Do Institutional Investors Improve Capital Allocation?*

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Abstract

I explore delegated portfolio managers' influence on firms' funding, economic welfare and shareholders' wealth. The finance literature has shown that delegated portfolio managers respond to career-concerns, highlighting their negative effects. I show a positive aspect of career-concerned delegated portfolio managers: They allocate capital better than individual investors, fostering growth and enriching shareholders. When adverse selection prevents capital from flowing to firms, speculators' information acquisition and capital provision are crucial to mend the funding market. But, when prices feed back into investment, individual investors have little room to profit and weak incentives to acquire information and, thus, inhibit investment. Delegated portfolio managers' career-concerns lead them endogenously to impound information into prices and to trade more often than individual investors, thus relaxing firms' financial constraints and promoting good firms' investment.

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, aggregating information in prices and thus mitigating the adverse selection problem associated with external financing. With asymmetric information prices may diverge from firms' fundamentals, inhibiting capital from flowing to firms and hence preventing good constrained firms from undertaking positive NPV projects. Speculators' information acquisition and trade are thus crucial to mend markets: As information about good firms gets reflected by prices, their cost of funding decreases, allowing them to raise capital more cheaply.

Institutional investors have replaced individual investors as both capital providers and

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speculators.[1] But, even though they are the main owners 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 that generally studied of individual investors.

Speculators, when concerned only with profits (whom I refer to as profit-maximising), underprovide information, as expressed famously by the Grossman and Stiglitz (1980) paradox.[2] They are willing to pay for information only if prices are noisy. As Dow, Goldstein, and Guembel (2011) point out, the underprovision problem takes an extreme form when prices not only reflect but also affect fundamentals. Speculators have little room to profit from market inefficiency even when pricy are noisy: Low prices induce firms to cancel their investments, and they are thus perfectly informative in a self-fulfilling way. Speculators have then 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 problem when prices feed back into investment. Many delegated portfolio managers respond mainly to implicit incentives linked to the value of assets under management. They respond to what have been called reputation concerns: They want to impress investors, to retain old clients and gain new ones, in order to increase flows.[4] Take, for example, US mutual funds: They do not charge performance fees, but rather bill clients only a proportion of assets under management.[5] I refer to such investors as career-concerned speculators.

The policy debate and the academic literature have shown the negative implications of delegated portfolio managers' agency frictions for, for example, corporate governance and asset prices.[6] I uncover a positive side of career-concerns that has been mostly neglected by the finance literature. I show that delegated portfolio managers' reputation concerns assist prices in their allocative role.

In my model, heterogeneous delegated portfolio mangers (funds) populate markets, some skilled and some not, and only skilled funds can learn about firm quality. Funds are only

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

[2] If market prices reflect information fully, profit-maximising speculators have no incentives to collect 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—thereby determining firms' cost of capital.

[4] Empirical literature (see, for example, Chevalier and Ellison (1997) and Sirri and Tufano (1998)) shows that there is a strong relationship between past institutional investors' performance and the flow of clients' funds: Clients invest mainly with past out-performers. Berk and Green (2004) demonstrate that this is theoretically consistent with clients searching for skilled management in order to maximise 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 charge 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).

interested in the growth of their assets under management. To attract clients, skilled funds want to signal their ability, but they can do so only when firms raise capital and invest: When firms fail to obtain funding, they do not undertake their projects and the market learns neither about their true quality nor about funds' skills. To induce firms to invest, skilled speculators must acquire information and impound it into prices, and thereby reduce firms' financial constraints. But, on the other hand, unlike individual investors, funds trade even when unskilled (pretending to be skilled), distorting order flows and potentially hampering the allocative role of prices. I show, however, in equilibrium, that the negative effect of an unskilled speculator's trade complements the positive effect of the skilled speculator's transmission of information via prices, and only augments the benefits 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 still willing to undertake them because they gain private benefits. Firms rely on external finance to undertake their own projects since they have no cash, no mortgageable assets and no access to credit—they are holding an asset that is viewed by the market as having negative NPV. With no other information, the market breaks down and no investment takes place.

Firms may, however, rely on speculators to acquire information and trade, potentially relaxing their financial constraints by allowing them to raise funds more cheaply. Firms in my model raise funds via equity, in particular via a seasoned equity offering (SEO). Herein I focus on equity finance because it is the most relevant form of funding for the firms I model, listed corporations with projects with negative average NPV and no assets in place.[7]

Markets in my model are populated by a large speculator and a number of liquidity traders. The speculator is either profit-maximising or career-concerned and he is either skilled or unskilled. The skilled speculator can acquire perfect information about a firm's quality at a small cost, whereas the unskilled speculator faces an infinite cost of information acquisition. The speculator and liquidity traders trade and, after observing the aggregate order flow, competitive risk neutral market makers set the price, taking into account the effect that it 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 unmodelled, which I model explicitly in Section 4. The price set by the market maker determines the success of the fund-raising: It contains information that allows capital providers to update their beliefs about the quality of the firm.

[7]Equity, as Myers and Majluf (1984) predict, is a financing instrument of last resort. Recent empirical evidence (see for example, DeAngelo, DeAngelo, and Stulz (2010) and Park (2011)) suggests strong correlation between firms' decision to issue equity and financial distress analogous to my negative NPV assumption.

Firstly, I characterise the equilibrium in which the skilled speculator acquires information when he is profit-maximising and then, secondly, when he is career-concerned. I find that career-concerned speculators allocate capital more efficiently than profit-maximising speculators, allowing firms to fund a larger fraction of projects that have on average positive NPV. Further, for reasonable parameter restrictions, career-concerns have additional benefits at both the economy wide and firm levels: They decrease total corporate losses brought about by undertaking bad projects and not undertaking good ones, they reduce good firms' underpricing and they mitigate the agency problem between the manager and shareholders.

Prices play a crucial role when they reflect information when it is "pivotal" for investment, i.e. when without such information the market would break down. The more informative are prices when information is pivotal for investment, the cheaper it is for firms to raise funds, and thus more expensive projects can be funded.

Crucial for price informativeness is the willingness of the speculator to acquire information when it is reflected by the price. Differently from a skilled profit-maximising speculator, a skilled career-concerned one welcomes high and informative prices because they maximise firm's investment, and only when investment is undertaken does the market learn the firm's true quality, thus allowing a skilled speculator to show off his ability. A profit-maximiser does not benefit from the firm's undertaking good investments when prices are already high.

But, differently from an unskilled profit-maximising speculator who, at equilibrium, does not trade, an unskilled career-concerned speculator always trades. The former suffers a loss from trading fairly priced shares, while the latter wants to avoid revealing that he is unskilled and wants to emulate the skilled trader who always follows his signal. Since he has no information about the firm's quality, he randomises between buying and selling.

While a skilled career-concerned speculator is keen to have informative prices, and thus acquires and follow his signal, impounding his information into prices, his positive effect on prices may be hindered by the random trading of an unskilled career-concerned speculator. But, fortunately, the extra noise in the order flow generated by the unskilled career-concerned speculator does not destroy the informativeness of the price. In fact, the unskilled speculator trades in an unusual way: He sells relatively more often than he buys due 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, feedback effects induce an unskilled speculator to sell frequently.

Since 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 it matters for investment, prices are more informative when speculators are career-concerned than when they are profit-maximising.

I proceed to explore the effects of career-concerns on economic welfare and on firms' wealth. When prices are noisy, two inefficiencies can arise in my model: Bad projects may get funded and good ones may not. For a wide range of parameters, when career-concerned speculators trade, firms invest less, at equilibrium, than when profit-maximising speculators do. Since, when the average NPV of the project is negative, undertaking bad projects is more costly for the economy than not undertaking good ones, career-concerned speculators, by reducing investment, reduce total inefficiencies. At the firm level, reducing the probability that bad projects get funded reduces the probability that managers of bad firms invest in negative NPV projects; thus, career-concerned speculators reduce the agency problem between firms and shareholders by channeling funds efficiently. Finally, a trade-off between profit-maximising speculators and career-concerned ones arises when good firms hold cheap projects: While it is less likely that good firms raise funds with career-concerned speculators, they do so, on average, at a lower cost of underpricing; the latter effect dominates the former, making shareholders' wealth higher with career-concerned speculators.

In Section 4, I extend the baseline model to look at a particular mechanism by which firms raise funds, a seasoned equity offering; I show that all the results from the baseline model still hold and prove the additional result that career-concerned speculators reduce the SEO discount.

I build 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, I add a stage that follows secondary market trading, in which firms choose the price at which to raise funds. The firm sets the SEO price to ensure its success and compensate uninformed bidders for the winner's curse à la Rock (1986). This results in SEO prices often being set lower than secondary market prices; the difference is known as the discount.

The SEO mechanism can exacerbate the effect of underprovision of information on capital allocation since 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.

I also engage with the literature on price manipulation, showing that a speculator does not manipulate prices, i.e. he does not trade against his private information in the secondary market. In contrast with Gerard and Nanda's result, I show that a positively informed profit-maximising speculator does not manipulate prices when prices feed back into investment: By selling or not trading, he pushes the price of the good firm down causing the SEO to fail and he makes no profits. Likewise, by showing that the unskilled speculator does not manipulate prices either, I engage with Goldstein and Guembel's (2008) result that when projects have ex ante positive NPV, the unskilled profit-maximising speculator manipulates prices via selling.

