epsilon^{1},\\
p_1^{2} &= V_{\mathrm{G}} - (1-\epsilon)I.
\end{aligned}$$

This cannot be an equilibrium for $\epsilon \to 0$ because the skilled speculator has a profitable deviation: if he acquires information and follows his signal he obtains positive profits with vanishing probability ϵ while incurring a cost c. He then prefers not to acquire information and the market breaks down.

6.1.3 Proof of Lemma 2.3

Prices: For sufficiently low ϵ, if the order flow is $y \in \{-2,-1,0\}$, condition (3) is not satisfied and the equity issue fails. Nevertheless, prices take into account that $\tilde{\chi} = I$ with probability ϵ and so the firm can invest. When $y \in \{1,2\}$, the firm is able to raise I from capital providers provided that (13) is satisfied.

Beliefs: Clients observe the hired fund's action and the firm's type when the investment is undertaken, after which clients update their beliefs about the fund's ability.[21] The client's posteriors are as follows:

$$\mathbb{P}(\mathrm{S}\,|\,\Theta\iota, a, y)
\begin{cases}
= 0 & \text{if } \Theta\iota = \mathrm{B} \text{ and } a = +1\\
 & \text{or if } \Theta\iota = \mathrm{G} \text{ and } a = -1,\\
= \dfrac{\theta\gamma}{\theta\gamma + (1-\gamma)\mu^*} & \text{if } \Theta\iota = 0 \text{ and } a = +1,\\
= \dfrac{(1-\theta)\gamma}{(1-\theta)\gamma + (1-\gamma)(1-\mu^*)} & \text{if } \Theta\iota = 0 \text{ and } a = -1,\\
= \dfrac{\gamma}{\gamma + (1-\gamma)\mu^*} & \text{if } \Theta\iota = \mathrm{G} \text{ and } a = +1,\\
= \dfrac{\gamma}{\gamma + (1-\gamma)(1-\mu^*)} & \text{if } \Theta\iota = \mathrm{B} \text{ and } a = -1,\\
\in [0,1] & \text{if } a = 0.
\end{cases} \tag{45}$$

Action $a = 0$ is off the equilibrium path. Perfect Bayesian equilibrium imposes no restrictions. I choose to set

$$\mathbb{P}(\mathrm{S}\,|\,a = 0) = 0. \tag{46}$$

[21] The fund's action and the firm's type when the project is undertaken are a sufficient statistic for the order flow.

In the next section I provide a microfoundation for these out-of-equilibrium beliefs.

Unskilled speculator: An unskilled speculator who does not trade obtains no payoff owing to the out-of-equilibrium beliefs of equation (46). He mixes between buying and selling if his utility from the the two actions is the same and is greater than zero. His utility from buying is

$$\Phi(a^{\mathrm{U}} = +1) = \frac{1}{3}(1-\epsilon)\frac{\theta\gamma}{\theta\gamma + (1-\gamma)\mu} + \frac{1}{3}\theta\frac{\gamma}{\gamma + (1-\gamma)\mu}(2+\epsilon). \tag{47}$$

When this speculator buys, the equity issue can either succeed or fail. If it succeeds, then the firm's value realizes, and so the client can infer the correctness of the fund's trade. If the issue fails, the project is not undertaken, the firm's value is not realized (unless the firm can self-finance the project) and so the client can observe only the fund's action. The firm's equity issue succeeds either when the order flow is $y \in \{1, 2\}$ or when $y = 0$ and $\tilde{\chi} = I$—that is, with overall probability $\left(\frac{2}{3} + \frac{\epsilon}{3}\right)$. In these circumstances, the speculator is wrong with probability $1-\theta$ and earns nothing (the project is undertaken but the firm is bad) and he is right with probability θ. With remaining probability the firm's offering fails $\left(\frac{1}{3}(1-\epsilon)\right)$.

The unskilled speculator's utility from selling is

$$\Phi(a^{\mathrm{U}} = -1) = (1-\epsilon)\frac{(1-\theta)\gamma}{(1-\theta)\gamma + (1-\gamma)(1-\mu)} + (1-\theta)\epsilon\frac{\gamma}{\gamma + (1-\gamma)(1-\mu)}. \tag{48}$$

When this speculator sells, the firm can invest in the project only if $\chi = I$. That is, only with probability ϵ can the client observe the correctness of the fund's trade; otherwise, the firm does not invest and the client can only make inferences from the selling action.

The fund mixes between buying and selling if $\mu^*(\theta, \gamma, \epsilon)$ solves

$$f(\mu^*, \theta, \gamma, \epsilon) = 0,$$

where

$$f(\mu, \theta, \gamma, \epsilon) := \Phi(a^{\mathrm{U}} = +1) - \Phi(a^{\mathrm{U}} = -1). \tag{49}$$

I use continuity of the payoff functions to show that, for sufficiently small ϵ, the equilibria are close to those for $\epsilon = 0$. The function $\mu^*(\theta, \gamma, \epsilon)$ is continuous in ϵ at $\epsilon = 0$ because the derivative of μ with respect to ϵ evaluated at $\epsilon = 0$ exists and is finite. In fact,

$$\left.\frac{\partial \mu^*}{\partial \epsilon}\right|_{\epsilon=0} = -\left.\frac{\partial f/\partial \mu^*}{\partial f/\partial \epsilon}\right|_{\epsilon=0};$$

furthermore, $\partial f/\partial \epsilon$ is constant and it is different from zero. Thus, since I focus on small ϵ, it suffices to prove the optimality of the fund's action when $\epsilon = 0$.

At equilibrium, $\mu^*(\theta, \gamma, 0) \in [0, \theta)$. In fact, $\mu^*(\theta, \gamma, 0) \in (0, \theta)$ by the intermediate value theorem when one considers that $\gamma \in (0, 1)$ and $\theta \in (0, 1)$ and that f is continuous in μ, as well as

$$\begin{aligned} f(\theta, \theta, \gamma, 0) &= -\frac{3(1-\theta)}{(1-\gamma)(1-\theta) + \gamma(1-\theta)} + \frac{2\theta}{\gamma + (1-\gamma)\theta} + \frac{\theta}{(1-\gamma)\theta + \gamma\theta} \\ &= -\frac{2\gamma(1-\theta)}{\gamma(1-\theta) + \theta} < 0 \end{aligned}$$

and

$$f(0, \theta, \gamma, 0) = \frac{1}{\gamma} - \frac{3(1-\theta)}{1-\gamma+\gamma(1-\theta)} + \frac{2\theta}{\gamma} > 0 \quad \text{when} \quad \gamma < \frac{1+2\theta}{3-2\theta+2\theta^2}.$$

Whenever $\gamma \in \left[\frac{1+2\theta}{3-2\theta+2\theta^2}, 1\right]$, we have that $\mu^* = 0$. And, since f is strictly decreasing in μ, it follows that μ^* is unique.

