Do Institutional Investors Improve Capital Allocation?*

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Abstract

This paper contrasts profit-maximizing individual investors with career-concerned portfolio managers in terms of their effect on firms' funding, economic welfare, and shareholder wealth. The finance literature has shown the negative effects of portfolio managers' career concerns. In contrast, I show a positive side: I find that delegated portfolio managers allocate capital more efficiently than do individual investors, which promotes investment, fosters firm growth, and enriches shareholders. Funding markets require information, but individual speculators 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. Finally, I show that career-concerned speculators mitigate the effect of the winner's curse and thereby reduce the discount in a seasoned equity offering.

1 Introduction

A fundamental task of the economy is to allocate capital efficiently, thus fostering economic growth. The stock market plays a crucial role in the efficient allocation of capital by aggregating information in prices and thereby mitigating the adverse selection problem associated with external financing. With asymmetric information prices may diverge from firms' fundamentals; this inhibits the flow of capital to good firms and prevents them from undertaking projects that generate positive net present value (NPV). Hence the acquiring of information by speculators and their trading are both needed to mend markets: as information about a good firm becomes reflected in its stock price, the firm's cost of funding decreases, and this allows it to raise capital more cheaply.

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Institutional investors have replaced individual investors as both capital providers and speculators.[1] Yet, even though they are now the main holders of public equity, their role in channeling funds efficiently has been neglected. How do institutional investors affect the allocation of capital? I contrast their role with the more generally studied one of individual investors.

Profit-maximizing speculators underprovide information, as expressed famously by the Grossman and Stiglitz (1980) paradox.[2] Speculators are willing to pay for information only if prices are noisy. As pointed out by Dow, Goldstein, and Guembel (2011), the underprovision problem takes an extreme form when prices not only reflect but also influence fundamentals. In that case, speculators have little room to profit from market inefficiency even when prices are noisy. Low prices, which induce firms to cancel their investments, are perfectly informative in a self-fulfilling way. Speculators then have only weak incentives to acquire information, generating a negative externality on firms' investment.[3]

I ask whether delegated portfolio managers, a large class of institutional investors, help to solve the underprovision of information problem when prices feed back into investment. Many delegated portfolio managers respond mainly to implicit incentives linked to the value of assets under management. Thus they respond to so-called reputation concerns: such managers seek to increase flows by impressing investors, retaining old clients, and gaining new ones.[4] An example is given by US mutual funds, which do not charge performance fees and instead bill clients only a fixed percentage of assets under management.[5] I shall refer to such investors as *career-concerned* speculators.

Both policy debate and the academic literature have demonstrated the negative effects of delegated portfolio managers' agency frictions on, for example, corporate governance and asset prices.[6] It has often been suggested that delegated portfolio managers should charge

[1]There is considerable evidence for these facts. For example, Michaely and Vincent (2012) find that, by the end of 2009, institutional investors held 70 per cent of the aggregate US market capitalization. According to Aggarwal, Prabhala, and Puri (2002), the majority of equity in initial public offerings is allocated to institutional investors, and the Flow of Funds data provided by the Federal Reserve indicate that institutional investors hold nearly 86 per cent of the corporate bonds in the US corporate bond markets.

[2]If market prices reflected information fully, then profit-maximizing speculators would have no incentive to acquire it.

[3]The price at which a speculator and his counterparty transact conveys information to the funding market—a transaction spillover from the secondary to the primary market—and thus affects the firm's cost of capital.

[4]Empirical literature (see, e.g., Chevalier and Ellison (1997) and Sirri and Tufano (1998)) document the strong relationship between an institutional investor's past performance and the flow of clients' funds: clients invest mainly with those that have out-performed in the past. Berk and Green (2004) demonstrate that this dynamic is theoretically consistent with clients searching for skilled management in order to maximize their own wealth.

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

[6]See, for example, Dasgupta and Piacentino (2012), Dasgupta and Prat (2008), Dasgupta, Prat, and Verardo (2011), Guerrieri and Kondor (2012), and Scharfstein and Stein (1990).

performance fees in order to align fund managers' interests with those of their clients, but there is only limited evidence supporting the benefits of such fees.[7] I discover a positive effect of portfolio managers' implicit incentives that has been largely neglected by the finance literature; I show that they assist prices in their allocative role.

In my model, heterogeneous delegated portfolio mangers, *funds*, populate markets; some are skilled and some are not, but only skilled funds can learn about firm quality. Funds are interested only in the growth of their assets under management. To attract clients, skilled funds want to signal their ability. However, doing so requires that firms raise capital and invest. Firms that fail to obtain funding do not undertake their projects, so the market learns neither about their true quality nor about funds' skills. Skilled speculators can induce firms to invest only by acquiring information and then impounding it into prices, thus reducing firms' financial constraints. Yet unlike individual investors, funds trade even when they are unskilled; this distorts order flows and may well hamper the allocative role of prices. However, I show that in equilibrium the negative effect of trading by an unskilled speculator complements the positive effect of the skilled speculator transmitting information via prices and thus serves to augment the beneficial effects of delegated portfolio management on capital allocation.

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 gain private benefits from doing so. Firms rely on external finance to undertake their own projects because they have no cash, no mortgageable assets, and no access to credit—they are holding an asset that the market believes to have negative NPV. With no other information, the market breaks down and no investment takes place.

In order to avoid this fate, firms may rely on speculators to acquire information and trade, thus relaxing the firm's financial constraints by allowing it to raise funds more cheaply. Firms in the model presented here raise funds via equity—in particular, via a seasoned equity offering (SEO). I focus on equity finance because it is the most relevant form of funding for the firms being modeled: listed corporations with projects having negative average NPV and with no assets in place.[8]

Markets in the model are populated by a large speculator and a number of liquidity

[7] Elton, Gruber, and Blake (2003) show that, on average, the mutual funds that charge higher performance fees take on more risk; however, there is only with weak evidence of higher returns resulting from this strategy.