This paper is closely related to recent empirical literature that investigates the role of institutional investors in SEOs; this literature has uncovered positive roles of institutional investors in SEOs in line with my theoretical results.

Chemmanur, He, and Hu (2009) analyse a sample of 786 institutions (mutual funds and plan sponsors) who traded between 1999 and 2005. Firstly, they find that more 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 investors trade than when institutional investors do. Secondly, they find that institutional investors do not engage in manipulation strategies before the SEO: They find that more net buying in the secondary market is associated with more share allocations in the SEO and more post-offer net buying—which is in line 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 institutional holdings 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 perform on average better post-SEO than those subscribed to by individual investors. Further, it supports the idea that institutional investors reduce the probability that bad projects are undertaken. They analyse a sample of 7365 SEOs deals from 1980 to 2004, of which 6950 are completed.

Further, this paper is related to the empirical literature that studies the relationship between stock prices and corporate investment. There is a wide empirical literature questioning whether the stock market is a side show.[8] Recently, Durnev, Morck, and Yeung (2004), show that more informative stock prices facilitate more efficient corporate investment. My model suggests a further question to investigate cross-sectionally: In a sample of distressed firms, do those with higher institutional ownership have higher price informativeness?

My results do not hold only when firms raise funds via outside equity. In fact, if prices reflect fundamentals more with career-concerned speculators than profit-maximising ones, investment responds more when the former speculators trade, and firms' cost of capital should decrease in whatever way firms choose to raise funds. 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 either be profit-maximising or career-concerned. In Section 5.2 I extend the baseline model to incorporate a

[8] Levine (2005) summarises the literature on the relationship between financial systems and growth, emphasising that stock markets matter for growth.

speculator who cares about profits and reputation simultaneously. The results of the baseline model obtain in the limits as the speculator cares only about profits or reputation.

I also extend the baseline model in Section 5.3 allowing both career-concerned and profit-maximising speculators to trade together and find a sufficient condition for the main result that career-concerned speculators relax firms' financial constraints to hold.

The rest of the paper is organised as follows. After the literature review below, Section 2 introduces the baseline model and finds the equilibria when speculators acquire information, firstly when they are profit-maximising and then when they are career-concerned. In Section 3, I discuss the benefits created by career-concerned speculators relative to profit-maximising ones. Then, in Section 4, I solve for the seasoned equity model and, in Section 5, I extend the baseline model to include the possibility of firms' issuing debt, of more general preferences, and of simultaneous trading of profit-maximisers and career-concerned speculators. Section 6 concludes.

1.1 Review of the Literature

This paper brings together two influential strands of literature. The first concerns the feedback effect literature that studies the fundamental role of prices in aggregating information and allocating resources efficiently. The second focuses on the role of career-concerned speculators in finance, in asset pricing in particular.

The feedback effects literature underlines two important implications of the fundamental role of asset prices: That they affect investment, firstly, by driving managerial learning (Dow and Gorton (1997), Dow, Goldstein, and Guembel (2011), Goldstein, Ozdenoren, and Yuan (2012), Subrahmanyam and Titman (2001)) and, secondly, by affecting financing decisions (Baker, Stein, and Wurgler (2003), Fulghieri and Lukin (2001)) via their impact on the cost of equity. These two strands of the literature focus on the feedback loop whereby prices both reflect information about the cash flows and influence them. But, while in the managerial learning channel, prices guide managers in undertaking good projects, in the financing channel they allow good firms to raise funds more cheaply reducing the cost of capital.

Despite that Dow, Goldstein, and Guembel (2011) focus on a distinct feedback mechanism (their model makes use of the managerial learning channel rather than the equity financing channel) their paper is the closest to mine in spirit. They point out that in order for prices to perform their allocative role and guide managers' decisions, speculators must have the incentive to produce information and to trade, thus impounding their information into prices. But, when speculators are profit-maximising as the likelihood that a firm does not invest increases, the more likely it is that their information loses its speculative value, which may lead to a drop in investment and market breakdown. They show that there is low information production when a firm's fundamentals are low, i.e. in a recession. I introduce career-concerns as a potential solution to their problem.

My paper is also closely related to Fulghieri and Lukin (2001) who study firms' preferences toward debt or equity when profit-maximising speculators can produce noisy information on the firm's quality, but when the average quality of the industry is ex ante positive. While information acquisition is also key to their paper, 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 showing a new, positive side 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, to excessive trading volume, to excessive price volatility and to excessive risk-taking. While I also find 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 (as enumerated above).

Few papers attempt to model institutional investors' career-concerns. I borrow delegated asset managers' payoffs from Dasgupta and Prat's (2008) in reduced form. In so doing, I can 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). The former show the emergence of career-concerns for speculators in a defaultable bond market with labour market competition among portfolio managers. The latter also obtain 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 to study the role of institutional investors on underpricing and on the SEO discount. In contrast to my model, institutional investors do not face career-concerns, but are profit-maximising individuals who acquire information if they can profit from it. While I study how speculators' preferences affect secondary market prices and discounts, the authors explore good firms' incentives to stimulate institutional investors' information acquisition in both the secondary market stage and in the bidding stage. They derive a number of empirical predictions: firstly, that SEOs with greater secondary market buying by institutional investors experience more oversubscription and lower discounts, and secondly that higher discounts are associated to a greater degree 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 $\Theta = \mathrm{G}$ stands for "good" and $\Theta = \mathrm{B}$ 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, and while the incentives of good firms' managers are aligned with those of shareholders, bad firms' managers earn private benefits when projects are implemented, creating an agency problem. Managers of bad firms are thus willing to undertake negative NPV projects.[9]

For simplicity, firms have no cash or any other assets in place,[10] except an old project on their books $\tilde{\chi}$ that will payoff I with (small) probability ϵ[11]—thus, $\mathbb{P}(\tilde{\chi} = I) = \epsilon$—and will payoff zero otherwise; therefore, unless this project succeeds, firms cannot self-finance their projects. Further, they hold a project that is viewed by the market as having negative NPV:

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

thus they cannot mortgage the project to raise funding.

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

2.1.2 The Speculator and Liquidity Traders

A risk neutral speculator and liquidity traders trade the firm's equity. The speculator is one of two types, $\tau \in \{\mathrm{S}, \mathrm{U}\}$, where $\mathbb{P}(\tau = \mathrm{S}) = \gamma \in (0,1)$.[12] 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 information acquisition. 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

[9] This is in line with Jensen's 1986 interpretation of overinvestment or empire-building.

[10] My results in fact depend only on the non-pledgeability of any assets in place, i.e. the assumption that firms can no longer mortgage their assets to fund themselves.

[11] This asset will serve to add uncertainty to players' payoffs and thus will serve to refine away unreasonable equilibria even as ϵ goes to zero.

[12] Such restriction guarantees the existence of reputation concerns. If speculators are all either skilled or unskilled, there are no concerns for their careers, since there is no possibility of affecting clients' beliefs about their type.

$l \in \{-1, 0, 1\}$ each with equal probability.

2.1.3 Timing and Prices

If $\tilde{\chi} = 0$ firms can invest only if they can raise I. Firms in my model raise capital via issuing equity. In Section 5.1 I show that conditional on a firm's raising capital by issuing debt my analysis remains unchanged: Not only the qualitative results of the propositions remain unchanged but, further, 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 explicit mechanism by which firms issue equity is temporarily left unmodelled. I address this issue in Section 4 by modelling explicitly an SEO.

There are four dates: $t = 0, 1, 2, 3$. At $t = 0$ the firm decides whether to raise I, and then the skilled speculator decides whether to acquire information ($\eta = 1$), thereby observing a signal of the quality of the firm. 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 $y = a + l$, he 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 from capital providers. Competitive capital providers invest I in the firm by buying a proportion of firm's shares α that makes them break even. Capital providers are uninformed about the quality of the firm and by observing prices they update their beliefs about her 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 her at $t = 2$. If not, the issue fails and the project is not undertaken.

At $t = 2$ the firm is able to raise successfully the required funds I from capital providers whenever she can issue a proportion α of shares such that competitive capital providers break-even:

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

Because the firm cannot issue more than 100 per cent of her shares, a necessary condition for the issue to succeed is that $\alpha \leq 1$, i.e. that

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

Furthermore, whenever the issue is successful the manager is willing to invest, thus the inequality above is also a sufficient condition for the issue to succeed. In fact, by investing, a bad firm manager earns private benefits whereas a good firm manager maximises shareholders' wealth. Therefore,

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

where I call $\iota = 1$ the firm's successful fund-raising and $\iota = 0$ its failure.

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

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

If firm's fund-raising is successful, then the firm 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 $\tilde{\chi}$. Equivalently equation 5 can be re-written plugging in for α from equation 2 and for ι from equation 5, 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, the final realisation of the firm's value depends on her ability to raise funds via prices, i.e. it is endogenous: There is a feedback effect from prices to realised asset values.

2.1.4 A Speculator's Payoff

Speculators' payoff will take different forms at different points of the paper, reflecting their different preferences: In reality, they can be, for example, hedge funds, mutual funds, or individual investors.