The equation for μ^* when $\epsilon = 0$ is

$$\begin{aligned} \mu^*(\theta, \gamma, 0) = & \frac{2\gamma\theta^2 + \theta(3-\gamma) - 3\gamma}{6(1-\gamma)} + \\ & + \frac{1}{6}\sqrt{\frac{9\gamma^2 - 6\gamma\theta - 30\,\gamma^2\theta + 9\theta^2 + 18\gamma\theta^2 + 37\gamma^2\theta^2 - 12\,\gamma\theta^3 - 20\gamma^2\theta^3 + 4\gamma^2\theta^4}{(1-\gamma)^2}}. \end{aligned} \tag{50}$$

Skilled speculator: I show (i) that the skilled speculator has no profitable deviation from following his signal after acquiring information (ii) that he prefers to acquire. A skilled speculator who acquires and obtains a positive signal prefers buying to selling or to not trading. In fact,

$$\Phi\left(a^{\mathrm{S}} = 1,\, \sigma = \sigma_{\mathrm{G}},\, \eta^* = 1\right) > \max\left\{\Phi\left(a^{\mathrm{S}} = 0,\, \sigma = \sigma_{\mathrm{G}},\, \eta^* = 1\right), \Phi\left(a^{\mathrm{S}} = -1,\, \sigma = \sigma_{\mathrm{G}},\, \eta^* = 1\right)\right\},$$

where

$$\begin{aligned} &\Phi(a^{\mathrm{S}} = +1,\, \sigma = \sigma_{\mathrm{G}},\, \eta^* = 1) = \frac{1}{3}(2+\epsilon)\frac{\gamma}{\gamma + (1-\gamma)\mu^*} + \frac{1}{3}(1-\epsilon)\frac{\theta\gamma}{\theta\gamma + (1-\gamma)\mu^*}, \\ &\Phi(a^{\mathrm{S}} = 0,\, \sigma = \sigma_{\mathrm{G}},\, \eta^* = 1) = 0, \\ &\Phi(a^{\mathrm{S}} = -1,\, \sigma = \sigma_{\mathrm{G}},\, \eta^* = 1) = (1-\epsilon)\frac{(1-\theta)\gamma}{\gamma(1-\theta) + (1-\gamma)(1-\mu^*)} + (1-\theta)\epsilon\frac{\gamma}{\gamma + (1-\gamma)(1-\mu^*)}. \end{aligned}$$

I must therefore show that

$$\Phi(a^{\mathrm{S}} = +1,\, \sigma = \sigma_{\mathrm{G}},\, \eta^* = 1) - \Phi(a^{\mathrm{S}} = -1,\, \sigma = \sigma_{\mathrm{G}},\, \eta^* = 1) > 0, \tag{51}$$

since the payoff from buying is always greater than zero for $\gamma \in (0, 1)$. This difference is continuous in both μ and ϵ, and it is strictly positive at $\epsilon = 0$. Again, since I focus on small ϵ, it suffices to prove the optimality of the fund's action when $\epsilon = 0$.

For $\epsilon = 0$, the fund prefers to buy if

$$\frac{2}{3}\frac{\gamma}{\gamma+(1-\gamma)\mu^*}+\frac{1}{3}\frac{\theta\gamma}{\theta\gamma+(1-\gamma)\mu^*}-\frac{(1-\theta)\gamma}{\gamma(1-\theta)+(1-\gamma)(1-\mu^*)}>0. \tag{52}$$

This function is decreasing in μ and so if it is satisfied for $\mu = \theta$, then it is satisfied for all $\mu < \theta$. Rewriting inequality (52) for $\mu = \theta$ now yields

$$\frac{2}{3(\gamma+\theta(1-\gamma))};$$

this value is always strictly positive, which proves inequality (51).

Upon observing a bad signal, the skilled speculator must prefer to sell rather than to buy or to not trade:

$$\Phi(a^{\mathrm{S}}=-1,\,\sigma=\sigma_{\mathrm{B}},\,\eta^*=1)>\max\left\{\Phi(a^{\mathrm{S}}=0,\,\sigma=\sigma_{\mathrm{B}},\,\eta^*=1),\Phi(a^{\mathrm{S}}=+1,\,\sigma=\sigma_{\mathrm{B}},\,\eta^*=1)\right\},$$

where

$$\begin{aligned}
&\Phi(a^{\mathrm{S}}=-1,\,\sigma=\sigma_{\mathrm{B}},\,\eta^*=1)=(1-\epsilon)\frac{(1-\theta)\gamma}{(1-\theta)\gamma+(1-\gamma)(1-\mu^*)}+\epsilon\frac{\gamma}{\gamma+(1-\gamma)(1-\mu^*)},\\
&\Phi(a^{\mathrm{S}}=0,\,\sigma=\sigma_{\mathrm{B}},\,\eta^*=1)=0,\\
&\Phi(a^{\mathrm{S}}=+1,\,\sigma=\sigma_{\mathrm{B}},\,\eta^*=1)=\frac{1}{3}(1-\epsilon)\frac{\theta\gamma}{\theta\gamma+(1-\gamma)\mu^*}.
\end{aligned}$$

I must show that

$$\Phi(a^{\mathrm{S}}=-1,\sigma=\sigma_{\mathrm{B}},\eta^*=1)-\Phi(a^{\mathrm{S}}=+1,\sigma=\sigma_{\mathrm{B}},\eta^*=1)>0; \tag{53}$$

for $\epsilon = 0$ this inequality can be rewritten as

$$\frac{(1-\theta)\gamma}{(1-\theta)\gamma+(1-\gamma)(1-\mu^*)}-\frac{1}{3}\frac{\theta\gamma}{\theta\gamma+(1-\gamma)\mu^*}>0,$$

and is satisfied.

Having proved that the skilled speculator prefers to follow his signal, I must now show that he prefers to acquire information. His payoff from acquiring information and following his signal is

$$\begin{aligned}
\Phi(s^{\mathrm{S}}(\sigma),\,\eta^*=1)-c=\theta\frac{1}{3}\left(2+\epsilon\right)\frac{\gamma}{\gamma+(1-\gamma)\mu^*}&+\theta\frac{1}{3}(1-\epsilon)\frac{\theta\gamma}{\theta\gamma+(1-\gamma)\mu^*}+\\
&+(1-\theta)(1-\epsilon)\frac{(1-\theta)\gamma}{(1-\theta)\gamma+(1-\gamma)(1-\mu^*)}+\\
&+(1-\theta)\epsilon\frac{\gamma}{\gamma+(1-\gamma)(1-\mu^*)}-c.
\end{aligned} \tag{54}$$

If the speculator does not acquire information, then what is his optimal deviation? When $\mu^* \in (0, \theta)$, the payoff from buying and selling is the same at equilibrium and is higher than the payoff from not trading; hence selling is an optimal deviation. When $\mu^* = 0$, selling is the unique most profitable deviation. Thus, for all $\mu^* \in [0, \theta)$, selling is the most profitable deviation. I must therefore show that

$$g(\mu^*, \theta, \gamma, \epsilon) := \Phi(s^{\mathrm{S}}(\sigma),\, \eta^* = 1) - \Phi(a^{\mathrm{S}} = -1,\, \eta^* = 1) > 0. \tag{55}$$

