Reputation Effects on the Decision to Go Public

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Abstract

Many rigorous studies on the determinants of the going-public decision have been performed in the literature, yet a firm's reputation effects are less discussed. A reputation model is proposed herein to emphasize the important role of a firm's reputation effects on the decision to go public. We find that firms anticipate enhancing their reputation by going public. On the other hand, firms do take advantage of their reputation to go public, resulting in over-going public. The reputation-motivated effect and the reputation-enhancing effect are proposed and these effects are applied to explain the empirical phenomena of IPOs.

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1. Introduction

There are a variety of sources for firms to generate those funds needed for their investment expenditures. Majluf and Myers (1984) proposed the pecking order theory, stating that firms prefer internal finance to external finance, whereby for external funds, debt is preferred to equity. A field survey conducted by Graham and Harvey (2001) suggests that a firm's capital structure is determined under different conditions, such as the firm's size, industrial benchmark, and firm's credit rating, etc. Thus, just as Myers (2001) mentioned, there is no universal theory of the debt-equity choice and no reason to expect one. In this paper we focus on the firm's financing decision on going public or remaining private when external funds are needed for a new investment. Specifically, we discuss the role of the firm's reputation in the decision-making process.

IPOs were the hot wave in the 1990s when many firms took advantage of going public. New finance is widely regarded as the main reason for a firm's decision to go public (Roell, 1996). Except for this new access to finance, firms also benefit from the reduction of their bank credit cost due to wider sources of borrowing after an IPO (Pagano, Panetta and Zingales, 1998). A public listing increases the visibility of the firm and it provides an initial certification by the professional participants of the financial market as well as it offers a longer-term price signal to the public. The

public information may strengthen a firm's bargaining power with banks as well as some other sources of external funds and hence reduce a firm's cost of credit. Thus, many firms are prone to go public no matter what level their quality is.

Welch's study (1999) showed that almost half the firms that go public are de-listed within five years after their IPO. Obviously, some firms that have a low quality management also list their shares publicly. It seems that, for some theoretical models that stress the signaling role of going public (e.g. Leland and Pyle, 1977), they are unable to give a reason to the over-going public phenomenon. In this paper we find that a firm's reputation is the motive it to go public. On the one hand, firms take advantage of their reputation to go public, while on the other hand, firms believe that going public will enhance their reputation.

Ritter and Welch (2002) mentioned that formal theories of IPO-issuing activity are difficult to test, because only the set of firms actually going public is observable and those private firms which could have gone public are unobservable. In our model the going-public decision is based on the existence of the marginal benefit from a stock listing. That is, we compare the firm's value of going public with that of remaining private. If the marginal benefit, which equals the expected firm's value of going public minus the expected firm's value of remaining private, is positive, then the firm chooses to go public. A negative marginal benefit will keep the firm private.

The model suggests that the propensity to go public is increasing in a firm's management quality as well as its reputation.

A lot of established studies in the literature have been generated on initial public offerings (IPOs), because the going-public decision, process, and performance are all important not only from the firm's viewpoint, but also from that of the market. Empirical studies focusing on some interesting IPO phenomena include the first-day returns anomaly, underpricing, the "hot-issue" market, and the long-term underperformance (Loughran, Ritter, and Rydgvist, 1994; Loughran and Ritter, 2001, 2002; Ritter and Welch, 2002), etc. A handful of theories try to explain these phenomena, while a few take the issuer's reputation into consideration. In this paper we also develop a rigorous theoretical analysis to explain these IPO phenomena. Starting with a reputation model, we discuss the reasons why firms choose to go public. Furthermore, the IPO phenomena, such as the first-day abnormal returns, underpricing, the "hot-issue" market, and the long-term underperformance, are explained from the viewpoint of a firm's reputation.

We find that firms choose to go public in order to enhance their reputation, while at the same time, firms also take advantage of their reputation to go public. Two reputation effects are proposed. Firms take advantage of their reputation to go public and to increase their firms' values, and this is regarded as the

reputation-motivated effect. Going public enhances a firm's reputation, which is regarded as a reputation-enhancing effect. The reputation-motivated effect offers a good explanation to the "hot-issue" market, while the reputation-enhancing effect explains the phenomena of the abnormal first-day returns and underpricing. We also find that the long-run underperformance and de-listing of IPOs are both due to over-going public.