[8] 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.

traders. The speculator is either profit maximizing or career concerned and may be either skilled or unskilled. The skilled speculator can acquire perfect information about a firm's quality at a cost, whereas the unskilled speculator faces an infinite cost of acquiring information. 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 price will have on a firm's ability to raise the required funds.

Firms issue public equity. In the baseline model I leave the mechanism by which firms issue equity unmodeled, but this mechanism is modeled explicitly in Section 4. 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 find 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. I also find that, under reasonable restrictions on the parameters, career concerns yield additional benefits at the level of the firm and the economy both. In particular, speculators' career concerns decrease total corporate losses brought about by undertaking bad projects and not undertaking good ones, and they reduce the underpricing of good firms.

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. In fact, the unskilled speculator trades in an unusual way: he sells relatively more often than he buys owing to the feedback (between prices and investment) that makes firm value endogenous. When the firm does not invest speculators 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 effects induce 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 in the career-concerned case. Thus, when prices matter for investment, they are more informative when speculators are career concerned than when they are profit maximizing.

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. When the average NPV of the project is negative, undertaking bad projects is more costly for the economy than not undertaking good ones; hence 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 4 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.

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.

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.

This paper is related as well to the research addressing the relation between stock prices and corporate investment. There is a wide empirical literature questioning whether the stock market is anything more than a side show.[9] Durnev, Morck, and Yeung (2004) show that more informative stock prices facilitate more efficient corporate investment. My model suggests

[9] Levine (2005) summarizes the literature on the relationship between financial systems and growth, concluding that stock markets do matter for growth.

another question that could be investigated cross-sectionally: In a sample of distressed firms, do those with more institutional ownership exhibit greater price informativeness?

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 5.1 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 5.2, 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 5.3 identifies a sufficient condition for the main result—that career-concerned speculators relax firms' financial constraints—to hold.

The rest of the paper is organized as follows. After the literature review in Section 1.1, Section 2 introduces the baseline model and finds the two equilibria where the profit-maximizing and career-concerned speculators acquire information. Section 3 compares the benefits created by career-concerned speculators with those created by profit-maximizing ones, and Section 4, solves for the seasoned equity model. Section 5 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 6 concludes.

1.1 Review of the Literature

This paper brings together two influential strands of literature. One is the feedback effect literature, which studies the fundamental role of prices in aggregating information and allocating resources efficiently. The other is research addressing the role of career-concerned speculators in finance—and especially in asset pricing.

The feedback effects literature underscores two important implications of the fundamental role of asset prices: They influence investment, firstly, by driving managerial learning (Dow, Goldstein, and Guembel (2011), Dow and Gorton (1997), Goldstein, Ozdenoren, and Yuan (2012), Subrahmanyam and Titman (2001)) and secondly, by affecting financing decisions (Baker, Stein, and Wurgler (2003), Fulghieri and Lukin (2001)) thorough their impact on the cost of equity. In each case, research focuses on the feedback loop whereby prices reflect information about the cash flows and also influence them. In the managerial learning channel, prices guide managers toward undertaking good projects; in the financing channel, prices allow good firms to raise funds more cheaply and so reduce their the cost of capital.

The paper of Dow, Goldstein, and Guembel (2011) is the closest to mine in spirit despite its use of the managerial learning channel rather than the equity financing channel. They point out that, in order for prices to perform their allocative role and guide managers' decisions, speculators must have the incentive to acquire information and then to trade, thus impounding their information into prices. But, if speculators are profit maximizing then, as the likelihood that a firm does not invest increases, the more likely their information is to lose its speculative value; this may lead to a drop in investment and market breakdown. The authors show that there is low information acquisition when a firm's fundamentals are low (e.g. in a recession). I introduce career concerns as a potential solution to this problem.

My paper is also closely related to Fulghieri and Lukin (2001), who study firms' preferences for debt versus equity when profit-maximizing speculators can produce noisy information on the firm's quality but when the average quality of the industry is ex ante positive. Information acquisition is also key to their paper; however, they study how the quantity of information produced in markets is affected by firms' capital structure decisions whereas I study how it is affected by speculators' preferences.

My paper extends the career concerns literature by revealing a new, positive dimension of career-concerned speculators. In particular, papers such as Dasgupta and Prat (2006, 2008), Dasgupta, Prat, and Verardo (2011), Guerrieri and Kondor (2012), and Scharfstein and Stein (1990) show that unskilled speculators' inefficient actions lead to an increase in noise and to excessive amounts of trading volume, price volatility and risk taking. Although my study confirms that unskilled speculators generate endogenous noise and increase trading volume, I find that they increase price informativeness when it is relevant for investment and benefit the economy and shareholders of good firms in a number of different ways.

Few papers attempt to model institutional investors' career concerns. I borrow delegated asset managers' payoffs from Dasgupta and Prat's (2008) in reduced form. This allows me to abstract from the relationship of the fund and its clients that the authors have extensively explored, and that I take as given, in order to concentrate on the relationship between the fund and firms. Other notable exceptions are Guerrieri and Kondor (2012) and Berk and Green (2004). Guerrieri and Kondor show the emergence of career concerns among speculators in a defaultable bond market with labor market competition among portfolio managers. Berk and Green derive funds' career concerns endogenously in a model with competition, but they use an optimal contracting set up in which funds have market power.

Finally, 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 do not face career concerns. Instead they are all 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. They report two main empirical findings. First, SEOs with greater secondary market buying by institutional investors experience more oversubscription and lower discounts. Second, higher discounts are associated with a greater extent of adverse selection faced by firms.