As already pointed out in the introduction, nowadays the majority of equity holders are delegated portfolio managers who invest on behalf of clients and who are subject to different types of compensation contracts. Their compensation typically comprises two parts: A percentage of returns they earn—usually referred to as the performance fee—and a percentage of assets under management—usually referred to as the fixed fee. These percentages vary from fund to fund and sometimes they are zero—e.g. the majority of mutual funds' performance fees are nil.[13]

While the ability to make profits is key to obtaining the performance fee, the fund's ability to build reputation is key to obtaining the fixed fee: One way for funds to expand their compensation is to increase assets under management by retaining old clients and winning new ones. These contracts drive delegated asset managers to behave differently from purely profit-maximising specualtors, whose rewards depend entirely on portfolio returns.

The expected utility functional below captures these two main features of the speculators'

[13] According to Elton, Gruber, and Blake (2003) in 1999 only 1.7 percent of all bond and stock mutual funds charged performance fees.

preferences, namely the performance and reputation components:

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

where $w_1 \geq 0$ is the weight that a speculator assigns to expected net returns on investment and $w_2 \geq 0$ is the weight that the fund assigns to his expected reputation. η is 1 whenever the speculator acquires information at cost c and 0 otherwise. Explicitly, expected net returns are

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

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

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

I call reputation r the probability $\mathbb{P}$ that the speculator is skilled—i.e. funds' clients' posterior belief about the manager's type based upon all observables,[14] namely the the firm's type, which is observable only if $\iota = 1$, the fund's action a and the order flow y.[15] The speculator maximises reputation and returns conditional on knowing his type τ and his signal σ.

I export funds' career-concnerns from the dynamic setting of Dasgupta and Prat (2008) to a static one.[16] Reputation concerns usually arise in a repeated setting: Funds care about affecting clients' beliefs about their type to increase their future fees, and clients care about employing skilled funds who generate them higher future returns. By considering career-concerns in a static setting I am implicitly assuming an unmodelled 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 my analysis I study only the two limiting cases of a pure profit-maximiser ($w_2 = 0$) and a pure careerist ($w_1 = 0$). In Section 5.2 I also study case in which the speculator cares about profits and reputation simultaneously.

2.2 Results

2.2.1 No Information Acquisition: The Impossibility of Firms' Financing

Proposition 1. *When the speculator's information is exogenous, i.e. when the speculator cannot produce information about the quality of the firm, firms are unable to raise I.*

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

[15] The order flow is a sufficient statistic for the price, since the price will be determined by the market maker according to the order flow.

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

Proof. If information in the market is exogenous, the firm's price at $t = 0$ is

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

Given inequality 1, and capital providers' posterior about the quality of the firm being equal to the prior 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 lower than zero, for small ϵ, because the project's NPV is strictly negative by assumption, inducing fund-raising to fail. Therefore, firms can invest only when $\tilde{\chi} = I$.

Since information acquisition is essential, I study the effect of speculators' preferences on information acquisition.

□

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

I characterise the equilibrium when a speculator is profit-maximising (i.e. when his payoff assumes the form described in equation 7 letting $w_2 = 0$) and when he acquires information if he is skilled.

Proposition 2. *For*

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

and

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

there exists a unique Perfect Bayesian Equilibrium in which the unskilled speculator does not trade, the skilled speculator acquires and follows his signal and the firm chooses to issue equity. Formally,

- *The unskilled speculator never trades:*

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

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

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

- *Secondary market prices are:*

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

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

In Appendix 7.1.1 I show that this is an equilibrium; below I review the steps of the proof. In Appendix 7.1.2 I show that this is the unique equilibrium in strictly dominant strategies.

At equilibrium, because of the feedback between prices and investment, the equity issue succeeds only when the order flow is $y \in \{1, 2\}$ as long as inequality 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 of a percentage of shares lower than 100 per cent, and thus the issue fails. When $y \in \{-2, -1, 0\}$ the project is not undertaken and therefore profits are zero as long as $\epsilon = 0$.

At equilibrium no speculator has incentives to deviate. A skilled positively informed speculator has no incentives to deviate from buying when observing a positive signal: Not trading or selling would decrease the odds that a good firm invests thus reducing his only chances of making profits. A skilled negatively informed speculator prefers selling: With small probability ϵ he can profit from his short position. And, finally, an unskilled speculator does not want to trade fairly priced shares to avoid incurring 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 $c < \bar{c}_{pm}$.

Finally, firms always choose to issue equity at $t = 0$: With positive probability they can raise I and invest. The manager of the good firm in so doing maximises shareholders' wealth, while the manager of the bad firm maximises his private benefits.

Corollary 2. *If prices are sufficiently informative then there is no Perfect Bayesian Equilibrium in which a skilled profit-maximising speculator acquires information.*

The proof is in Appendix 7.1.1.1. Intuitively, when prices are sufficiently informative the skilled speculator has little room to profit and his information loses its speculative value. This is the case when investment fails given $y = 1$ (i.e. when inequality 10 is not satisfied). When investment succeeds only when $y = 2$, since prices then 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 study the equilibrium when a speculator is career-concerned (i.e. when his payoff assumes the form described in equation 7 with $w_1 = 0$) and when, if he is skilled, he acquires information.

Proposition 3. *For*

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

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

there exists a Perfect Bayesian Equilibrium in which the skilled speculator acquires and follows his signal, the unskilled speculator randomises between buying and selling, where μ^* is the probability with which he buys, and finally the firm chooses to issue equity. Formally:

- *The unskilled speculator plays according to*

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

  where

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

- *The skilled speculator plays according to*

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

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

- *Secondary market prices are:*

$$p_1^{-2} = p_1^{-1} = \epsilon \, \frac{\theta(1-\gamma)(1-\mu^*)V_G + (1-\theta)[\gamma + (1-\gamma)(1-\mu^*)]V_B}{(1-\theta)\gamma + (1-\gamma)(1-\mu^*)} =: \epsilon \, p_\epsilon^{-1}$$

$$p_1^0 = \epsilon \, \bar{V} =: \epsilon \, p_\epsilon^0$$

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

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

The proof is provided in Appendix 7.1.3. Below is the intuition.

Given the strategies of the skilled and the unskilled speculators, investment succeeds whenever $y \in \{1, 2\}$ as long as inequality 13 is satisfied. Prices when the order flow is $y = 1$ or $y = 2$ contain the same information about firm quality because, given speculators always trade, each occurs only when a speculator buys, therefore the only distinction between these events is that when $y = 1$ noise is zero and when $y = 2$ noise is one. A similar argument applies when the order flow is $y = -1$ and $y = -2$.

The payoff of the career-concerned speculator is linear in his ability, i.e. 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 update their beliefs about the fund's ability.[17] When the firm's fund-raising fails ($\iota = 0$) the value of the firm is endogenously zero (unless $\chi = I$) and thus an inference channel is shut: Clients' inferences are limited to the hired fund's action. In fact, due to the feedback between prices and investment, the value of the firm is zero whenever she does not invest and clients cannot observe the realisation of the firm's type Θ and thus, the correctness of the speculators' trade. Notice that a fund's selling leads to a failure to raise capital from the market since the order flow $y \in \{-2, -1, 0\}$. I call selling "the pooling action" because it pools skilled and unskilled speculators on the selling action, as opposed to buying, which can lead to the fund's being right (buying a good firm) or wrong (buying a bad firm) and potentially separating—I call buying "the separating action".

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

Supposing an equilibrium in which the skilled acquires and follows his signal, the unskilled career-concerned must trade. If he does not trade he reveals his type. Thus he randomises between buying and selling; μ^* is the probability with which he buys that makes him indifferent. At equilibrium μ^* is always less than θ, indicating that the fund is more likely to sell than to buy. Selling allows him to pool with the skilled speculator, while buying sometimes reveals that he is unskilled. While it may seem then that the unskilled speculator should always sell, this is not always true: The probability with which he sells feeds back into his utility. If the client believes that the fund always sells, his posterior upon observing such action is that the fund is very likely unskilled. Then the unskilled may have an incentive to deviate.

I prove here intuitively by contradiction that $\mu^* < \theta$ (the formal proof is in the Appendix). Suppose that μ^* is greater than θ and that the beliefs of the client are such that the skilled speculator follows his signal and that the unskilled speculator mixes between buying and selling where he buys with probability μ^*. Then, since $\mu^* > \theta$, upon observing a sale, the client thinks it more likely that he is matched to a skilled speculator and the unskilled speculator obtains a payoff greater than γ from selling and being pooled with the skilled speculator. If the unskilled speculator buys instead, with some probability he is revealed to be right and with some probability he is revealed to be wrong, obtaining in expectation a lower payoff than the one he gets from selling. Therefore, he is not indifferent between buying and selling and he sells all the time, generating 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 it itself affects the payoff that he gets when he either buys or sells: The less likely he is to sell, the higher is the payoff from selling and the other way around. Note that this contrasts with typical mixing strategy equilibria in normal form games in which a player's mixing probability makes his *opponent* indifferent.

Given the unskilled speculator's strategy, it is optimal for the skilled to follow his signal conditional on having acquired and, likewise, anticipating this optimal course of action, it is optimal to acquire for $c < \bar{c}_{cc}$.

Finally, firms always choose to issue equity at t = 0: With positive probability they can raise I and invest. The manager of the good firm in so doing maximises shareholders' wealth, while the manager of the bad firm maximises 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 and follows his signal, even though prices may be 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 $\mu^* = 0$.

□

While in Corollary 2 I show that a profit-maximising speculator does not acquire information when prices are sufficiently informative, Corollary 2 highlights that a skilled career-concerned speculator is willing to acquire even then.