Again, I show strict preference and continuity at $\epsilon = 0$ in order to prove the existence of an equilibrium for small ϵ. Since g is continuous in both μ and ϵ and g is strictly positive at $\epsilon = 0$, I focus on $\epsilon = 0$ and show that g is indeed strictly positive. In fact,

$$g(\mu^*, \theta, \gamma, 0) = \frac{2\theta\gamma}{3(\gamma + (1-\gamma)\mu^*)} + \frac{\theta^2\gamma}{3(\theta\gamma + (1-\gamma)\mu^*)} - \frac{\theta(1-\theta)\gamma}{(1-\theta)\gamma + (1-\gamma)(1-\mu^*)} > 0;$$

the reason is that $g > 0$ exactly when $\frac{g}{\theta\gamma} > 0$ and when $\frac{\partial(\frac{g}{\theta\gamma})}{\partial\gamma} < 0$ for all $\mu, \gamma \in (0,1)$ and θ. Since $g = 0$ when $\gamma = 1$, it follows that g is strictly positive for $\gamma \in (0,1)$.

Thus, the skilled speculator is better-off acquiring than not acquiring if

$$\Phi(s^{\mathrm{S}}(\sigma),\, \eta^* = 1) - c \geq \Phi(a^{\mathrm{S}} = -1,\, \eta = 0)$$

or

$$c < \frac{(2+\epsilon)\theta\gamma}{3(\gamma + (1-\gamma)\mu^*)} + \frac{(1-\epsilon)\theta^2\gamma}{3(\theta\gamma + (1-\gamma)\mu^*)} - \frac{(1-\epsilon)\theta(1-\theta)\gamma}{(1-\theta)\gamma + (1-\gamma)(1-\mu^*)} =: \bar{c}_{\mathrm{cc}}. \tag{56}$$

Firms: Firms have the same incentives as those described in the proof of Lemma 2.2.

Microfoundation of Out-of-Equilibrium Beliefs

The equilibrium in Lemma 2.3 relies on the out-of-equilibrium belief that

$$\mathbb{P}(\mathrm{S}|a = 0) = 0,$$

that is, on the career-concerned speculator's earning no profit if he abstains from trading. But is it reasonable to impose such a strict out-of-equilibrium belief?

Suppose there exists a small proportion of "naive" managers who always follow their signals; accordingly, they do not trade when they receive a signal $\sigma = \emptyset$. In this case, to refrain from trading is no longer an out-of-equilibrium event. I use $r(\cdot)$ to denote the equilibrium reputation. Now suppose that $r(\text{right})$, the reputation from being right, is greater than $r(\text{wrong})$; suppose also that $r(\text{right}) > 0 \geq r(\text{wrong})$.[22]

In any equilibrium in which these assumptions hold, it is optimal for a skilled speculator to follow his signal. Then, when the client observes his fund playing $a = 0$, it must be that the fund is unskilled, that is, $r(a = 0) = 0$. Moreover, since a skilled speculator can never be wrong, it must also be that a wrong speculator is unskilled; that is, $r(\text{wrong}) = 0$. Then, for any randomizing probability, the unskilled speculator is better-off randomizing between buying and selling than not trading, since by randomizing he at least has a chance of being right.

[22]It is possible to show that this is always the case when the career-concerned speculator cares enough about profits.

6.2 Seasoned Equity Offering

6.2.1 Proof of Lemma 2.4

Unskilled speculator: Let us check that his strategy at $t = 2$ is subgame perfect. For $y \in \{1, 2\}$, this speculator prefers staying out to buying:

$$0 > \alpha_{\mathrm{U}} \left(\bar{V} + \epsilon I - p_2^y\right) \quad \forall y \in \{1, 2\};$$

this follows because $p_2^y > \bar{V} + \epsilon I$ for $y \in \{1, 2\}$. For $y \in \{-2, -1, 0\}$, the SEO fails and the speculator is indifferent between buying and staying out.

By the one deviation property, I need only to check that the unskilled speculator has no incentive to deviate at $t = 1$ in order to prove that the strategy at $t = 1$ is subgame perfect. The proof is the same as the proof in Lemma 2.2, where I show that the unskilled speculator has no incentive to deviate from not trading.

Skilled positively informed speculator: Let us check that his strategy at $t = 2$ is subgame perfect. When $y = 1$, he clearly prefers buying to staying out:

$$\alpha_{\mathrm{S}} \left(V_{\mathrm{G}} + \epsilon I - p_2^1\right) > 0,$$

since $p_2^1 < V_{\mathrm{G}} + \epsilon I$. For any other y this speculator is indifferent. In fact, when $y = 2$ his private information is revealed and the price reflects the firm's fair value; he then makes zero profit regardless. When $y \in \{-2, -1, 0\}$, the SEO fails and he is indifferent between buying and staying out.

To show that the speculator's strategy at $t = 1$ is subgame perfect, it is enough to check deviations at $t = 1$. For the proof, refer to that of Lemma 2.2 for the skilled speculator.

Skilled negatively informed speculator: When $y \in \{-2, -1, 0\}$, this speculator is indifferent between buying and staying out because the SEO fails. When $y \in \{1, 2\}$ he prefers to stay out since he does not want to buy overpriced a bad firm. In fact,

$$0 > \alpha_{\mathrm{S}}(V_{\mathrm{B}} + \epsilon I - p_2^y), \qquad \text{where} \quad y \in \{1, 2\}.$$

For the proof that his $t = 1$ strategy is subgame perfect, please refer to the proof of Lemma 2.2.

Information acquisition: The skilled speculator prefers to acquire information and follow his signal if

$$\begin{aligned}
\Pi(s^{\mathrm{S}}(\sigma), \eta^* = 1) = \theta & \left[\frac{1}{3}\left(V_{\mathrm{G}} - I + \epsilon I - p_1^1\right) + \frac{\epsilon}{3}\left(V_{\mathrm{G}} - p_\epsilon^0\right)\right] + \\
& + (1-\theta)\left[\frac{\epsilon}{3}\left(p_\epsilon^{-1} - V_{\mathrm{B}} + p_\epsilon^0 - V_{\mathrm{B}}\right)\right] + \\
& + \frac{\theta}{3}\alpha_{\mathrm{S}}\left(V_{\mathrm{G}} + \epsilon I - p_2^1\right) - c > 0,
\end{aligned}$$

that is, if

$$c < \mathcal{C}_{\text{pm}} := \frac{\theta(1-\theta)(1-\gamma)\Delta V}{3[\theta + (1-\theta)(1-\gamma)]} + \\ + \frac{\epsilon\theta(1-\theta)\Delta V}{3}\left(2 + \frac{1-\gamma}{\theta(1-\gamma)+(1-\theta)}\right) + \frac{\theta}{3}\alpha_{\text{S}}\frac{(1-\theta)(1-\gamma)\beta\Delta V}{\theta\gamma + (1-\gamma)\beta}.$$

Good firm: The manager of the good firm seeks to maximize the probability of investment in order to maximize shareholders' wealth. Whenever investment succeeds (i.e., $p_2^y > I$), shareholders receive

$$\left(1 - \frac{I}{p_2^1}\right)(V_{\text{G}} + \epsilon I);$$

this value is greater than zero, which is all any shareholders would receive if the manager did not issue shares or issued too small a number of shares.