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.[10]

For simplicity, I assume that firms have no cash or any other assets in place.[11] The only exception is an old project $\tilde{\chi}$ that will pay off I with (small) probability ϵ[12]—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.

[10] This is in line with Jensen's (1986) interpretation of overinvestment and empire building.

[11] 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.

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

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 $\mathbb{P}(\tau = \mathrm{S}) = \gamma \in (0,1)$.[13] 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 perfect 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 $\mathbb{P}(\Theta \,|\, \sigma_\Theta) = 1$. 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.

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 5.1 shows that, conditional on a firm's raising capital by issuing debt, my analysis remains unchanged. Not only do the qualitative results of the propositions remain unchanged, but also the prices and the strategies of the players coincide at $t = 1$.

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 4 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:

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

[13]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.

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 at 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.

As mentioned previously, 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.[14]

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

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

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;[15] 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.[16] 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.[17] 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

[14] See note 5.

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

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

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

career concerns in a static setting, I implicitly assum 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 5.2 I study the case in which the speculator cares both about profits and reputation.

2.2 Results

2.2.1 No Information Acquisition: The Impossibility of Firms' Financing

Proposition 1. *When the speculator cannot acquire information about the firms' quality, firms are unable to raise I.*

Proof. If the speculator cannot acquire information about 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,

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

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 $w_1 = 0$.

Proposition 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 followin statements hold.

- *The unskilled speculator never trades:*

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

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

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

- *Secondary market prices are*

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

- *Firms always choose to raise I at $t = 0$.*

Appendix 7.1.1 shows that this is an equilibrium; here I review the steps of the proof. Appendix 7.1.2 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 $c < \bar{c}_{\text{pm}}$.

Finally, firms always 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. *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 7.1.1.1. 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 $w_1 = 0$.

Proposition 3. *For*

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

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*

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

- *Firms always choose to raise I at $t = 0$.*

The proof is given in Appendix 7.1.3 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.[18] If the firm's fund raising fails ($\iota = 0$) then the value of the firm is endogenously zero (unless $\chi = I$) and thus

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

an inference channel is shut: clients' 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 believes 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). This contrasts with typical mixing strategy equilibria in normal-form games, where a player's mixing probability makes his *opponent* indifferent.

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 $c < \bar{c}_{\text{cc}}$.

Finally, firms 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 3. *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 Proposition 3 I show that, for sufficiently low costs, a skilled speculator acquires information and follows his signal whenever $\mu^* = 0$. □

Corollary 2 shows that a profit-maximizing speculator does not acquire information when prices are sufficiently informative. According to Corollary 3, however, a skilled career-concerned speculator is willing to acquire information even in those circumstances.

3 Benefits of Career Concerns

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

3.1 Career Concerns and Firms' Financial Constraints

Proposition 4. *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 $I \in (\bar{I}_{\text{pm}}, \bar{I}_{\text{cc}}]$ that can be undertaken only with career-concerned speculators, where*

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

and

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

Proof. Since $\bar{I}_{\text{cc}}$ is decreasing in μ and $\bar{I}_{\text{cc}} = \bar{I}_{\text{pm}}$ whenever $\mu = 1$, it follows that $\bar{I}_{\text{cc}} > \bar{I}_{\text{pm}}$ for any $\mu < 1$. Note that μ is always less than 1 because it is less than $\theta \in (0, 1)$ by Proposition 3. Hence, there is a range of projects with costs $I \in (\bar{I}_{\text{pm}}, \bar{I}_{\text{cc}}]$ that can be undertaken only when career-concerned speculators trade. □

I now present two lemmas that build the intuition for the main result of Proposition 4.

Lemma 4.1. *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.*

Proof. 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 Propositions 2 and 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): 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. □

Lemma 4.2. *The cost of capital in the pivotal order flow is always lower when career-concerned than when profit-maximizing speculators trade.*

Having identified in Lemma 4.1 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.

Proof. 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 Lemma 4.2 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 $\mu^* < 1$.

$\square$

3.2 Project Quality and Career-Concerned Speculators

Career-concerned speculators allow both good firms 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 estabilishes that the overall effect of career concerns is indeed positive.

Proposition 5. *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

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

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. $\square$

3.3 Additional Effects of Career Concerns

3.3.1 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

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

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

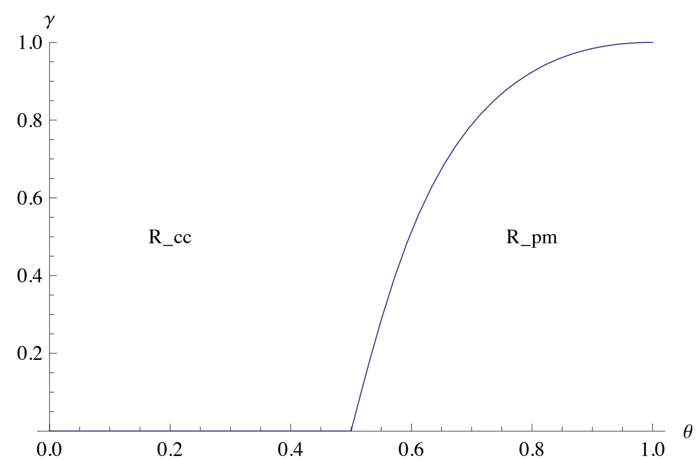

Figure 1: Regions

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

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

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

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

3.3.2 Total Inefficiency

Proposition 6. *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,[19] 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,

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

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)

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

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

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

which is greater than zero if and only if $\mu^* < \frac{1}{2}$ because the average project has negative NPV. This proves Proposition 6: in region R_{cc} total inefficiency is greater with profit-maximizing than with career-concerned speculators. □

3.3.3 Shareholder Wealth

Proposition 7. *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

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

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

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

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 ($I > \theta V_G$). $\square$

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.