3 The Benefits of Career-concerns

In what follows I focus, for simplicity, on the $\epsilon = 0$ limit since ϵ is only a tool for equilibrium selection.

3.1 Career-concerns Loosen 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 $I \in (\bar{I}_{pm}, \bar{I}_{cc}]$ that can be undertaken only with career-concerned speculators, where*

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

and

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

Proof. Since $\bar{I}_{cc}$ is decreasing in μ and $\bar{I}_{cc} = \bar{I}_{pm}$ whenever $\mu = 1$, then $\bar{I}_{cc} > \bar{I}_{pm}$ for any $\mu < 1$; note that μ is always less than 1 since it is less than $\theta \in (0,1)$ (Proposition 3).

Therefore, there is a range of projects with costs $I \in (\bar{I}_{pm}, \bar{I}_{cc}]$ which can be undertaken only when career-concerned speculators trade. □

The following lemmata 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 $y = 1$, thus making $y = 1$ 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 in that order flow.

Whenever y is less than 1, at equilibrium, the equity issue fails and investment is not undertaken as shown in Propositions 2 and 3. To prove that $y = 1$ is pivotal, it is left to show that, unless investment is undertaken in $y = 1$, the market breaks down and no capital flows to firms. I show below 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 for both skilled profit-maximising and skilled career-concerned speculators, but for very different reasons.

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

When speculators are career-concerned, order flows $y \in \{1, 2\}$ contain the same information about firm quality. Since speculators always trade, each order flow occurs only when speculators buy, therefore the only distinction between these events is that when $y = 1$ noise is zero and when $y = 2$ noise is one. 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 speculators trade.*

Proof. 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-maximising speculators trade. Low cost of capital is equivalent to high secondary market prices, i.e. prices that are more informative about the firm's being good.

Since, conditional on information acquisition, the skilled speculator's and liquidity traders' behaviours are identical in the two models, key to this result is the behaviour of unskilled career-concerned speculators. In particular, I ask whether, when the order flow is 1, prices reveal more of the skilled speculator's private information.

Unskilled profit-maximising speculators never trade, thus noise is exogenously determined by liquidity traders, who confound the skilled speculator's private information. Contrariwise, an unskilled career-concerned speculator always trades—generating endogenous noise in the order flow—to avoid revealing his type, and to emulate skilled traders who always follow their signal. But why is it that when career-concerned speculators trade, the price when the order flow is 1 reveals more of the skilled's speculator private information? The confounding of a skilled speculator's buy order occurs when speculators are career-concerned only when an unskilled speculator buys and liquidity traders don't trade and when speculators are profit-maximising when unskilled speculators don't trade and liquidity traders submit a buy order. Since the probability that liquidity traders submit any type of order is the same independently of whether the speculator is profit-maximising or career-concerned, the only difference is the probability with which an unskilled speculator trades. An unskilled profit-maximising speculator does not trade with probability 1, while a career-concerned speculator buys with probability $\mu^* < 1$.

$\square$

3.2 Project Quality with Career-concerned Speculators

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

Proposition 5. *Career-concerns allow firms to undertake on average positive NPV projects.*

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

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

since it is a decreasing function of I and the equilibrium when career-concerned speculators acquire information exists if and only if inequality 13 is satisfied, i.e. if

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

it is left to show that inequality 18 holds for the largest I. For the largest I inequality 18 binds.

$\square$

3.3 Additional Benefits of Career-concerns

3.3.1 Useful Notation

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

Define $\Gamma(\theta)$ implicitly by $\mu^*(\theta, \Gamma(\theta)) = \frac{1}{2}$ and define the first region as

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

and the second region as R_{pm} as the complement of R_{cc} in $[0,1]^2$. Graphically,

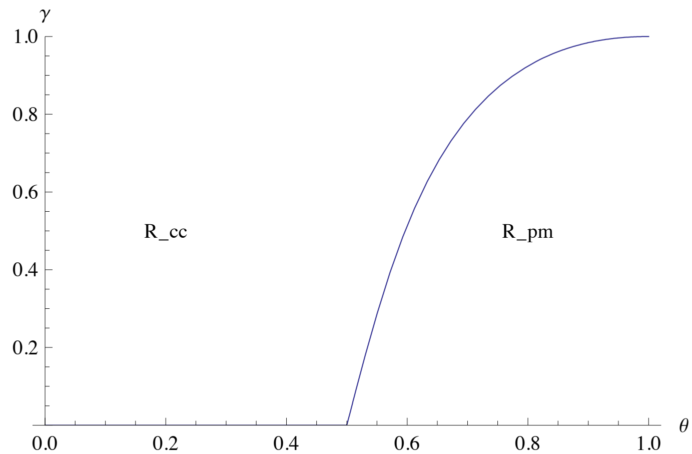

Figure 1: Regions

A sufficient condition for μ^* to be lower than $\frac{1}{2}$ is that θ is lower than $\frac{1}{2}$ (recall that $\mu^* < \theta$), i.e. that the median firm in the industry is bad. This condition is realistic. In fact, in reality, bad managers undertake negative NPV projects only if they destroy little value. Managers of bad firms would not want to undertake excessively negative NPV projects that destroy too much value without expecting to experience scrutiny from the Board of Directors. Thus,

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

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

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

3.3.2 Total Inefficiency

Proposition 6. *For $(\theta, \gamma) \in R_{cc}$, total inefficiency resulting from over- and underinvestment is lower when speculators are career-concerned than when they are profit-maximising.*

Proof. Two economic inefficiencies arise in my model:[18] One derives from not funding good projects and the other one derives from funding bad ones. This two inefficiencies have an asymmetric effect on the economy since the average losses generated by not funding good projects are smaller than the average losses generated by funding bad ones because of condi-

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

tion 1. Condition 1 can be in fact 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 realises, i.e.

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

I ask whether it is higher with career-concerned or profit-maximising speculators.

The probability that a good project is not undertaken is

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

and the probability that a bad project is undertaken is

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

When $\mu^* < \frac{1}{2}$, underinvestment always occurs with career-concerned speculators: The probabilities that both a good and a bad projects are undertaken ($\mathbb{P}(\iota = 1 \,|\, \mathrm{G})$ and $\mathbb{P}(\iota = 1 \,|\, \mathrm{B})$) are always lower with career-concerned speculators than with profit-maximising ones. Since condition 19 holds, and $\mathbb{P}(\iota = 0 \,|\, \mathrm{G}) + \mathbb{P}(\iota = 1 \,|\, \mathrm{B})$ is the same in both models, then the average economic losses generated by undertaking bad projects are higher than those generated by not undertaking good ones, and they are thus minimised when underinvestment occurs, i.e. when $\mu^* < \frac{1}{2}$. When $\mu^* < \frac{1}{2}$ total inefficiency is thus minimised with career-concerned speculators.

In other words, when profit maximising speculators trade, substituting for 21 and 22 in equation 20 I get

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

and when career-concerned speculators trade I get

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

Subtracting the second equation from the first, I find

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

which is greater than zero if and only if $\mu^* < \frac{1}{2}$ because the average project has negative NPV, proving Proposition 6, i.e. that the total inefficiency is higher with profit-maximising speculators in region R_{cc}. □

3.3.3 Shareholders' Wealth

Proposition 7. *For $(\theta, \gamma) \in R_{cc}$, the trading of career-concerned speculators maximises shareholders' wealth in good firms.*

Proof. Conditional on investment being undertaken, the wealth of shareholders in good firms is equal to

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

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

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

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

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

where

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

and,

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

Normalising $V_{\mathrm{B}}=0$ and subtracting equation 25 from equation 24 shareholders' wealth is higher when career-concerned speculators trade if

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

or

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

or

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

This last inequality holds if and only if $\mu^* < \frac{1}{2}$ since projects have negative average NPV or

$$I > \theta V_G.$$

□

A trade-off between profit-maximising speculators and career-concerned ones arises when good firms hold cheap projects: While it is ex ante less likely that good firms raise I with career-concerned speculators when $\mu^* < \frac{1}{2}$, they do so at a significantly lower cost of under-pricing when $y = 1$ and, on average, the latter effect dominates the former, making shareholders' wealth higher with career-concerned speculators. As μ^* increases, it becomes more likely that firms invest with career-concerned speculators, but the benefits of career-concerned on prices decrease and shareholders' wealth is higher with profit-maximising speculators.

3.3.4 Management's Discipline

Proposition 8. *For $(\theta,\gamma) \in R_{cc}$, career-concerned speculators minimise the agency problem between managers and shareholders of bad firms.*

Whenever $(\theta,\gamma) \in R_{cc}$ the probability that a bad firm has access to capital is lower when career-concerned speculators trade than when profit-maximising speculators do. In fact, the probability that a bad firm raises equity when speculators are career-concerned is

$$\mathbb{P}(\iota = 1 \,|\, \mathrm{B}) = \frac{2}{3}(1-\gamma)\mu^*$$

and when they are profit maximising is

$$\mathbb{P}(\iota = 1 \,|\, \mathrm{B}) = \frac{1}{3}(1-\gamma).$$

The former is always smaller than the latter when $\mu^* < \frac{1}{2}$.