The rest of our paper is organized as follows. Section 1 develops the model. Section 2 forms the equilibrium and characterizes the results. Section 3 proposes the main information effects and explains the IPO phenomena from the viewpoint of reputation. Section 4 states the phenomenon of over-going public and section 5 concludes the paper. All proofs are in the attached appendix.

2. The Model

We consider an economy with three dates, indexed by T=0, 1, and 2 as shown in Fig. 1. The firm is established at the beginning of the first period (time 0 or T=0). After one period of operation (time 1 or T=1), the firm decides to participate in a new project and needs funding for this investment. The manager's decision is to generate the funds needed through private placement or in the public markets. If the manager chooses to remain private, then the firm may use internal funds. If the manager chooses to generate the funds from the public, then the firm needs to go public and

sell a proportion of shares to outside investors, which is hence regarded as an initial public offering (IPO). A firm's financing decision is denoted as $d \in \{G, N\}$, whereas *G* refers to going public and *N* refers to remaining private.

A. Management Quality

The new project will continue for one period and the outcome will be realized at Time 2. If it is a successful investment, then the firm's value will increase to 1. A failed investment will cause the firm to face ruin. The outcome for the new project depends on the management quality of the firm as being either high (denoted as a type-H firm) or low (denoted as a type-L firm). Management quality is private information and outside investors cannot identify the firm's type. It is assumed that a firm's management quality will sustain the same level across periods. The common prior that a firm is type-H is of probability θ. Furthermore, we assume that the project executed by a type-H firm will be successful with probability δ, whereas that executed by a type-L firm will be successful with probability $1-\delta$. Thus, we have

$$\begin{cases} \delta = P(S|H) = P(F|L) \\ 1-\delta = P(F|H) = P(S|L). \end{cases} \quad (1)$$

The distribution of δ is publicly known, while only a firm's manager observes it. It is assumed that $\delta > 1/2$.

B. Firm's Reputation

The firm's performance within the first period is observable, which forms an inference as to the management's quality. It is believed that a high management quality firm is more likely to have a successful historical performance and hence carry with it a successful name. Thus, higher performance is "good news' regarding a firm's quality (Milgrom, 1981). A firm's cash flow reveals its past performance. If the firm generates high cash flow within the first period, then the firm is regarded as a high performance firm and will have a greater probability to achieve a successful project in the future. If it generates relatively low cash flow, then it is regarded as a low performance firm and will more likely fail at a project in the future.

We denote a firm's performance within the first period as $\Omega_1 \in \{S, F\}$. Consequently, Ω_1 becomes a sufficient indicator for the firm's reputation level. We refer to Ω_1 as the firm's reputation status. After observing the firm's past performance, outside investors update their beliefs that the firm is type-H with a probability of *p*. Thus, the firm's expected value

$$\begin{aligned} v(p) &= P(S)\cdot 1 + P(F)\cdot 0 \\ &= P(S|H)\cdot P(H) + P(S|L)\cdot P(L) \\ &= \delta \cdot p + (1-\delta)(1-p). \end{aligned} \qquad (2)$$

C. Financing Decision

At time 1, a firm's manager decides whether to go public in order to generate the

funds needed for the new project or whether to remain private. Assume that the primary goal of the management is to maximize the firm's expected value perceived by outside investors. The firm's financing decision again updates investors' beliefs of the firm's type. Here, $p^{d}_{\Omega_1}$ at time 1 refers to a posterior that the firm is type-H, given $d \in \{G, N\}$ and $\Omega_1 \in \{S, F\}$. If the firm remains private, taking $p^{N}_{\Omega_1}$ as investors' posterior that the firm is type-H, then the firm's expected value will be $NV^{t}_{\Omega_1} \forall t \in \{H, L\}, \Omega_1 \in \{S, F\}$, where

$$\begin{aligned} NV^{N}_{\Omega_1} &= v(p^{N}_{\Omega_1}) \\ &= \delta \cdot p^{N}_{\Omega_1} + (1-\delta)(1-p^{N}_{\Omega_1}). \end{aligned} \tag{3}$$