4 A Seasoned Equity Offering

4.1 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.[20] 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,

[20]See note 8.

results derived from the baseline model apply to more general settings than that of an SEO, as I show in Section 5.1.

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 (1993) 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 Nands 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.

4.1.1 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 $t = 3$ 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.[21] Uninformed speculators have no information about the firm and may refrain from bidding if they expect losses (conditional on their available information),

[21] 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.

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

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

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).

4.1.2 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 $t = 2$.

4.2 Results

4.2.1 SEO with Profit-Maximizing Speculators

Proposition 8 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 7.2.2); 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 7.2.2 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 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.[22] 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 Proposition 8 as the unique one.[23] 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.

Proposition 8. *Let*

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

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

[22] The effects of these two economic phenomena are formally identical in the models.

[23] 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:*

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

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

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

- *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*

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

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

The proof is given in Appendix 7.2.1.

Observing the equilibria of Proposition 2 and Proposition 8 immediately yields the following corollary.

Corollary 8. *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.

4.2.2 SEO with Career-Concerned Speculators

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

Proposition 9. *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:*

$$\eta^* = 1;$$
$$s_1^{\mathrm{S}}(\sigma) = \begin{cases} +1 & \text{if} \quad \sigma = \sigma_{\mathrm{G}}, \\ -1 & \text{if} \quad \sigma = \sigma_{\mathrm{B}}; \end{cases}$$
$$s_2^{\mathrm{S}}(\sigma) = \begin{cases} +1 & \text{if} \quad \sigma = \sigma_{\mathrm{G}}, \\ 0 & \text{if} \quad \sigma = \sigma_{\mathrm{B}}. \end{cases}$$

- *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*

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

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

The proof is provided in Appendix 7.2.3.

Corollary 8 is now an immediate consequence of comparing Proposition 3 and Proposition 9.

4.3 Effects of Speculator Incentives on SEOs

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, whcih leads to the following result.

Proposition 10. *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 7.2.4. 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 10. *When profit-maximizing speculators trade, the cost of capital may be higher in an SEO than in the baseline model.*

It follows from Proposition 10 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 8).

4.3.1 Loosening Firms' Financial Constraints

I show here that Proposition 4 holds, and is even starker when firms raise funds via an SEO. As in Section 3, I set $\epsilon = 0$ to prove the results.

Proposition 11. *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 $\mu < 1$. □

Lemmas 4.1 and 4.2 build the intuition of Proposition 4 in Section 3. Lemma 4.1 proves that $y = 1$ is pivotal for investment, and Lemma 4.2 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 8. The intuition behind the lower cost of capital with career-concerned than with profit-maximizing speculators is similar to that for Lemma 4.2. In an SEO, however, the winner's curse rationing—which arises when profit-maximizing speculators trade—increases firms' cost of capital (see Corollary 10). Hence there is an even wider range of projects that can be undertaken only with career-concerned speculators.

4.3.2 Other Benefits

It remains to show that Propositions 5–7 all hold also in the SEO model. Only the proof of Proposition 7 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 10 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.

5 Extensions

5.1 Raising Capital via Debt

I have shown that career-concerned speculators—more so than profit-maximizing ones—reduce a firm's financial constrains 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 $F > I > V_{\text{B}}$ such that capital providers break even:

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

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

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

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

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

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

5.2 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 Propositions 2 and 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 12. *Depending on the relative degree to which speculators care about profits compared with their reputation, there are three types of equilibria.*

(i) Given vanishing ϵ, for w_2 sufficiently large a speculator behaves as in Proposition 3.

(ii) Given vanishing ϵ, for w_2 sufficiently small a speculator never acquires information.

(iii) For fixed $\epsilon > 0$ and w_2 sufficiently small, a speculator behaves as in Proposition 2.

The proof is given in Appendix 7.3.

5.3 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 13. *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 4) obtains.*

The proof is in Appendix 7.4. 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 13 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 $c_{\text{cc}} > \hat{c}_{\text{cc}}$), then profit-maximizing speculators are unwilling to acquire in $y = 2$ and so the market breaks down.

According to Corollary 2, 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 $c_{\text{cc}} > \hat{c}_{\text{cc}}$, 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 do the skilled profit-maximizing speculator is unwilling to acquire information, just as in Proposition 4.

6 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 dependend on external finance for their growth relatively better-off in markets with delegated portfolio managers or in those with individual investors?

7 Appendix

7.1 Baseline Model

7.1.1 Proof of Proposition 2

I show here that there are no profitable deviations from the equilibrium of Proposition 2. Uniqueness is shown in Appendix 7.1.2.

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 Proposition 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

$$\frac{\epsilon}{3}\left(p_\epsilon^{-1} - V_\mathrm{B} + p_\epsilon^0 - V_\mathrm{B}\right) \;>\; \frac{1}{3}\left(V_\mathrm{B} - I + \epsilon I - p_1^2\right) + \frac{1}{3}\left(V_\mathrm{B} - I + \epsilon I - p_1^1\right) + \frac{\epsilon}{3}\left(V_\mathrm{B} - p_\epsilon^0\right),$$

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 becuase

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

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.

7.1.1.1 Proof of Corollary 2

Suppose there exists an equilibrium in which the strategies of the players are as described in Proposition 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.

7.1.2 On the Uniqueness of the Equilibrium of Proposition 2

If $\epsilon = 0$ then there are multiple equilibria—that is, the equilibrium of Proposition 2 is not unique. However, none of these equilibria is strict, and the equilibrium of Proposition 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 Proposition 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.