At $t = 0$, the firm's manager issues the number of shares that will warrant the equity issue's success when the level of informativeness in prices is the lowest (i.e., when $y = 1$):

$$\frac{n'}{n+n'}p_2^1 = I. \tag{57}$$

Issuing a number of shares that satisfies equation (57), guarantees that, when the order flow is $y \in \{1, 2\}$, the firm can raise capital to undertake the project and shareholders are better-off.

Bad firm: The manager of the bad firm pools with the manager of the good firm by issuing the same number of shares, since choosing any other number of shares would reveal him to be bad. Therefore, with positive probability, the firm obtains funding and its manager earns private benefits.

6.2.2 On the Absence of Manipulation at $t = 1$

Two papers closely related to mine address manipulation: Gerard and Nanda (1993) and Goldstein and Guembel (2008). The former investigates the incentives to manipulate of a positively informed speculator; the latter those of an unskilled speculator. I show that the manipulation strategies outlined in these papers are unprofitable in my setting. The incentives to manipulate at $t = 1$ may arise for two reasons: to increase profits at $t = 1$ or to increase profits at $t = 2$ (and potentially suffering losses at $t = 1$).

Given a sufficiently small cost of acquiring information that the skilled speculator does so, I show that a speculator has no incentive to manipulate prices at $t = 1$. Toward this end, I show first that selling at $t = 1$ is a strictly dominant strategy for the negatively informed speculator and second that, in every equilibrium of the reduced game, all speculators follow their signals.

A negatively informed speculator does not profit from manipulating prices at $t = 1$ to increase his profits at $t = 2$ because he cannot short in the primary market. He can profit only at $t = 1$, so he chooses the action that maximizes his $t = 1$ expected profits. Since

$$\mathbb{E}\left[\tilde{p}_1 \middle| \iota, \Theta, a\right] \in (\epsilon V_{\text{B}}, V_{\text{G}} - I + \epsilon I), \tag{58}$$

he always prefers to sell.

Let us now study the reduced game. I have shown that the negatively informed speculator strictly prefers to sell at $t = 1$. Assume that the unskilled buys with probability ρ_1, does not trade with probability ρ_2, and sells with probability $1 - \rho_1 - \rho_2$. Assume further that the positively informed specualtor buys with probability δ_1, does not trade with probability δ_2 and sells with probability $1 - \delta_1 - \delta_2$. The equilibrium order flow at $t = 1$ is $y \in \{-2, 1, 0, 1, 2\}$, and prices are as follows:

$$
\begin{aligned}
p_1^{-2} &= \epsilon \frac{\theta(1-\gamma)(1-\rho_1-\rho_2)V_\mathrm{G} + (1-\theta)[\gamma + (1-\gamma)(1-\rho_1-\rho_2)]V_\mathrm{B}}{(1-\gamma)(1-\rho_1-\rho_2) + (1-\theta)\gamma} =: \epsilon p_\epsilon^{-2}, \\
p_1^{-1} &= \frac{\theta[\gamma(1-\delta_1) + (1-\gamma)(1-\rho_1)]V_\mathrm{G} + (1-\theta)[\gamma + (1-\gamma)(1-\rho_1)]}{\theta\gamma(1-\delta_1) + (1-\gamma)(1-\rho_1) + (1-\theta)\gamma} =: \epsilon p_\epsilon^{-1}, \\
p_1^0 &= \epsilon \bar{V} =: \epsilon p_\epsilon^0, \\
p_1^1 &= \frac{\theta[\gamma(\delta_1+\delta_2) + (1-\gamma)(\rho_1+\rho_2)]V_\mathrm{G} + (1-\theta)(1-\gamma)(\rho_1+\rho_2)V_\mathrm{B}}{\theta\gamma(\delta_1+\delta_2) + (1-\gamma)(\rho_1+\rho_2)} - (1-\epsilon)I, \\
p_1^2 &= \frac{\theta[\gamma\delta_1 + (1-\gamma)\rho_1]V_\mathrm{G} + (1-\theta)(1-\gamma)\rho_1 V_\mathrm{B}}{\theta\gamma\delta_1 + (1-\gamma)\rho_1} - (1-\epsilon)I.
\end{aligned}
$$

Secondary market prices are determined according to equation (32), and if inequality (30) holds then firms can raise enough funds to invest when $y \geq 1$. For $y \in \{-2, -1, 0\}$, (30) does not hold for any speculator strategy and the SEO fails. Therefore, given the order flow, the firm sets the SEO prices at $t = 2$ such that

$$
\begin{aligned}
p_2^1 &\leq p_1^1 + I, \\
p_2^2 &\leq p_2^1 + I.
\end{aligned}
$$

Because of the rationing problem, the SEO price per share (given $y = 1$) cannot be higher than the secondary market price per share. Whether this condition holds will depend on speculators' $t = 2$ strategies, about which I make no assumption. The inequalities just displayed constitute an equilibrium if the positively informed and the unskilled speculators are indifferent among buying, selling, and not trading.

If a positively informed speculator sells, the SEO then fails with probability 1, and he makes no profits at $t = 2$ irrespective of his strategy at $t = 1$. His profits are

$$
\Pi(a_1^\mathrm{S} = -1, \sigma = \sigma_\mathrm{G}, \eta^* = 1) = \frac{\epsilon}{3}\left(V_\mathrm{G} - p_\epsilon^{-2} + V_\mathrm{G} - p_\epsilon^{-1} + V_\mathrm{G} - p_\epsilon^0\right).
$$

If he does not trade at $t = 1$ then the SEO succeeds when $y = 1$, in which case the speculators strictly prefers to buy at $t = 2$. His profits are then

$$
\Pi(a_1^\mathrm{S} = 0, \sigma = \sigma_\mathrm{G}, \eta^* = 1) = \frac{1}{3}\alpha_\mathrm{S}\left(V_\mathrm{G} + \epsilon I - p_2^1\right).
$$

If the positively informed speculator buys at $t = 1$ then the SEO succeeds whether $y = 1$ or $y = 2$; he then strictly prefers to buy at $t = 2$ and his profits are

$$\Pi(a_1^{\mathrm{S}} = 1,\, \sigma = \sigma_{\mathrm{G}},\, \eta^* = 1) = \frac{1}{3}(V_{\mathrm{G}} - I + \epsilon I - p_1^2) + \frac{1}{3}(V_{\mathrm{G}} - I + \epsilon I - p_1^1) + \frac{\epsilon}{3}(V_{\mathrm{G}} - p_\epsilon^0) + \\ + \frac{1}{3}\alpha_{\mathrm{S}}\left(V_{\mathrm{G}} + \epsilon I - p_2^1\right) + \frac{1}{3}\alpha_{\mathrm{S}}\left(V_{\mathrm{G}} + \epsilon I - p_2^2\right).$$

By equation (58) we have

$$\mathbb{E}\left[\tilde{p}_1 \middle| \iota, \Theta, a\right] < V_{\mathrm{G}} - I + \epsilon I$$

so, for $\epsilon \to 0$, the speculator strictly prefers to buy.