4 A Seasoned Equity Offering

4.1 Model

Up to now I have assumed, for simplicity, that secondary market prices determine a firm's ability to raise funds, and I abstained from modelling a firm's equity issue explicitly. A popular way for public firms to raise capital is via a seasoned equity offering. I model it 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 with projects with negative average NPV and no cash and assets in place.[19] The relevance of a well-functioning equity market is underscored by DeAngelo, DeAngelo, and Stulz (2010) who report that without the capital raised via SEOs, 62 per cent of issuers would run out of cash in the year after the SEO. Nevertheless, the results of the baseline model apply to more general settings than to 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 paper: The issuer usually sets the SEO price lower than the secondary market price, where the difference between the two prices is called the "discount". While my aim is very different from theirs, their model is very well suited for my analysis. While they 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. Nevertheless, I am able address manipulation by engaging directly with Gerard and Nanda's message. I further engage with the literature on manipulation with feedback effects (see, for example, Goldstein and Guembel (2008)) by also showing that an unskilled speculator has no incentive to manipulate prices, i.e. to trade in the absence of information.

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

[19] Equity, as Myers and Majluf (1984) predict, is a financing instrument of last resort. Further, recent empirical evidence (see for example, DeAngelo, DeAngelo, and Stulz (2010) and Park (2011)) suggests strong correlation between a firm's decision to issue equity and financial distress analogous to my negative NPV assumption.

4.1.1 Timing and Prices

The timing is now as follows. 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 to acquire information, $\eta \in \{0, 1\}$. At $t = 1$ the speculator, who can be skilled or unskilled with probability respectively of γ and $1 - \gamma$, submits an order in the secondary market: He either buys, sells or does not trade $a \in \{-1, 0, 1\}$. 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, taking into account the public information—the order flow. While in the trading stage the speculator trades with liquidity traders, in the bidding stage, uninformed bidders and the speculator submit bids.[20] Uninformed speculators have no information about the firm and they may refrain from bidding if they expect losses conditional on their available information, which is particularly harmful since they are key to the success of the SEO. In fact, 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 is known and it's denoted by N_τ for the speculator (where $\tau \in \{\mathrm{S}, \mathrm{U}\}$) and N_{N} for the uninformed bidders. Subscript N will indicate 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 the participants on a pro rata basis. The uninformed bidders end up with the following proportion of shares:

$$\alpha_{\mathrm{N}} = \begin{cases} 1 & \text{if the speculator does not trade} \\ \dfrac{N_{\mathrm{N}}}{N_\tau + N_{\mathrm{N}}} = \dfrac{1}{\beta} & \text{if the speculator trades} \end{cases} \tag{26}$$

where $1/\beta$ 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. In fact, the issuer must set the SEO price to ensure the success of the equity offering and compensate the uninformed investors for the winner's curse. The SEO price, p_2^y is set according to

$$\mathbb{E}\left[\tilde{\alpha}_{\mathrm{N}}\left(\tilde{v} + I - p_2^y\right) \,\middle|\, y\right] = 0, \tag{27}$$

[20] One may wonder whether there is a conceptual difference between the unskilled speculator and the uninformed bidder. While both are unaware of the underlying value of the firm, the unskilled speculator has at $t = 1$ more information than the uninformed bidder, knowing whether or not the order flow results from his trade.

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 to make uninformed bidders break-even conditional on public information.

The SEO price is often lower than the trading price, and the difference between these two prices is a function of the informativeness of the secondary market price and of the rationing taking place at $t = 2$. Prices in the secondary market ($t = 1$) are set in anticipation of the success of the firm's fund-raising and investment at $t = 2$. The investment at $t = 2$ succeeds if the firm can raise I by issuing n' new shares, i.e. if

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

Necessary and sufficient condition for the success of the SEO is that

$$p_2^y > I. \tag{28}$$

Therefore,

$$\iota = \begin{cases} 1 \text{ if } p_2^y > I \\ 0 \text{ otherwise.} \end{cases} \tag{29}$$

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

$$p^y := p_1(y) = \mathbb{E}\left[\tilde{v} \,|\, y, \iota\right], \tag{30}$$

similarly to p_1^y in equation 6.

4.1.2 A Speculator's Payoff

The speculator's payoff is similar in substance to that introduced in equation 7 but it is adjusted to take into account the new ingredients of the model. It is,

$$U = w_1 \Pi + w_2 \Phi - c\eta, \tag{31}$$

where

$$\Pi = \mathbb{E}\left[a(\tilde{v} - \tilde{p}_1) \,|\, \tau, \sigma\right] + \alpha_\tau \mathbb{E}\left[\tilde{v} + I - \tilde{p}_2 \,|\, \tau, \sigma\right] \tag{32}$$

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

$$\Phi = \mathbb{E}\big(\mathbb{P}(\mathrm{S} \,|\, \Theta\iota, a_1, a_2, y) \,|\, \tau, \sigma\big), \tag{33}$$

since now funds' clients have an additional updating variable which is the fund's action at $t = 2$.

4.2 Results

4.2.1 An SEO with Profit-maximising Speculators

In Proposition 9, I characterise the equilibrium in which the skilled speculator acquires 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 it is the unique one satisfying a refinement. The proof comprises two steps: First, to show that each speculator follows his signal at $t = 1$ independently of $t = 2$ strategies (which I prove in Appendix 7.2.2) and, second, to show 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. I refer to a speculator's trading against his private information as manipulation. Gerard and Nanda show that a positively informed speculator may want to sell or not trade at $t = 1$ if his secondary market losses can be recouped through the purchase of shares in the SEO at lower prices. In my model prices feed back into investment and thus a positively informed speculator does not manipulate prices: By selling or not trading, he pushes the price of the good firm down causing the SEO to fail and thus he makes no profits. Likewise, the unskilled speculator does not manipulate prices either, contrary to Goldstein and Guembel's paper in which the authors show that, in a dynamic model with feedback effects, the unskilled profit-maximising 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 the the fact that they consider a managerial learning channel while I consider a financing channel.[21] Firstly, they study positive NPV projects. Secondly, their speculator has a wider action space at $t = 2$. He can either buy, sell or stay out in $t = 2$; since I model an SEO, at $t = 2$, the speculator, in my model, can either participate or not in the SEO. Thirdly, they consider a secondary market price-setting at $t = 2$, while I consider a price setting à la Rock. Selling, Goldstein and Guembel argue, 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. In my model such a strategy is not profitable for two reasons: Firstly, in the bidding stage speculators can either buy or stay out, and secondly, because I assume average negative NPV projects, selling always pushes

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

prices to zero leaving no space for manipulation.

At $t = 2$, both the skilled and unskilled speculator may be indifferent between buying and staying out if, upon observing the order flow, they anticipate an SEO failure, or, if the private information of the skilled speculator is fully reflected by the price. Nevertheless, it is possible to break the indifference and to obtain the equilibrium of Proposition 9 as the unique one.[22] This equilibrium is the most reasonable one: It says that a skilled speculator follows his signal and an unskilled one never trades, as is the case in equilibria in which speculators are profit-maximising and there are no gains from manipulating prices.

Proposition 9. *For*

$$I \leq \frac{\theta[\gamma + (1-\gamma)\beta]V_G + (1-\theta)(1-\gamma)\beta V_B}{[\theta\gamma + (1-\gamma)\beta](1-\epsilon)} =: \mathcal{I}_{pm}, \tag{34}$$

$$c \leq \mathcal{C}_{pm} \tag{35}$$

there exists a unique (refined) Perfect Bayesian Equilibrium in which the unskilled does not trade at $t = 1$ and stays out at $t = 2$, the skilled acquires and follows his signal and firms issue a number of shares that maximises the probability that investment succeeds. Formally,

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

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

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

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

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

- *At $t = 1$ prices are*

$$
\begin{aligned}
p_1^{-2} &= \epsilon\, V_{\mathrm{B}} =: \epsilon\, p_\epsilon^{-2} \\
p_1^{-1} &= \epsilon\, \frac{\theta(1-\gamma)V_{\mathrm{G}} + (1-\theta)V_{\mathrm{B}}}{\theta(1-\gamma) + 1 - \theta} =: \epsilon\, p_\epsilon^{-1} \\
p_1^{0} &= \epsilon\, \bar{V} =: \epsilon\, p_\epsilon^{0} \\
p_1^{1} &= \frac{\theta V_{\mathrm{G}} + (1-\theta)(1-\gamma)V_{\mathrm{B}}}{\theta + (1-\theta)(1-\gamma)} - (1-\epsilon)I \qquad (36) \\
p_1^{2} &= V_{\mathrm{G}} - (1-\epsilon)I.
\end{aligned}
$$

At $t = 2$, since the equity issue succeeds only given $y \in \{1, 2\}$, the SEO prices are

$$
\begin{aligned}
p_2^{1} &= \frac{\theta[\gamma + (1-\gamma)\beta]V_{\mathrm{G}} + (1-\theta)(1-\gamma)\beta V_{\mathrm{B}}}{\theta\gamma + (1-\gamma)\beta} + \epsilon I \qquad (37) \\
p_2^{2} &= V_{\mathrm{G}} + \epsilon I.
\end{aligned}
$$

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

The proof is in Appendix 7.2.1.

Observing the equilibria of Proposition 2 and Proposition 9 gives immediately the following corollary.

Corollary 9. *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 so long as funding occurs in $y = 1$.

Note that $y = 1$ implying successful investment imposes different restrictions on projects in the two models since rationing concerns increase the cost of capital in the SEO model.