7.1.3 Proof of Proposition 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.[24] The client's

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

posteriors are as foolows:

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

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

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

In Appendix 7.1.3.1 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 and the firm's value is not realized (unless the firm can self-finance the project). Under these circumstances, the client can observe only the fund's action. Therefore, firm invests either when the order flow is $y \in \{1, 2\}$ or when $y = 0$ and $\tilde{\chi} = I$—that is, with overall probability $\left(\frac{2}{3} + \frac{\epsilon}{3}\right)$. When the firm invests, 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 he buys and the firm does not invest $\left(\frac{1}{3}(1-\epsilon)\right)$.

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 the fund sells, the firm can invest in the project only if $\chi = 1$, namely, 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 with probability $\mu^*(\theta, \gamma, \epsilon)$ between buying and selling if

$$f(\mu, \theta, \gamma, \epsilon) := \Phi(a^{\mathrm{U}} = +1) - \Phi(a^{\mathrm{U}} = -1) = 0. \tag{49}$$

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 $\epsilon = 0$ since the derivative of μ with respect to ϵ evaluated at $\epsilon = 0$ exists and is finite. In fact,

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

and $\partial f / \partial \epsilon$ 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, given $\gamma \in (0,1)$, $\theta \in (0,1)$ and 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

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

by the intermediate value theorem $\mu^*(\theta, \gamma, 0) \in (0, \theta)$. Whenever $\gamma \in \left[\frac{1+2\theta}{3-2\theta+2\theta^2}, 1\right]$ then $\mu^* = 0$. Further, since f is strictly decreasing in μ, 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 that the skilled speculator has no profitable deviation from following his signal once he acquires and that he prefers to acquire. A skilled speculator who acquires and obtains a positive signal prefers to buy than to sell or rather not trade. 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

$$\Phi(a^{\mathrm{S}} = +1, \sigma = \sigma_{\mathrm{G}}, \eta^* = 1) = \frac{1}{3}\left(2 + \epsilon\right)\frac{\gamma}{\gamma + (1-\gamma)\mu^*} + \frac{1}{3}(1-\epsilon)\frac{\theta\gamma}{\theta\gamma + (1-\gamma)\mu^*}$$

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

$$\Phi(a^{\mathrm{S}} = -1, \sigma = \sigma_{\mathrm{G}}, \eta^* = 1) = (1-\epsilon)\frac{(1-\theta)\gamma}{\gamma(1-\theta) + (1-\gamma)(1-\mu^*)} + (1-\theta)\epsilon\frac{\gamma}{\gamma + (1-\gamma)(1-\mu^*)}.$$

Thus, I must 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 $\epsilon = 0$. Thus, for $\epsilon = 0$, the fund prefers to buy if

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

Since the above function is decreasing in μ, then if it is satisfied for $\mu = \theta$, it is satisfied for all $\mu < \theta$. Then, rewriting inequality 52 for $\mu = \theta$ I get

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

which is always strictly positive, proving inequality 51.

The skilled speculator must prefer to sell upon observing a bad signal 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

$$\Phi(a^{\mathrm{S}} = -1, \sigma = \sigma_{\mathrm{B}}, \eta^* = 1) = (1-\epsilon)\frac{(1-\theta)\gamma}{(1-\theta)\gamma + (1-\gamma)(1-\mu^*)} + \epsilon\frac{\gamma}{\gamma + (1-\gamma)(1-\mu^*)},$$

$$\Phi(a^{\mathrm{S}} = 0, \sigma = \sigma_{\mathrm{B}}, \eta^* = 1) = 0,$$

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

I must show that

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

which, for $\epsilon=0$ can be re-written 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 it is satisfied.

Having showed that the skilled speculator prefers to follow his signal, I must now show that he prefers to acquire. His payoff from acquiring information and following the 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 he does not acquire 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 that from not trading—selling is an optimal deviation. When $\mu^{*}=0$ selling is the unique most profitable deviation. Thus, for $\forall\mu^{*}\in[0,\theta)$ selling is a most profitable deviation. Thus I must 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 $\epsilon=0$ to prove existence of the equilibrium for small ϵ. Since g is continuous in both μ and ϵ and it is strictly positive at $\epsilon=0$, I focus on $\epsilon=0$ and show that g is indeed strictly positive. In fact,

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

since $g>0$ exactly when $\frac{g}{\theta\gamma}>0$ and $\frac{\partial(\frac{g}{\theta\gamma})}{\partial\gamma}<0$ for all $\mu,\gamma\in(0,1)$ and θ. Since $g=0$ when $\gamma=1$, 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

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

Firms: They have the same incentives as those described in the proof of Proposition 2 (Appendix 7.1.1).

7.1.3.1 Microfoundation of the Out-of-equilibrium Beliefs

The equilibrium in Proposition 3 relies on the out-of-equilibrium belief that

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

ergo, on the fact that a career-concerned speculator obtains zero if he stays out. 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 $\sigma=\emptyset$. Then, staying out is no longer an out-of-equilibrium event.

Call $r(\cdot)$ the equilibrium reputation and suppose that the reputation from being right $r(\text{right})$ is greater than the reputation from being wrong $r(\text{wrong})$ and suppose that $r(\text{right}) > 0 \geq r(\text{wrong})$.[25]

In any equilibrium in which this condition is satisfied 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, i.e. $r(a=0)=0$; further, since a skilled speculator can never be wrong, it must also be that when the fund is wrong he is unskilled, then $r(\text{wrong})=0$. Then for any randomising probability, the unskilled speculator is better-off randomising between buying and selling than staying out, since by randomising he has a chance of being right.

7.2 Seasoned Equity Offering

7.2.1 Proof of Proposition 8

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

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

[25] It is possible to show that this is always the case when the career-concerned speculator cares sufficiently for profits.

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

Due to the one deviation property I must check only that the unskilled speculator has no incentive to deviate at $t = 1$ to prove that the strategy at $t = 1$ is subgame perfect. The proof is the same as the proof in Proposition 2 when I show that the unskilled speculator has no incentive to deviate from not trading.