Let us now study the unskilled speculator. In Goldstein and Guembel (2008) there are no equilibria in which an unskilled speculator profits from buying at $t = 1$. Buying at $t = 1$ is never profitable for such a speculator in a game where prices feed back into investment. First, buying increases the firm's excepted value, but the unskilled speculator expects the firm's value to be lower than what is reflected by prices. Second, by increasing the price, this speculator may influence a firm's investment (through reducing its cost of equity) and thereby lead firms to overinvest, reducing the value of his long position. The exact same argument applies here.

Contrary to Goldstein and Guembel (2008), however, I find that selling is not profitable for the unskilled speculator, either. Projects in their model have ex ante positive NPV, and the unskilled speculator can profit by establishing a short position in a stock (at $t = 1$) and then driving down the stock price from further sales (at $t = 2$). The market will infer that the lower price may reflect negative information about the firm and thus lead the investment to fail. In my model such a strategy is not possible: The unskilled speculator cannot sell at $t = 2$ because the action space is restricted to buying or not buying shares in the equity issue. He will therefore choose his action to maximize his expected profits at $t = 1$.

Given that the skilled speculator always follows his signal, the unskilled speculator prefers not to trade rather than to buy or to sell at $t = 1$.

6.2.3 Proof of Lemma 2.5

Prices: The firm can successfully raise funds when $y = \{1, 2\}$ if $p_2^y > I$. If $y = \{-2, -1, 0\}$ the SEO fails, since then inequality (30) does not hold.

Beliefs: Clients' posteriors are now

$$\mathbb{P}(\mathrm{S}\,|\,\Theta\iota, y, a_1, a_2) \begin{cases} = 0 & \text{if } \Theta\iota = \mathrm{B} \text{ and } a_1 = a_2 = +1 \\ & \text{or if } \Theta\iota = \mathrm{G} \text{ and } a_1 = -1 \text{ and } a_2 = 0 \\ = \dfrac{\theta\gamma}{\theta\gamma + (1-\gamma)\mu^*} & \text{if } \Theta\iota = 0 \text{ and } a_1 = a_2 = +1 \\ = \dfrac{(1-\theta)\gamma}{(1-\theta)\gamma + (1-\gamma)(1-\mu^*)} & \text{if } \Theta\iota = 0 \text{ and } a_1 = -1 \text{ and } a_2 = 0 \\ = \dfrac{\gamma}{\gamma + (1-\gamma)\mu^*} & \text{if } \Theta\iota = \mathrm{G} \text{ and } a_1 = a_2 = +1 \\ = \dfrac{\gamma}{\gamma + (1-\gamma)(1-\mu^*)} & \text{if } \Theta\iota = \mathrm{B} \text{ and } a_1 = -1 \text{ and } a_2 = 0 \\ \in [0,1] & \text{if } a_1 = 0 \\ \in [0,1] & \text{if } a_1 \ncong a_2 \end{cases}$$

where by $a_1 \cong a_2$ I mean that (i) if the speculator buys at $t = 1$ then he buys at $t = 2$ and (ii) if the speculator sells at $t = 1$ he stays out at $t = 2$.

Since perfect Bayesian equilibrium does not impose any restrictions on the out-of-equilibrium beliefs, I choose to set

$$\mathbb{P}\left(\mathrm{S}\,\middle|\,a_1 = 0\right) = 0 \tag{59}$$

and

$$\mathbb{P}\left(\mathrm{S}\,\middle|\,a_1 \ncong a_2\right) = 0. \tag{60}$$

By imposing the out-of-equilibrium belief of (60), the problem reduces to the one already solved in Lemma 2.3. Clients observe two actions that, at equilibrium, contain the same information as what can be inferred by observing a_1 in the baseline model. Hence, the proof of the equilibrium behavior of unskilled and skilled speculators mirrors the proof of Lemma 2.3.

Firms: Firms have the same incentives as those described in the proof of Lemma 2.4 (Appendix 6.2.1).

6.2.4 SEO Discount

An SEO succeeds if and only if $y \in \{1, 2\}$, as shown in Propositions 2.4 and 2.5.

When profit-maximizing speculators trade and $y = 2$, the price per share at $t = 1$ equals the price at $t = 2$—since the speculator's private information is revealed in the $t = 1$ price and since uninformed bidders do not face the winner's curse. When $y = 1$, the $t = 1$ price per share is higher than its $t = 2$ counterpart. In fact, if $y = 1$ then n' (the number of shares issued at $t = 0$) solves for

$$\frac{n'}{n + n'} p_2^1 = I$$

as described in equation (57). Then, after substituting for n' from the previous equation in the $t = 2$ price per share

$$\frac{p_2^1}{n+n'} = \frac{p_2^1}{n + \frac{I \cdot n}{p_2^1 - I}} = \frac{p_2^1 - I}{n};$$

this value is always lower than the $t = 1$ price per share (p_1^1/n). Comparing the SEO price of (39) with the secondary market price of (38), it makes it clear that

$$p_1^1 > p_2^1 - I.$$

When career-concerned speculators trade, the price per share at $t = 1$ and at $t = 2$ is equal if the SEO succeeds. According to the equilibrium prices given in Lemma 2.5, if $y \in \{1, 2\}$ then

$$p_1^y = p_2^y - I.$$

6.3 Proof of Proposition 2.7

Suppose that for sufficiently low cost of information acquisition ($c < \mathcal{C}$) and for sufficiently low investment cost ($I < \mathcal{I}$) there exists an equilibrium in which the skilled speculator acquires information and follows his signal and in which the unskilled speculator mixes between buying and selling (and buys with probability μ^{**}).

Then, if inequality (3) is satisfied whenever $y > 0$, the prices at equilibrium are

$$\begin{aligned}
p_1^{-2} = p_1^{-1} &= \epsilon \, \frac{\theta(1-\gamma)(1-\mu^{**})V_{\mathrm{G}} + (1-\theta)[\gamma + (1-\gamma)(1-\mu^{**})]V_{\mathrm{B}}}{(1-\theta)\gamma + (1-\gamma)(1-\mu^{**})} =: \epsilon p_\epsilon^{-1}, \\
p_1^0 &= \epsilon \, \bar{V} =: \epsilon \, p_\epsilon^0, \\
p_1^1 = p_1^2 &=: \frac{\theta[\gamma + (1-\gamma)\mu^{**}]V_{\mathrm{G}} + (1-\theta)(1-\gamma)\mu^{**}V_{\mathrm{B}}}{\theta\gamma + (1-\gamma)\mu^{**}} - (1-\epsilon)I.
\end{aligned}$$

Let us check that this is an equilibrium.