4.2.2 An SEO with Career-concerned Speculators

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

Proposition 10. *For*

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

there exists a Perfect Bayesian Equilibrium in which:

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

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

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

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

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

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

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

$$\eta^*=1.$$

- *Prices:*

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

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

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

The proof is provided in Appendix 7.2.3.

Comparing Proposition 3 and Proposition 10, Corollary 9 follows immediately.

4.3 The Benefits of Career-concerned Speculators in an SEO

There are two main differences between the baseline model and the SEO model, and both arise at $t = 2$: Firstly, the participants in the equity offering and, secondly, 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—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-maximising, leading to the following result.

Proposition 11. *While the SEO price may be set at a discount when the speculator is profit-maximising, this is never the case when the speculator 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 11. *When profit-maximising speculators trade, the cost of capital may be higher in an SEO than in the baseline model.*

It follows from Proposition 11 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-maximising, thus when speculators are career-concerned the cost of capital is as high in the SEO as in the baseline model.

The differences between the baseline model and the SEO model, while affecting prices at $t = 2$, do not affect either prices at $t = 1$ or speculators' behaviours, as highlighted by Corollary 9.

4.3.1 Career-Concerned Speculators Relax Firms' Financial Constraints

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

Proposition 12. *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* $I \in$

$(\mathcal{I}_{pm}, \mathcal{I}_{cc}]$ *that can be undertaken only with career-concerned speculators, where*

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

and

$$\mathcal{I}_{pm} = \frac{\theta[\gamma + (1-\gamma)\beta]V_G + (1-\theta)(1-\gamma)\beta V_B}{\theta\gamma + (1-\gamma)\beta}.$$

Proof. Since $\mathcal{I}_{cc}$ is a decreasing function of μ and $\mathcal{I}_{pm}$ is a decreasing function of β and they are equal when $\mu = \beta$, then $\mathcal{I}_{cc} < \mathcal{I}_{pm}$ for any $\mu < \beta$, which is always satisfied since $\beta > 1$ and $\mu < 1$.

□

Lemma 4.1 and Lemma 4.2 build the intuition of Proposition 4 in Section 3. Lemma 4.1 proves the pivotality of order flow 1 for investment, while Lemma 4.2 proves that the cost of capital given $y = 1$ is lower with career-concerned speculators than profit-maximising ones.

The argument for the proof of the pivotality of order flow 1 remains unchanged (because of Corollary 9). The intuition behind the fact that the cost of capital given $y = 1$ is lower with career-concerned speculators than with profit-maximising ones is similar to that of Lemma 4.2. However, in an SEO, the winner's curse rationing that arises when profit-maximising speculators trade, increases firms' cost of capital as highlighted by Corollary 11. Thus, there is an even wider range of projects that can be undertaken only with career-concerned speculators.

4.3.2 The Other Benefits of Career-concerns in an SEO

It is left to show that Proposition 5, Proposition 6, Proposition 7 and Proposition 8 also hold in the SEO model. Only the proof of Proposition 7 depends on $t = 2$ prices and thus changes from the baseline model. Proposition 7 says that the career-concerned speculators maximise shareholders' wealth for a range of parameters $(\theta, \gamma) \in R_{cc}$. Here, there exists a wider region of parameters (θ, γ) in which career-concerned speculators maximise good firms' shareholders' wealth. This follows directly from Corollary 11 since in an SEO when profit-maximising speculators' trade, good firms face a higher cost of capital and thus a higher underpricing than in the baseline model.

5 Extensions

5.1 Raising Capital via Debt

I show that career-concerned speculators slacken firms' financial constrains compared to profit-maximising speculators when they acquire information and impound it into prices in anticipation of an equity issue. The reader may wonder whether this beneficial effect of career-concerns disappears when speculators acquire information in anticipation of a debt issue. Herein I show, that conditional on issuing debt or equity, the beneficial effect remains, but I abstain from asking whether the firm will choose to issue equity or debt. It is indeed behind the scope of my paper; Fulghieri and Lukin (2001), for example, have addressed this question in a different setting whenever a speculator is profit-maximising only.

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 she can issue debt with face value $F > I > V_{\mathrm{B}}$ such that capital providers break-even:

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

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

$$F = \frac{I - \big(1 - \hat{\theta}(y)\big)V_{\mathrm{B}}}{\hat{\theta}(y)}. \tag{38}$$

Notice that I am assuming, for simplicity, that a good and a bad firm pay off respectively V_{G} and V_{B} for sure.

Necessary condition for the debt issue to succeed is that

$$\mathbb{E}\left[V_{\tilde{\Theta}} \,|\, y\right] - I = \hat{\theta}(y)V_{\mathrm{G}} + \big(1 - \hat{\theta}(y)\big)V_{\mathrm{B}} - I \geq 0; \tag{39}$$

in fact, if such inequality is not satisfied there is no F that satisfies equation 38, since F must be lower or equal to V_{G}.

Further, inequality 39 is also a sufficient condition for the debt issue to succeed: A good firm issues debt as long as her shareholders gain, which is the case if

$$V_{\mathrm{G}} - F = \frac{\mathbb{E}\left[V_{\tilde{\Theta}}|y\right] - I}{\hat{\theta}(y)} > 0, \tag{40}$$

i.e. if

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

Since inequality 39 coincides with inequality 3, then, a debt issue succeeds if and only if an equity issue succeeds. As in the equity issue case, I indicate with $\iota = 1$ the success of a debt issue and with $\iota = 0$ its failure.

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

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

which, by plugging in for equation 40 is equivalent to

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

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

5.2 A Career-concerned Speculator Who Cares also about Profits

Let us now study the behaviour of a speculator whose payoff is as stated in equation 7.

I show that the equilibria characterised in Proposition 2 and Proposition 3 are a result of the limiting behaviour of a speculator who cares both about profits and reputation by letting one or the other go to zero. Interestingly, for sufficiently small w_2 (the weight assigned by the speculator to his reputation) and letting $\epsilon = 0$, the skilled speculator never acquires information. This result reinforces the idea that career-concerns help firms slacken their financial constraints: With no career-concerns there may be some equilibria in which there is no information acquisition for any I.

Proposition 13. *Depending on the relative degree to which speculators care about profits compared to their reputation, three types of equilibria can be identified:*

- *Given vanishing ϵ, for w_2 sufficiently large, there is an equilibrium in which speculators behave as in Proposition 3.*
- *Given vanishing ϵ, for w_2 sufficiently small, there is no equilibrium in which a speculator acquires information.*
- *For fixed $\epsilon > 0$ and w_2 sufficiently small, there is an equilibrium in which speculators behave as in Proposition 2.*

The proof is in Appendix 7.3.

5.3 Profit-maximising and Career-concerned Speculators Trading Together

Let us now suppose that the speculator can be one of four types: He can be either a skilled or an unskilled profit-maximising speculator or he can be either a skilled or an unskilled career-concerned speculator. The timing and the other players are as in the baseline model.

There is a proportion r of career-concerned speculators and a proportion $1 - r$ of profit-maximising ones. A speculator can be skilled or unskilled with probabilities γ and $1 - \gamma$ respectively.

Proposition 14. *For each $r, \gamma, V_{\mathrm{G}}, V_{\mathrm{B}}$ there is a $c^*_{cc} > 0$, such that, so long as $c_{cc} > c^*_{cc}$, 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 to profit-maximising ones by increasing price informativeness in the pivotal state for investment, i.e. in $y = 1$. Here I show that when $y = 1$ is the pivotal state for investment, then, as the proportion of career-concerned speculators increases, so does price informativeness and thus the fraction of projects that can be undertaken at equilibrium. In fact, keeping the proportions of skilled and unskilled speculators constant, I show that price informativeness given y = 1 increases as the proportion of career-concerned speculators increases.

Proposition 14 identifies a sufficient condition for $y = 1$ to be pivotal: As long as career-concerned speculators are unwilling to acquire information when investment succeeds in $y = 2$ only (i.e. if $c_{cc} > c^*_{cc}$), then profit-maximising speculators are unwilling to acquire in $y = 2$, and the market breaks down.

In Corollary 2 I show that profit-maximising speculators do not acquire information in $y = 2$ given investment fails in $y = 1$, because there is no noise in the price. Here, the trade of unskilled career-concerned speculators generates some extra noise in $y = 2$ that may leave some room to profit for the skilled profit-maximising speculators, even when the equity issue fails in $y = 1$. But as long as $c_{cc} > c^*_{cc}$, if investment fails in $y = 1$, then career-concerned speculators do not want to acquire inoformation in $y = 2$. Then, prices, given $y = 2$, are perfectly informative and the skilled profit-maximising speculator is unwilling to acquire, just as in Proposition 4.

6 Conclusions

Adverse selection plagues markets, pooling firms with good projects with those with bad ones, and increasing good firms' cost of external finance.

Speculators trade in stock markets and provide capital to firms. By acquiring information and impounding it into prices via their trades, they can reduce firms' adverse selection costs associated with external financing. They transmit part of their private information through stock market prices, guiding uninformed participants in their capital provision decisions and thus helping good constrained firms to raise funds more cheaply and invest.

Unfortunately, individual investors who care only about portfolio returns underprovide information. They profit from the information only when they can hide it. This problem is severe when industry fundamentals are poor and prices feed back into investment.

But, nowadays, individual investors are not the main market participants, having been replaced by delegated portfolio managers. Delegated portfolio managers respond to incentives different from those of individual investors: They are career-concerned.