Skilled positively informed: Let us check that his strategy at $t = 2$ is subgame perfect. When $y = 1$, he clearly prefers to buy than to stay 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 he is indifferent. In fact, when $y = 2$ his private information is revealed and the price reflects the firm's fair value: He makes zero profit whether he buys or stays out. When $y \in \{-2, -1, 0\}$ the SEO fails and he is indifferent between buying and staying out.

To show that his strategy at $t = 1$ is subgame perfect it is enough to check deviations at $t = 1$. For the proof refer to that of Proposition 2 for the skilled speculator.

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

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

Again for the proof that his $t = 1$ strategy is subgame perfect please refer to the proof of Proposition 2.

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

$$\begin{aligned}
\Pi(s^{\mathrm{S}}(\sigma), \eta^* = 1) = \theta &\left[\frac{1}{3}\left(V_{\mathrm{G}} - I + \epsilon I - p_1^1\right) + \frac{\epsilon}{3}\left(V_{\mathrm{G}} - p_\epsilon^0\right)\right] + && (57)\\
&+ (1-\theta)\left[\frac{\epsilon}{3}\left(p_\epsilon^{-1} - V_{\mathrm{B}} + p_\epsilon^0 - V_{\mathrm{B}}\right)\right] + && (58)\\
&+ \frac{\theta}{3}\alpha_{\mathrm{S}}\left(V_{\mathrm{G}} + \epsilon I - p_2^1\right) - c > 0 && (59)
\end{aligned}$$

i.e.

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

Good firm: The manager of the good firm wants to maximise the probability of investment to maximise shareholders' wealth. In fact, whenever investment succeeds (i.e. $p_2^y > I$), firms' shareholders get

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

which is greater than zero, which is what shareholders would get if the manager did not issue shares or issued too small a number of shares.

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

$$\frac{n'}{n + n'} p_2^1 = I. \tag{60}$$

Issuing a number of shares that satisfies equation 60, 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 choosing to issue the same number of shares. Choosing to issue any other number of shares would reveal him to be bad. Further, with positive probability the firm obtains funding and he earns private benefits.

7.2.2 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 first investigates the incentives to manipulate of a positively informed speculator, while the second investigates 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: First, to increase profits at $t = 1$ and, second, to increase profits at $t = 2$ (potentially making losses at $t = 1$).

Given a sufficiently small cost of information acquisition such that the skilled speculator acquires information, I show that a speculator has no incentive to manipulate prices at $t = 1$. Firstly, I show that selling at $t = 1$ is a strictly dominant strategy for the negatively informed speculator. Then, I show 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 $t = 2$, since he cannot short in the primary market. He can profit only at $t = 1$ and he thus chooses the action that maximises his $t = 1$ expected profits. Since

$$\mathbb{E}\left[\tilde{p}_1 \middle| \iota, \Theta, a\right] \in (\epsilon V_\mathrm{B}, V_\mathrm{G} - I + \epsilon I), \tag{61}$$

he always prefer to sell.

Let us study the reduced game. I have shown that the negatively informed speculators strictly prefers to sell at $t = 1$. Let us assume that the unskilled buys with probability ρ_1, does not trade with probability ρ_2 and sells with probability $1 - \rho_1 - \rho_2$. Let us assume that the positively informed 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

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

Secondary market prices are determined according to equation 32 and for y weakly greater than 1 firms have the ability to raise enough funds to invest as long as inequality 30 holds. For $y \in \{-2, -1, 0\}$, independently of speculators' strategy, inequality 30 does not hold and the SEO fails. Thus, 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 that is the case will depend on the strategies at $t = 2$ of speculators on which I make no assumption.

This is an equilibrium if the positively informed and the unskilled speculators are indifferent among buying, selling and not trading.

If a positively informed speculator sells he induces the SEO to fail with probability one, and he makes no profits in $t = 2$ independently 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 $t = 1$, the SEO succeeds when $y = 1$, and then he strictly prefers to buy at $t = 2$. His profits then are:

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

If he buys at $t = 1$, the SEO succeeds when $y = 1$ and $y = 2$ and then he strictly prefers to buy at $t = 2$. His profits are:

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

Since, by equation 61

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

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 the unskilled speculator in a game in which prices feed back into investment. Firstly, buying increases the firm's excepted value, while the unskilled speculator expects that the value of the firm is lower than what is reflected by prices. Secondly, the unskilled speculator, by increasing the price, may manipulate the firm's investment (reducing their cost of equity) leading firms to overinvest and decreasing the value of his long position. The exact same argument applies here.

But, selling is also not profitable for the unskilled speculator, differently from Goldstein and Guembel (2008). In their model projects 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 $t = 2$ since the action space is restricted to buying or not buying shares in the equity issue. So he will choose his action to maximise his expected profits at $t = 1$.

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

7.2.3 Proof of Proposition 9

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 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 if the speculator buys at $t = 1$ he buys at $t = 2$ and if he 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:

$$\mathbb{P}\left(\mathrm{S}\,\middle|\, a_1 = 0\right) = 0 \tag{62}$$

and

$$\mathbb{P}\left(\mathrm{S}\,\middle|\, a_1 \ncong a_2\right) = 0. \tag{63}$$

By imposing the out-of-equilibrium belief of equation 63, the problem reduces to that already solved in Proposition 3: Clients observe two actions that at equilibrium contain the same information as observing a_1 in the baseline model. Thus, the proof of the equilibrium behaviour of unskilled and skilled speculators, is the same as that of Proposition 3.

Firms: They have the same incentives as those described in the proof of Proposition 8 (Appendix 7.2.1)

7.2.4 SEO Discount

An SEO succeeds if and only if $y \in \{1, 2\}$ as shown in Proposition 8 and Proposition 9.