Unskilled speculator: The unskilled speculator's payoff from buying is:

$$\begin{aligned}
U\left(a^{\mathrm{U}} = +1\right) =& w_1 \Pi\left(a^{\mathrm{U}} = +1\right) + w_2 \Phi\left(a^{\mathrm{U}} = +1\right) = \\
&= -\frac{2}{3} w_1 \left[\frac{\Delta V \theta(1-\theta)\gamma}{\theta\gamma + (1-\gamma)\mu}\right] + \\
&+ \frac{1}{3} w_2 \left[(1-\epsilon)\frac{\theta\gamma}{\theta\gamma + (1-\gamma)\mu} + (2+\epsilon)\,\frac{\theta\gamma}{\gamma + (1-\gamma)\mu}\right].
\end{aligned} \tag{61}$$

The unskilled speculator's payoff from selling is:

$$\begin{aligned}
U\left(a^{\mathrm{U}} = -1\right) =& w_1 \Pi\left(a^{\mathrm{U}} = -1\right) + w_2 \Phi\left(a^{\mathrm{U}} = -1\right) = \\
&= -\frac{2}{3}\epsilon w_1 \left[\frac{\Delta V \theta(1-\theta)\gamma}{\theta(1-\gamma) + (1-\gamma)(1-\mu)}\right] + \\
&+ w_2 \left[(1-\epsilon)\frac{(1-\theta)\gamma}{(1-\theta)\gamma + (1-\gamma)(1-\mu)} + \epsilon \frac{(1-\theta)\gamma}{\gamma + (1-\gamma)(1-\mu)}\right]
\end{aligned} \tag{62}$$

And the unskilled's payoff from not trading is:

$$U\left(a^{\mathrm{U}}=0\right)=w_1\Pi\left(a^{\mathrm{U}}=0\right)+w_2\Phi\left(a^{\mathrm{U}}=0\right)=0.$$

This speculator randomizes between buying and selling provided: (i) the utility from buying or selling is higher than that from not trading, which is the case whenever $\epsilon=0$ and $w_2>0$; and (ii) there exists a μ^{**} that makes him indifferent between buying and selling, or such that

$$\varphi\left(\mu^{**},\theta,\gamma,\Delta V,w_1,w_2\right)=U\left(a^{\mathrm{U}}=+1\right)-U\left(a^{\mathrm{U}}=-1\right)=0.$$

Note that

$$\varphi\left(\mu,\theta,\gamma,\Delta V,w_1,w_2\right)=f\left(\mu,\theta,\gamma,\epsilon\right)-h\left(\mu,\theta,\gamma,\Delta V,w_1,\epsilon\right),$$

where f is as defined in equation (49) and

$$h(\mu,\theta,\gamma,\Delta V,w_1,\epsilon)=\frac{2}{3}w_1\Delta V\theta(1-\theta)\gamma\left[\frac{1}{\theta\gamma+(1-\gamma)\mu}-\frac{\epsilon}{\theta(1-\gamma)+(1-\gamma)(1-\mu)}\right].$$

Whenever $w_1=0$ we have $h=0$ and so $\mu^{**}=\mu^{*}$, where $\mu^{*}(\epsilon=0)$ is defined as in equation (50).

Now fix $\epsilon=0$, which yields

$$\frac{d\mu^{**}}{dw_1}=-\frac{\partial\varphi/\partial w_1}{\partial\varphi/\partial\mu}.$$

Since at $\epsilon=0$ we have

$$\frac{\partial\varphi}{\partial w_1}<0,$$

it follows that $\frac{\partial\varphi}{\partial\mu}$ determines the sign of the derivative of μ^{**} with respect to w_1. And because

$$\begin{aligned}\frac{\partial\varphi}{\partial\mu^{**}}=&-\frac{3(1-\gamma)(1-\theta)}{(\gamma(1-\theta)+(1-\gamma)\ (1-\mu))^2}-\frac{2(1-\gamma)\theta}{(\gamma+(1-\gamma)\mu\ )^2}-\frac{(1-\gamma)\theta}{(\gamma\theta+(1-\gamma)\mu)^2}+\\&+\frac{w_1}{w_2}\frac{2\Delta V(1-\gamma\ )(1-\theta)\theta}{(\gamma\theta+(1-\gamma)\mu)^2},\end{aligned}$$

$\frac{d\mu^{**}}{dw_1}<0$ if $\frac{\partial\varphi}{\partial\mu}<0$ or, equivalently, if w_1 is low.

Furthermore, $\mu^{**}=0$ whenever

$$\varphi\left|_{\mu^{**}=0}\right.\leq 0$$

or, equivalently, when

$$w_1\geq w_2\frac{1-3\gamma+2\theta+2\gamma\theta-2\gamma\theta^2}{2\ (1-\theta)(1-\gamma\theta)\Delta V}=:\underline{w}_1.$$

Since the derivative of μ^{**} with respect to w_1 changes sign at most once, μ^{**} is positive at $w_1=0$, and μ^{**} is nonnegative, the mixing probability decreases in w_1 on the interval $[0,\underline{w}_1]$ and is then absorbed by zero.

Finally, fix $\epsilon > 0$. In this case, if $w_2 = 0$ then the unskilled speculator deviates and does not trade because, when $w_2 = 0$, the payoff from either buying or selling is negative. Given the continuity of μ in w_2, this statement holds in a neighbourhood of w_2. Thus, for small w_2 and $\epsilon > 0$, the unskilled speculator prefers not to trade. Hence this is not an equilibrium.

A skilled speculator who follows his signal receives

$$U(s^{\mathrm{S}}(\sigma),\, \eta^* = 1) = w_1 \Pi(s^{\mathrm{S}}(\sigma),\, \eta^* = 1) + w_2 \Phi(s^{\mathrm{S}}(\sigma),\, \eta^* = 1).$$

He prefers to follow his signal if

$$U(s^{\mathrm{S}}(\sigma),\, \eta^* = 1) > \max\left\{U(a^{\mathrm{S}} = 0,\, \eta^* = 1), U(a^{\mathrm{S}} = -1,\, \eta^* = 1), U(a^{\mathrm{S}} = +1,\, \eta^* = 1)\right\};$$

in other words, he follows his signal if doing so makes him better-off than (respectively) not trading, buying, or selling, where

$$\begin{aligned} U(a^{\mathrm{S}} = 0, \eta^* = 1) &= 0, \\ U(a^{\mathrm{S}} = -1, \eta^* = 1) &= U(a^{\mathrm{D}} = -1), \\ U(a^{\mathrm{S}} = +1, \eta^* = 1) &= U(a^{\mathrm{D}} = +1). \end{aligned}$$

If the unskilled speculator randomizes between buying and selling, then the payoff from buying and selling is the same at equilibrium and is higher than the payoff from not trading. Hence selling is an optimal deviation for the skilled speculator. He therefore follows his signal if

$$\mathcal{G}(\mu^{**}, \theta, \gamma, \Delta V, w_1, w_2) = U(s^{\mathrm{S}}(\sigma),\, \eta^* = 1) - U(a^{\mathrm{S}} = -1,\, \eta^* = 1) > 0,$$

where

$$\mathcal{G}(\mu, \theta, \gamma, \Delta V, w_1, w_2) = l(\mu, \theta, \gamma, \Delta V, w_1, \epsilon) + g(\mu, \theta, \gamma, \epsilon).$$

Here g is as defined in equation (55) and

$$l = \frac{2}{3} w_1 \theta \Delta V (1-\theta) \left\{ \frac{(1-\gamma)\mu}{\theta\gamma + (1-\gamma)\mu} + \epsilon \left[\frac{\gamma + (1-\gamma)(1-\mu)}{(1-\theta)\gamma + (1-\gamma)(1-\mu)} + 1 \right] \right\}.$$

Fixing $\epsilon = 0$, if $w_1 = 0$ then $l = 0$ and the proof is as in Lemma 2.3.