Even when the feedback loop caused by firms' financial constraints makes the underprovision problem severe, career-concerned speculators provide more information to the stock market than profit-maximising ones, thus loosening firms' financial constraints. They care about signalling their skills to current and potential clients. Their only way to communicate their ability to the market is to make investment happen and to show that they traded in the right direction, even if their price impact means that they make limited returns. But career-concerned speculators trade even when they have no information, distorting order flows and potentially hampering the allocative role of prices. I show, however, in equilibrium, that the trade of unskilled speculators augments the benefits of delegated portfolio management on capital allocation.

I show that career-concerned speculators relax firms' financial constraints even when firms raise funds via equity—the most expensive way for firms to raise capital with adverse selection. I model an SEO and show 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 (see, for example, Chemmanur, He, and Hu (2009), and Gao and Mahmudi (2008)) is consistent with my result; institutional investors have beneficial effects on the SEO discount and on the likelihood of a successful SEO.

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, when the order flow is $y \in \{-2, -1, 0\}$, 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 I have shown in Proposition 1 that firms are unable to raise I when the market believes that the firm is of average quality, this will also be the case for any posterior belief lower than that when $y = 0$. 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, i.e. if

$$\Pi(a^{\mathrm{U}} = 0) > \Pi(a^{\mathrm{U}} = +1). \tag{41}$$

This inequality is satisfied since by buying he moves the price and it is never profitable for him to buy into a firm of the average quality at a price that is higher than the average price. In fact, inequality 41 can be re-written 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 since $p_1^y > \bar{V} - (1 - \epsilon)I$ for $y \in \{1, 2\}$.

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

$$\Pi(a^{\mathrm{U}} = 0) > \Pi(a^{\mathrm{U}} = -1). \tag{42}$$

Because of the feedback effect between prices and investment, selling always triggers a firm's funding failure since $y \in \{-2, -1, 0\}$ 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 then prefers not to trade rather than to sell and inequality 42 is satisfied. Equation 42 can be re-written 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 since he speculator 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 selling rather than buying 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: The skilled positively informed speculator has no incentives to deviate from buying when observing a positive signal: Not trading or selling would decrease the chances that a good firm invests thus reducing his chances of making profits.

He 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 since

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

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 incentives of the skilled speculator to acquire information. A skilled speculator who acquires and plays according to the equilibrium strategy above gets:

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

Given that he has not acquired, optimally, he acts as does the unskilled speculator and does not trade. Therefore, he acquires and follows his signal if his payoff when he acquires is greater than zero, or if,

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

Good firms: Whenever a firm does not issue equity she cannot invest and shareholders earn zero profits. Thus, shareholders are better off if the firm invests whenever she has the opportunity since

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

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 earn private benefit from investing, thus always choose to issue equity at $t = 0$ because they want to maximise their probability 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 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 and follows his signal he obtains positive profits with vanishing probability ϵ while incurring a cost c. He then prefers not to acquire and the market breaks down.

7.1.2 On the Uniqueness of the Equilibrium of Proposition 2

If $\epsilon = 0$ there are multiple equilibria, i.e. 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, by obtaining some unexpected cash at $t = 2$.

I argue below that conditional on the skilled speculator's acquiring information the equilibrium of Proposition 2 is unique. I show it 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 $\mathbb{P}(y = 0|\iota, \Theta, a) > 0$.

Then a positively informed speculator strictly prefers to buy since

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

And a negatively informed speculator strictly prefers to sell since

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

It then follows that the unskilled speculator prefers not to trade rather than to buy or to sell fairly priced shares. Even if fund-raising fails with probability one, making him indifferent between buying, selling and staying out, firms can invest when $\tilde{\chi} = I$ breaking this indifference.

7.1.3 Proof of Proposition 3

Prices: For sufficiently low ϵ, when 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 the firm can thus invest. When $y \in \{1, 2\}$ the firm is able to raise I from capital providers as long as inequality 13 is satisfied.

Beliefs: Clients observe the hired fund's action and the firm's type when the investment is undertaken, and update their beliefs about the fund's ability.[23] The client's posteriors are:

$$\mathbb{P}(\mathrm{S} \mid \Theta\iota, a, y) \begin{cases} = 0 & \text{if } \Theta\iota = \mathrm{B} \text{ and } a = +1 \\ & \text{or if } \Theta\iota = \mathrm{G} \text{ and } a = -1 \\ = \dfrac{\theta\gamma}{\theta\gamma + (1-\gamma)\mu^*} & \text{if } \Theta\iota = 0 \text{ and } a = +1 \\ = \dfrac{(1-\theta)\gamma}{(1-\theta)\gamma + (1-\gamma)(1-\mu^*)} & \text{if } \Theta\iota = 0 \text{ and } a = -1 \\ = \dfrac{\gamma}{\gamma + (1-\gamma)\mu^*} & \text{if } \Theta\iota = \mathrm{G} \text{ and } a = +1 \\ = \dfrac{\gamma}{\gamma + (1-\gamma)(1-\mu^*)} & \text{if } \Theta\iota = \mathrm{B} \text{ and } a = -1 \\ \in [0,1] & \text{if } a = 0. \end{cases} \tag{43}$$

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

$$\mathbb{P}(\mathrm{S} \mid a = 0) = 0. \tag{44}$$

In Appendix 7.1.3.1 I provide a microfoundation for these out-of-equilibrium beliefs.

Unskilled speculator: An unskilled fund who does not trade obtains no payoff because of the out-of-equilibrium beliefs of equation (44). He mixes between buying and selling if his utility from the the two actions is the same and is higher than zero. His utility from buying is:

$$\Phi(a^{\mathrm{U}} = +1) = \frac{1}{3}(1-\epsilon)\frac{\theta\gamma}{\theta\gamma + (1-\gamma)\mu} + \frac{1}{3}\theta\frac{\gamma}{\gamma + (1-\gamma)\mu}(2+\epsilon)\,. \tag{45}$$

When the unskilled speculator buys, the equity issue can either succeed or fail. If it succeeds,

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

firm value realises and the client can infer the correctness of the fund's trade. When it fails the project is not undertaken and the firm's value does not realise (unless with probability ϵ the firm can self-finance the project), then the client observes only the fund's action. The firm thus invests and her value realises either when the order flow is $y \in \{1, 2\}$ or when $y = 0$ and $\tilde{\chi} = I$, i.e. with overall probability $\left(\frac{2}{3} + \frac{\epsilon}{3}\right)$. Then the fund is wrong with probability $1-\theta$ and gets zero (the project is undertaken and the firm is bad) and he is right with probability θ. With remaining probability he buys and the firm does not invest $\left(\frac{1}{3}(1-\epsilon)\right)$.

His utility from selling is:

$$\Phi(a^{\mathrm{U}} = -1) = (1-\epsilon)\frac{(1-\theta)\gamma}{(1-\theta)\gamma + (1-\gamma)(1-\mu)} + (1-\theta)\epsilon\frac{\gamma}{\gamma + (1-\gamma)(1-\mu)}. \tag{46}$$

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

$$f(\mu, \theta, \gamma, \epsilon) := \Phi(a^{\mathrm{U}} = +1) - \Phi(a^{\mathrm{U}} = -1) = 0. \tag{47}$$

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,

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

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

$$\mu^*(\theta, \gamma, 0) = \frac{2\gamma\theta^2 + \theta(3-\gamma) - 3\gamma}{6(1-\gamma)} + \\ + \frac{1}{6}\sqrt{\frac{9\gamma^2 - 6\gamma\theta - 30\,\gamma^2\theta + 9\theta^2 + 18\gamma\theta^2 + 37\gamma^2\theta^2 - 12\,\gamma\theta^3 - 20\gamma^2\theta^3 + 4\gamma^2\theta^4}{(1-\gamma)^2}}. \quad (48)$$

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

$$\Phi(a^{\mathrm{S}} = +1, \sigma = \sigma_{\mathrm{G}}, \eta^* = 1) - \Phi(a^{\mathrm{S}} = -1, \sigma = \sigma_{\mathrm{G}}, \eta^* = 1) > 0, \quad (49)$$

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

$$\frac{2}{3}\frac{\gamma}{\gamma + (1-\gamma)\mu^*} + \frac{1}{3}\frac{\theta\gamma}{\theta\gamma + (1-\gamma)\mu^*} - \frac{(1-\theta)\gamma}{\gamma(1-\theta) + (1-\gamma)(1-\mu^*)} > 0. \quad (50)$$

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 50 for $\mu = \theta$ I get

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

which is always strictly positive, proving inequality 49.