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

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

as described in equation 60. Then, substituting for n' from the previous equation in the $t = 2$ price per share, I find that

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

which is always lower than the $t = 1$ price per share (p_1^1/n). In fact, comparing the SEO price of equation 39 with the secondary market price of equation 38, it is clear that,

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

When career-concerned speculators trade, the price per share at $t = 1$ and $t = 2$ are equal given the SEO succeeds. Looking at equilibrium prices in Proposition 9 it is clear that when $y \in \{1, 2\}$,

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

7.3 Proof of Proposition 12

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 the unskilled speculator mixes between buying and selling, where he buys with probability μ^{**}.

Then, if inequality 3 is satisfied whenever $y > 0$, 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

$$\begin{aligned}
U\left(a^{\mathrm{U}} = +1\right) =& w_1 \Pi\left(a^{\mathrm{U}} = +1\right) + w_2 \Phi\left(a^{\mathrm{U}} = +1\right) = \\
=& -\frac{2}{3} w_1 \left[\frac{\Delta V \theta(1-\theta)\gamma}{\theta\gamma + (1-\gamma)\mu}\right] + \\
&+ \frac{1}{3} w_2 \left[(1-\epsilon)\frac{\theta\gamma}{\theta\gamma + (1-\gamma)\mu} + (2+\epsilon)\,\frac{\theta\gamma}{\gamma + (1-\gamma)\mu}\right].
\end{aligned} \tag{64}$$

The unskilled speculator's payoff from selling is:

$$U\left(a^{\mathrm{U}}=-1\right)=w_1\Pi\left(a^{\mathrm{U}}=-1\right)+w_2\Phi\left(a^{\mathrm{U}}=-1\right)= \tag{65}$$

$$=-\frac{2}{3}\epsilon w_1\left[\frac{\Delta V\theta(1-\theta)\gamma}{\theta(1-\gamma)+(1-\gamma)(1-\mu)}\right]+ \tag{66}$$

$$+w_2\left[(1-\epsilon)\frac{(1-\theta)\gamma}{(1-\theta)\gamma+(1-\gamma)(1-\mu)}+\epsilon\frac{(1-\theta)\gamma}{\gamma+(1-\gamma)(1-\mu)}\right] \tag{67}$$

And the unskilled's utility from not trading is

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

The unskilled randomises between buying and selling, firstly, as long as 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, secondly, as long as there exists a probability 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 $w_1=0$ then $h=0$ and thus $\mu^{**}=\mu^{*}$, where $\mu^{*}(\epsilon=0)$ is defined in equation 50.

Let's fix $\epsilon=0$ and find

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

Since at $\epsilon=0$

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

then $\frac{\partial\varphi}{\partial\mu}$ determines the sign of the derivative of μ^{**} with respect to w_1. Since at $\epsilon=0$

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

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

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

$$\varphi\,|_{\mu^{**}=0} \leq 0$$

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 once, it is first decreasing and then increasing, and $\mu^{**} > 0$ at $w_1 = 0$, then μ^{**} intersects zero exactly once when $w_1 = \underline{w}_1$.

Thus, for any $w_1 \in [0, \underline{w}_1]$ the function μ^{**} is decreasing in w_1 and for all $w_1 \geq \underline{w}_1$, $\mu^{**} = 0$.

Finally, fixing $\epsilon > 0$, if $w_2 = 0$ the unskilled speculator deviates and does not trade, since the payoff from both buying and selling if $w_2 = 0$ is negative. Given continuity of μ in w_2, this is true in a neighbourhood of w_2. Thus for small w_2 and $\epsilon > 0$ the unskilled prefers not to trade. Thus, this is not an equilibrium.

If the skilled speculator follows his signal he gets:

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

He prefers to follow his signal if

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

i.e. if he his better off following than: 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 randomises between buying and selling, the payoff from buying and selling is the same at equilibrium, and is higher than that from not trading. Thus, selling is an optimal deviation for the skilled speculators. Thus, he follows his signal if

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

where

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

g is 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 Proposition 3.

Whenever $w_1 > 0$ then $l \geq 0$ and thus the incentives to acquire of a skilled speculator are stronger than when $w_1 = 0$.

Then, the skilled speculator acquires if

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

When $w_1 = 0$ I get the equilibrium of Proposition 3.

When $\epsilon > 0$ and $w_2 = 0$ I get the equilibrium of Proposition 2.

When $\epsilon = 0$ and $w_2 = 0$ then $\mu^{**} = 0$. Then, the skilled speculator does not acquire information and the market breaks down.

7.4 Proof of Proposition 13

I will use the following two lemmata to prove Proposition 13. Set, for simplicity, $\epsilon = 0$.

Lemma 14. *For*

$$I \leq \frac{\theta\gamma V_{\mathrm{G}} + (1-\gamma)[1 - r + \mu^* r]\bar{V}}{\theta\gamma + (1-\gamma)(1-r) + (1-\gamma)\mu^* r} =: \bar{I} \tag{68}$$

$$c_{pm} \leq c^*_{pm}, \tag{69}$$

$$c_{cc} \leq c^*_{cc}, \tag{70}$$

there exists a Perfect Bayesian Equilibrium in which the unskilled profit-maximising speculator does not trade, the unskilled career-concerned randomises between buying and selling where μ^* is the probability with which he buys, the skilled speculator acquires and follows his signal and the firm chooses to issue equity. Formally,

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

$$s^{\mathrm{U}}_{pm}(\sigma = \emptyset) = 0. \tag{71}$$

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

$$s_{cc}^{\mathrm{U}}(\sigma = \emptyset) = \begin{cases} +1 \text{ with probability } \mu^* \\ -1 \text{ with probability } 1 - \mu^*, \end{cases} \tag{72}$$

where

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

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

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

- *Secondary market prices are:*

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

- *Firms always 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 positive and small.