Whenever $w_1 > 0$ we have $l \geq 0$ and so a skilled speculator is more inclined to acquire information than when $w_1 = 0$. In this case, the skilled speculator acquires information if

$$\begin{aligned} c < & \frac{2}{3} w_1 \theta \Delta V (1-\theta) \left\{ \frac{(1-\gamma)\mu^{**}}{\theta\gamma + (1-\gamma)\mu^{**}} + \epsilon \left[\frac{\gamma + (1-\gamma)(1-\mu^{**})}{(1-\theta)\gamma + (1-\gamma)(1-\mu^{**})} + 1 \right] \right\} + \\ & + w_2 \left\{ \frac{(2+\epsilon)\theta\gamma}{3(\gamma + (1-\gamma)\mu^{**})} + \frac{(1-\epsilon)\theta^2\gamma}{3(\theta\gamma + (1-\gamma)\mu^{**})} - \frac{(1-\epsilon)\theta(1-\theta)\gamma}{(1-\theta)\gamma + (1-\gamma)(1-\mu^{**})} \right\} =: \mathcal{C}. \end{aligned}$$

In contrast, when $w_1 = 0$ the equilibrium of Lemma 2.3 follows.

When $\epsilon > 0$ and $w_2 = 0$ we have the equilibrium of Lemma 2.2. When $\epsilon = 0$ and $w_2 = 0$ we have $\mu^{**} = 0$. Then the skilled speculator does not acquire information and the market breaks down.

6.4 Proof of Proposition 2.8

I will use the following two lemmata to prove Proposition 2.8. For simplicity set $\epsilon = 0$.

Lemma 2.6 *For*

$$I \leq \frac{\theta\gamma V_{\mathrm{G}} + (1-\gamma)[1-r+\mu^* r]\bar{V}}{\theta\gamma + (1-\gamma)(1-r) + (1-\gamma)\mu^* r} =: \bar{I}, \tag{63}$$

$$c_{\mathrm{pm}} \leq c^*_{\mathrm{pm}}, \quad \text{and} \tag{64}$$

$$c_{\mathrm{cc}} \leq c^*_{\mathrm{cc}}, \tag{65}$$

there exists a perfect Bayesian equilibrium in which the unskilled profit-maximizing speculator does not trade, the unskilled career-concerned speculator randomizes between buying and selling (where μ^* is the probability with which he buys) the skilled speculator acquires information and follows his signal, and the firm chooses to issue equity. Formally, the following statements hold.

- *The unskilled profit-maximizing speculator never trades:*

$$s^{\mathrm{U}}_{\mathrm{pm}}(\sigma = \emptyset) = 0. \tag{66}$$

- *The unskilled career-concerned speculator plays according to*

$$s^{\mathrm{U}}_{\mathrm{cc}}(\sigma = \emptyset) = \begin{cases} +1 & \text{with probability } \mu^*, \\ -1 & \text{with probability } 1-\mu^*, \end{cases} \tag{67}$$

  where $\mu^* \in [0, \theta)$.

- *The skilled speculator acquires information and follows his signal:*

$$\eta^* = 1;$$
$$s^{\mathrm{S}}(\sigma) = \begin{cases} +1 & \text{if} \quad \sigma = \sigma_{\mathrm{G}}, \\ -1 & \text{if} \quad \sigma = \sigma_{\mathrm{B}}. \end{cases}$$

- *Secondary market prices are*

$$p_1^{-2} = p_1^{-1} = p_1^0 = 0,$$
$$p_1^1 = \frac{\theta\gamma V_{\mathrm{G}} + (1-\gamma)[(1-r)+\mu^* r]\bar{V}}{\theta\gamma + (1-\gamma)(1-r) + (1-\gamma)\mu^* r} - I,$$
$$p_1^2 = \frac{\theta\gamma V_{\mathrm{G}} + (1-\gamma)\mu^* r\bar{V}}{\theta\gamma + (1-\gamma)\mu^* r} - I.$$

- *All firms' types choose to raise I at $t = 0$.*

Proof. Since $\epsilon = 0$ there exist multiple equilibria. I focus on the equilibrium that would be unique if ϵ were both positive and small.

Investment succeeds when $y \in \{1, 2\}$ as long as inequality (63) is satisfied. For $y < 1$, the capital providers' posterior about the quality of the firm is too low for the equity issue to succeed.

The proof of the behavior of the profit-maximizing speculator follows exactly the same logic as the proof of Lemma 2.2. The proof of the behavior of the career-concerned speculator is identical to that in Lemma 2.3. I will therefore omit both proofs.

The equilibrium behavior of career-concerned speculators is identical to that of Lemma 2.3 because I assume that funds' clients can distinguish between profit-maximizing and career-concerned speculators.[23] Because the presence of profit-maximizing speculators does not affect the states in which investment is undertaken when condition (63) holds, career-concerned speculators play the signaling game of Lemma 2.3. So when $\epsilon = 0$, from (56) it follows that the upper bound on cost for the career-concerned speculator is

$$c^*_{\text{cc}} \equiv \bar{c}_{\text{cc}} := \frac{2\theta\gamma}{3(\gamma + (1-\gamma)\mu^*)} + \frac{\theta^2\gamma}{3(\theta\gamma + (1-\gamma)\mu^*)} - \frac{\theta(1-\theta)\gamma}{(1-\theta)\gamma + (1-\gamma)(1-\mu^*)}; \tag{68}$$

where μ^* is as defined in equation (50).

The proof of the behavior of profit-maximizing speculators is not identical to that of Lemma 2.2, because prices are affected by the behavior of career-concerned speculators. Hence the proof consists of showing that there are no profitable deviations for each speculator. After showing that the unskilled profit-maximizing speculator does not trade and the skilled profit-maximizing speculator follows his own signal, I show that the latter acquires information if

$$c_{\text{pm}} < \frac{(1-\theta)(1-\gamma)}{3}\left[\frac{\mu^* r \Delta V}{\theta\gamma + (1-\gamma)\mu^* r} + \frac{(1-r+\mu^* r)\Delta V}{\theta\gamma + (1-\gamma)(1-r+\mu^* r)}\right] =: c^*_{\text{pm}}.$$

■

Lemma 2.7 *For*

$$I \le \frac{\theta\gamma V_{\text{G}} + (1-\gamma)\hat{\mu} r \bar{V}}{\theta\gamma + (1-\gamma)\hat{\mu} r}, \tag{69}$$

$$c_{\text{pm}} \le \hat{c}_{\text{pm}}, \tag{70}$$

$$c_{\text{cc}} \le \hat{c}_{\text{cc}}, \tag{71}$$

there exists a perfect Bayesian equilibrium in which the unskilled profit-maximizing speculator does not trade, the unskilled career-concerned speculator randomizes between buying and selling (where $\hat{\mu}$ is the

[23] This assumption does not contradict the assumption that market makers cannot distinguish between career-concerned and profit-maximizing speculators. Whereas market makers observe only the aggregate order flow and do not observe who submitted the trades, funds' clients can tell the difference between a career-concerned and profit-maximizing speculator when they make the hiring decision.

probability with which he buys), the skilled speculator acquires information and follows his signal, and the firm chooses to issue equity. Formally, the following statements hold.