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

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

I must show that

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

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:

$$\begin{aligned}
\Phi(s^{\mathrm{S}}(\sigma), \eta^* = 1) - c = \theta\frac{1}{3}(2+\epsilon)\frac{\gamma}{\gamma + (1-\gamma)\mu^*} + \theta\frac{1}{3}(1-\epsilon)\frac{\theta\gamma}{\theta\gamma + (1-\gamma)\mu^*} + \\
+ (1-\theta)(1-\epsilon)\frac{(1-\theta)\gamma}{(1-\theta)\gamma + (1-\gamma)(1-\mu^*)} + \\
+ (1-\theta)\epsilon\frac{\gamma}{\gamma + (1-\gamma)(1-\mu^*)} - c.
\end{aligned} \tag{52}$$

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,

$$g(\mu^*, \theta, \gamma, \epsilon) := \Phi(s^{\mathrm{S}}(\sigma), \eta^* = 1) - \Phi(a^{\mathrm{S}} = -1, \eta^* = 1) > 0. \tag{53}$$

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

$$c < \frac{(2+\epsilon)\theta\gamma}{3(\gamma + (1-\gamma)\mu^*)} + \frac{(1-\epsilon)\theta^2\gamma}{3(\theta\gamma + (1-\gamma)\mu^*)} - \frac{(1-\epsilon)\theta(1-\theta)\gamma}{(1-\theta)\gamma + (1-\gamma)(1-\mu^*)} =: \bar{c}_{cc}. \tag{54}$$

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 $r(\text{right}) > 0 \geq r(\text{wrong})$.[24]

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

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

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 9

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:

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

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:

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

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

$$\Pi(s^{\mathrm{S}}(\sigma), \eta^* = 1) = \theta\left[\frac{1}{3}\left(V_{\mathrm{G}} - I + \epsilon I - p_1^1\right) + \frac{\epsilon}{3}\left(V_{\mathrm{G}} - p_\epsilon^0\right)\right] + \tag{55}$$

$$+ (1-\theta)\left[\frac{\epsilon}{3}\left(p_\epsilon^{-1} - V_{\mathrm{B}} + p_\epsilon^0 - V_{\mathrm{B}}\right)\right] + \tag{56}$$

$$+ \frac{\theta}{3}\alpha_{\mathrm{S}}\left(V_{\mathrm{G}} + \epsilon I - p_2^1\right) - c > 0 \tag{57}$$

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 $y = 1$:

$$\frac{n'}{n + n'}p_2^1 = I. \tag{58}$$

Issuing a number of shares that satisfies equation 58, 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

$$\mathbb{E}\left[\tilde{p}_1 \middle| \iota, \Theta, a\right] \in (\epsilon V_{\mathrm{B}}, V_{\mathrm{G}} - I + \epsilon I), \tag{59}$$

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 30 and for y weakly greater than 1 firms have the ability to raise enough funds to invest as long as inequality 28 holds. For $y \in \{-2, -1, 0\}$, independently of speculators' strategy, inequality 28 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:

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

Since, by equation 59

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

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 10

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 28 does not hold.

Beliefs: Clients' posteriors are now:

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

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:

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

and

$$\mathbb{P}\left(\mathrm{S} \,\middle|\, a_1 \ncong a_2\right) = 0. \tag{61}$$

By imposing the out-of-equilibrium belief of equation 61, 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 9 (Appendix 7.2.1)

7.2.4 SEO Discount

An SEO succeeds if and only if $y \in \{1, 2\}$ as shown in Proposition 9 and Proposition 10.

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 58. 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 37 with the secondary market price of equation 36, 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 10 it is clear that when $y \in \{1, 2\}$,

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

7.3 Proof of Proposition 13

Suppose there exists an equilibrium in which the skilled speculator acquires and follows his signal and the unskilled speculator mixes between buying and selling, where μ^{**} is the probability with which he buys. Then prices at equilibrium are

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

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

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

The unskilled speculator's payoff from selling is:

$$U\left(a^{\mathrm{U}} = -1\right) = w_1\Pi\left(a^{\mathrm{U}} = -1\right) + w_2\Phi\left(a^{\mathrm{U}} = -1\right) = \tag{63}$$
$$= -\frac{2}{3}\epsilon w_1\left[\frac{\Delta V\theta(1-\theta)\gamma}{\theta(1-\gamma) + (1-\gamma)(1-\mu)}\right] + \tag{64}$$
$$+ w_2\left[(1-\epsilon)\frac{\gamma(1-\theta)}{\gamma(1-\theta) + (1-\gamma)(1-\mu)} + \epsilon\frac{\gamma(1-\theta)}{\gamma + (1-\gamma)(1-\mu)}\right] \tag{65}$$

And the unskilled's utility from not trading is

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

This is an equilibrium as long as there exists a probability μ^{**} that makes the unskilled fund indifferent between buying and selling, or such that

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

Thus it must be that he prefers randomising between buying and selling to not trading. This is the case whenever $\epsilon = 0$.

Note that

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

where f is as defined in equation 47 and

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

For $\epsilon\to 0$, $h>0$; further $h=0$ whenever $w_1=0$ and thus $\mu^{**}(\epsilon=0)=\mu^{*}(\epsilon=0)$.

Further,

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

where at $\epsilon=0$

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

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

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

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 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 $w_1\geq\underline{w}_1$, $\mu^{**}=0$.

Further when $w_1\geq\underline{w}_1$, the unskilled speculator always sells since $\mu^{**}=0$.

Finally, fixing $\epsilon>0$, if $w_2\to 0$ 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, then the skilled speculator's most profitable deviation is to sell. 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

$$\mathfrak{g}(\mu, \theta, \gamma, \Delta V, w_1, w_2) = l(\mu^{**}, \theta, \gamma, \Delta V, w_1) + g(\mu^{**}, \theta, \gamma, 0).$$

g is defined in equation 53 and

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

If $w_1 = 0$ then $l = 0$ and the proof is as in Proposition 3.

Whenver $w_1 > 0$ then $l > 0$ and the incentives to acquire of a skilled speculator are even stronger.

Then, the skilled speculator acquires if

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

When w_1 is small I get the equilibrium of Proposition 3.

When w_1 is large, and in particular when $w_1 \geq \underline{w}_1$ then $\mu^{**} = 0$. Then, the skilled speculator will not acquire information and the market breaks down. Thus, adding small reputation concerns to profit-maximising speculators induces them not to acquire.

Finally, for small w_2 and $\epsilon > 0$ this is not an equilibrium: The unskilled speculator's most profitable deviation is not to trade. Then, I get the equilibrium of Proposition 2.

7.4 Proof of Proposition 14

I will use the following two lemmata to prove Proposition 14. Set, for simplicity, $\epsilon = 0$.

Lemma 15. *For*

$$I \leq \frac{\theta\gamma V_{\mathrm{G}} + (1-\gamma)[1-r+\mu^* r]\bar{V}}{\theta\gamma + (1-\gamma)(1-r) + (1-\gamma)\mu^* r} =: \bar{I} \tag{66}$$

$$c_{pm} \leq \hat{c}_{pm}, \tag{67}$$

$$c_{cc} \leq \hat{c}_{cc}, \tag{68}$$

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:*

$$s^{\mathrm{U}}_{pm}(\sigma = \emptyset) = 0. \tag{69}$$

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

$$s^{\mathrm{U}}_{cc}(\sigma = \emptyset) = \begin{cases} +1 \text{ with probability } \mu^* \\ -1 \text{ with probability } 1-\mu^*, \end{cases} \tag{70}$$

  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 66 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.[25] Since the presence of profit-maximising speculators does not affect the states in which investment is undertaken when condition 66 holds, career-concerned speculators play the signalling game of Proposition 3. Thus, from equation 54 and letting $\epsilon = 0$ the upper bound on cost for the career-concerned speculator is:

$$\hat{c}_{cc} \equiv \bar{c}_{cc} := \frac{2\theta\gamma}{3(\gamma + (1-\gamma)\mu^*)} + \frac{\theta^2\gamma}{3(\theta\gamma + (1-\gamma)\mu^*)} - \frac{\theta(1-\theta)\gamma}{(1-\theta)\gamma + (1-\gamma)(1-\mu^*)}. \quad (71)$$

Where μ^* is as defined in equation 48.

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-

[25] 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.

maximising speculator acquires information if

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

□

Lemma 16. *For*

$$I \leq \frac{\theta\gamma V_{\mathrm{G}}+(1-\gamma)\hat{\mu} r\bar{V}}{\theta\gamma+(1-\gamma)\hat{\mu} r} \tag{72}$$

$$c_{pm} \leq c_{pm}^*, \tag{73}$$

$$c_{cc} \leq c_{cc}^*, \tag{74}$$

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:*

$$s_{pm}^{\mathrm{U}}(\sigma=\emptyset)=0. \tag{75}$$

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

$$s_{cc}^{\mathrm{U}}(\sigma=\emptyset)=\begin{cases}+1 & \textit{with probability } \hat{\mu}\\ -1 & \textit{with probability } 1-\hat{\mu},\end{cases} \tag{76}$$

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

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

and the skilled career-concerned speculator acquires as long as

$$c_{cc} < \frac{\theta\gamma}{3(\gamma + (1-\gamma)\hat{\mu})} + \frac{2\theta^2\gamma}{3(\theta\gamma + (1-\gamma)\hat{\mu})} - \frac{\theta(1-\theta)\gamma}{(1-\theta)\gamma + (1-\gamma)(1-\hat{\mu})} =: c^*_{cc}. \tag{77}$$

Unskilled career-concerned speculators are indifferent between buying and selling if:

$$\Phi(a^{\mathrm{U}} = +1) = \Phi(a^{\mathrm{U}} = -1).$$

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

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

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

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

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

or

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

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

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

or

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

Thus, the skilled speculator follows his signal. To obtain the upper bound on costs of equation 77 I check that he prefers to acquire given that his most profitable deviations when he does not, is to sell. □

To prove Proposition 14 I use the two lemmata above.

If $c_{cc}>c^*_{cc}$ 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 will 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 $c_{cc}>c^*_{cc}$.

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 66 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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