Investment succeeds when $y \in \{1, 2\}$ as long as inequality 68 is satisfied. For $y < 1$, the capital providers' posterior about the quality of the firm is too low for the equity issue to succeed.

While the proof of the behaviour of the career-concerned speculator is identical to that in Proposition 3, the proof of the behaviour of the profit-maximising one is not identical, but follows exactly the same logic of that in Proposition 2. I will thus omit both proofs.

The equilibrium behaviour of career-concerned speculators is identical to that of Proposition 3 because I assume that funds' clients can distinguish between profit-maximising and career-concerned speculators.[26] Since the presence of profit-maximising speculators does not

[26] This assumption does not contrast the assumption that market makers cannot distinguish between career-concerned and profit-maximising speculators: While market makers observe only the aggregate order flow, and do not observe who submitted the trades, funds' clients, instead, can tell the difference between whether the speculator is career-concerned or profit-maximising when they make the hiring decision.

affect the states in which investment is undertaken when condition 68 holds, career-concerned speculators play the signalling game of Proposition 3. Thus, from equation 56 and letting $\epsilon = 0$ the upper bound on cost for the career-concerned speculator is:

$$c^*_{cc} \equiv \bar{c}_{cc} := \frac{2\theta\gamma}{3(\gamma + (1-\gamma)\mu^*)} + \frac{\theta^2\gamma}{3(\theta\gamma + (1-\gamma)\mu^*)} - \frac{\theta(1-\theta)\gamma}{(1-\theta)\gamma + (1-\gamma)(1-\mu^*)}. \tag{73}$$

Where μ^* is as defined in equation 50.

The proof of the behaviour of profit-maximising speculators is not identical to that of Proposition 2, in that prices are affected by the behaviour of career-concerned speculators, but consists of showing that there are no profitable deviations for each speculator, just as in such proof. After showing that the unskilled profit-maximising speculator does not trade and the skilled profit-maximising speculator follows his signal, I show that the skilled profit-maximising speculator acquires information if

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

□

Lemma 15. *For*

$$I \leq \frac{\theta\gamma V_{\mathrm{G}} + (1-\gamma)\hat{\mu} r\bar{V}}{\theta\gamma + (1-\gamma)\hat{\mu} r} \tag{74}$$

$$c_{pm} \leq \hat{c}_{pm}, \tag{75}$$

$$c_{cc} \leq \hat{c}_{cc}, \tag{76}$$

there exists a Perfect Bayesian Equilibrium in which the unskilled profit-maximising speculator does not trade, the unskilled career-concerned randomises between buying and selling where $\hat{\mu}$ is the probability with which he buys, the skilled speculator acquires and follows his signal and the firm chooses to issue equity. Formally,

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

$$s^{\mathrm{U}}_{pm}(\sigma = \emptyset) = 0. \tag{77}$$

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

$$s^{\mathrm{U}}_{cc}(\sigma = \emptyset) = \begin{cases} +1 \text{ with probability } \hat{\mu} \\ -1 \text{ with probability } 1-\hat{\mu}, \end{cases} \tag{78}$$

where

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

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

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

- *Secondary market prices are:*

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

- *Firms always choose to raise I at $t = 0$.*

Proof. If inequality 68 does not hold, then investment fails in $y = 1$ as well. Then the skilled profit-maximising speculators acquires as long as

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

and the skilled career-concerned speculator acquires as long as

$$c_{cc} < \frac{\theta\gamma}{3(\gamma + (1-\gamma)\hat{\mu})} + \frac{2\theta^2\gamma}{3(\theta\gamma + (1-\gamma)\hat{\mu})} - \frac{\theta(1-\theta)\gamma}{(1-\theta)\gamma + (1-\gamma)(1-\hat{\mu})} =: \hat{c}_{cc}. \tag{79}$$

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

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

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

$$\hat{\mu} = \frac{-3\gamma + 3\theta - 2\gamma\theta - \gamma\theta^2}{6\,(1-\gamma)} + \sqrt{\frac{9\gamma^2 + 6\gamma\theta \ - 24\gamma^2\theta + 9\theta^2 + 22\gamma^2\theta^2 - 6\gamma\theta^3 - 8\ \gamma^2\theta^3 + \gamma^2\theta^4}{36(1-\gamma)^2}}. \tag{80}$$

A skilled speculator who acquires and obtains a positive signal prefers to buy rather than to sell or not to trade. 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, in fact

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

Thus, the skilled speculator follows his signal. To obtain the upper bound on costs of equation 79 I check that he prefers to acquire given that his most profitable deviations when he does not, is to sell. □

To prove Proposition 13 I use the two lemmata above.

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

Thus, a sufficient condition for $y = 1$ to be pivotal is that $c_{cc} > \hat{c}_{cc}$. The inequality $c^*_{cc} > \hat{c}_{cc}$ guarantees that if the skilled career-concerned speculators does not acquire given $y = 2$, he acquires given $y = 1$. The proof, which I omit, consists of showing the following two steps: Firstly, that $\mu^* < \hat{\mu}$ which follows by comparing equations 50 and 80. And, secondly, that the upper bounds on costs are decreasing in μ and that, given the same μ, $c^*_{cc} < \hat{c}_{cc}$.

Having shown that $y = 1$ is the pivotal state for investment, the cost of capital in such order flow decreases as the proportion of career-concerned speculators increases, in line with Proposition 4 that says that career-concerned speculators loosen firms' financial constraints.

In fact, from equation 68 I compute

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

Note that μ^* is a function of γ and θ and does not depend on r. Thus, keeping γ fixed, as the proportion of career-concerned speculators increases, so does the upper bound on investment. Thus, increasing the proportion of career-concerned speculators, firms' cost of capital decreases.

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