- *The unskilled profit-maximizing speculator never trades*

$$s_{\text{pm}}^{\text{U}}(\sigma = \emptyset) = 0. \tag{72}$$

- *The unskilled career-concerned speculator plays according to*

$$s_{\text{cc}}^{\text{U}}(\sigma = \emptyset) = \begin{cases} +1 & \textit{with probability } \hat{\mu}, \\ -1 & \textit{with probability } 1 - \hat{\mu}, \end{cases} \tag{73}$$

where $\hat{\mu} \in [0, \theta)$ *.*

- *The skilled speculator acquires information and follows his signal*

$$\eta^* = 1;$$
$$s^{\text{S}}(\sigma) = \begin{cases} +1 & \textit{if } \ \sigma = \sigma_{\text{G}}, \\ -1 & \textit{if } \ \sigma = \sigma_{\text{B}}. \end{cases}$$

- *Secondary market prices are*

$$p_1^{-2} = p_1^{-1} = p_1^0 = p_1^1 = 0,$$
$$p_1^2 = \frac{\theta\gamma V_{\text{G}} + (1-\gamma)\hat{\mu} r \bar{V}}{\theta\gamma + (1-\gamma)\hat{\mu} r} - I.$$

- *All firms' types choose to raise* I *at* $t = 0$*.*

Proof. If inequality (63) does not hold, then investment fails in $y = 1$ as well. In that case, the skilled profit-maximizing speculator acquires information provided that

$$c_{\text{pm}} < \frac{1}{3}\left[\frac{(1-\theta)(1-\gamma)\hat{\mu} r \Delta V}{\theta\gamma + (1-\gamma)\hat{\mu} r}\right] =: \hat{c}_{\text{pm}}$$

and the skilled career-concerned speculator acquires information provided that

$$c_{\text{cc}} < \frac{\theta\gamma}{3(\gamma + (1-\gamma)\hat{\mu})} + \frac{2\theta^2\gamma}{3(\theta\gamma + (1-\gamma)\hat{\mu})} - \frac{\theta(1-\theta)\gamma}{(1-\theta)\gamma + (1-\gamma)(1-\hat{\mu})} =: \hat{c}_{\text{cc}}. \tag{74}$$

Unskilled career-concerned speculators are indifferent between buying and selling if the payoff from buying is identical to that from selling:

$$\frac{2}{3}\frac{\theta\gamma}{\theta\gamma + (1-\gamma)\mu} + \frac{1}{3}\theta\frac{\gamma}{\gamma + (1-\gamma)\mu} = \frac{(1-\theta)\gamma}{(1-\theta)\gamma + (1-\gamma)(1-\mu)};$$

this condition is satisfied for $\hat{\mu} \in [0, \theta)$, where

$$\hat{\mu} = \frac{-3\gamma + 3\theta - 2\gamma\theta - \gamma\theta^2}{6\ (1-\gamma)} + \sqrt{\frac{9\gamma^2 + 6\gamma\theta\ \ - 24\gamma^2\theta + 9\theta^2 + 22\gamma^2\theta^2 - 6\gamma\theta^3 - 8\ \gamma^2\theta^3 + \gamma^2\theta^4}{36(1-\gamma)^2}}. \tag{75}$$

A skilled speculator who acquires information and obtains a positive signal prefers buying to selling or not trading. In fact,

$$\frac{\gamma}{3[\gamma + (1-\gamma)\hat{\mu}]} + \frac{2\theta\gamma}{3[\theta\gamma + (1-\gamma)\hat{\mu}]} > \max\left\{0, \frac{(1-\theta)\gamma}{\gamma(1-\theta) + (1-\gamma)(1-\hat{\mu})}\right\}.$$

A skilled speculator prefers to sell upon observing a bad signal rather than to buy or not to trade:

$$\frac{(1-\theta)\gamma}{(1-\theta)\gamma + (1-\gamma)(1-\hat{\mu})} > \max\left\{0, \frac{2\theta\gamma}{3[\theta\gamma + (1-\gamma)\hat{\mu}]}\right\}.$$

Thus, the skilled speculator follows his signal. To obtain the upper bound on the costs of equation (74) I check that he prefers to acquire information given that his most profitable deviation when he does not acquire is to sell. ■

I shall use Lemmata 2.6 and 2.7 to prove Proposition 2.8.

If $c_{\text{cc}} > \hat{c}_{\text{cc}}$ then, if the equity issue fails given $y = 1$, the skilled career-concerned speculator is not willing to acquire when $y = 2$. So, given reasonable out-of-equilibrium beliefs, neither the skilled nor the unskilled speculator trades conditional on the investment's failing in $y = 1$. Hence, prices are perfectly informative of the skilled profit-maximizing speculator's order to buy and so information loses its speculative value and will not be acquired.

Therefore, a sufficient condition for $y = 1$ to be pivotal is that $c_{\text{cc}} > \hat{c}_{\text{cc}}$. The inequality $c^*_{\text{cc}} > \hat{c}_{\text{cc}}$ guarantees that if the skilled career-concerned speculators does not acquire given $y = 2$, then he acquires given $y = 1$. The proof (which I omit) consists of showing: (i) that $\mu^* < \hat{\mu}$, which follows by comparing (50) and (75); and (ii) that the upper bounds on costs are decreasing in μ (and that, given the same μ, $c^*_{\text{cc}} < \hat{c}_{\text{cc}}$).

Having shown that $y = 1$ is the pivotal state for investment, the cost of capital in the associated order flow decreases as the proportion of career-concerned speculators increases; this result is in line with Proposition 2.1, which states that career-concerned speculators loosen firms' financial constraints.

In fact, from equation (63) I compute

$$\frac{d\bar{I}(r;\gamma)}{dr} = \frac{\theta(1-\theta)(1-\gamma)\gamma(1-\mu^*)\Delta V}{[1-\gamma+\gamma\theta - r(1-\gamma)(1-\mu^*)]^2} > 0.$$

Observe that μ^* is a function of γ and that θ does not depend on r. So if we keep γ fixed, then as the proportion of career-concerned speculators increases, so does the upper bound on investment. Therefore in response to an increasing proportion of career-concerned speculators, firms' cost of capital decreases.

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