If the firm goes public, then it sells a proportion of equity to the public. We assume here that the proportion sold is α, which does not vary with the firm's type. Moreover, since a firm's type remains uncertain to the underwriter who takes charge in the IPO, the floatation cost related to the IPO is assumed to be an exogenous *K* over both types of firms. The expected value for a going-public firm, $V^{t}_{\Omega} \forall t \in \{H, L\}$ and $\Omega \in \{\Omega_1, \Omega_2\}$, includes the net proceeds from the IPO as well as the value of the remaining equity after the IPO. Taking $p^{G}_{\Omega_1}$ as investors' posterior that the firm is type-H, a firm's expected net proceeds from IPO equal $\alpha \cdot v(p^{G}_{\Omega_1}) - K \quad \forall \Omega_1 \in \{S, F\}$, where $v(p^{G}_{\Omega_1}) = \delta \cdot p^{G}_{\Omega_1} + (1-\delta)(1-p^{G}_{\Omega_1})$. (4)

The expected value of the remaining equity depends on another of the investors' posterior, $p^{G}_{\Omega_1\Omega_2} \quad \forall \Omega_1 \in \{S, F\}$ and $\Omega_2 \in \{S, F\}$. Since going public means

revealing much more of the firm's private information, Ω_2 refers to investors' prediction of a firm's reputation after observing the firm going public, as either bearing a successful name (*S*) or a failed name (*F*). Take $\Omega_1 = S$ and $\Omega_2 = F$ as an example. This implies that investors observe an increase in the firm's cash flow in the first period and perceive that the project will hurt the firm's name in the future. Thus, the expected value of the remaining equity will be $(1-\alpha)v_t(p^G_{\Omega_1\Omega_2})$, where

$$v_t(p^G_{\Omega_1\Omega_2}) = \begin{cases} \delta \cdot v(p^G_{\Omega_1 S}) + (1-\delta)\cdot v(p^G_{\Omega_1 F}), & \text{if } t=H \\ \delta \cdot v(p^G_{\Omega_1 F}) + (1-\delta)\cdot v(p^G_{\Omega_1 S}), & \text{if } t=L \end{cases} \quad (5)$$

and

$$V^H_\Omega = \alpha \cdot v(p^G_{\Omega_1}) + (1-\alpha)\cdot v_H(p^G_{\Omega_1\Omega_2}) - K \quad (6)$$

$$V^L_\Omega = \alpha \cdot v(p^G_{\Omega_1}) + (1-\alpha)\cdot v_L(p^G_{\Omega_1\Omega_2}) - K\,. \quad (7)$$

The probability of a firm going public equals q^t_Ω. The subscript *t* refers to the firm's type ($t \in \{H, L\}$), where Ω refers to a firm's historical performance, i.e. the firm's reputation observed by outside investors ($\Omega \in \{S, F\}$). The firm's expected value is also a function of the investors' beliefs associated with the firm's type and reputation. Hence, q^t_Ω is increasing in the firm's expected value. That is, a firm's financing decision of to go public or not depends on the firm's expected value. We further assume that for a firm with a successful business history, investors will be more likely to perceive it as a type-H firm; that is, $p^d_S > p^d_F \forall d \in \{G, N\}$. Finally, it

is assumed that $0 < \delta, p, K < 1$.

3. Equilibria of the Going-Public Decision

The equilibrium concept we use is that of the Bayesian equilibrium defined as below.

Definition 1: A Bayesian equilibrium is a set of conditional going public probabilities $q_\Omega^t \ \forall t \in \{H, L\}, \Omega \in \{S, F\}$ and a set of investors' beliefs, p_Ω^d, $d \in \{G, N\}$, $\Omega \in \{\Omega_1, \Omega_2\}$; where (i) q_Ω^t maximizes a firm's expected value and (ii) p_Ω^d satisfies Baye's rule.

The model constructed in the previous section has multiple Bayesian equilibria, which are consistent with any kind of beliefs. These equilibria are sets of mixed strategies containing pure strategies, where degenerate probability distributions are included (Fudenberg and Tirole, 1992). We will now discuss the features of these equilibria.

Lemma 1 For each historical performance $\Omega_1 \in \{S, F\}$, there exists a pooling equilibrium where both types of firms choose not to go public. That is, $q_\Omega^t = 0 \forall t$.

Proof: See the Appendix

Lemma 1 is a common result in signaling games. If we make investors' beliefs unfavorable to one of the financing strategies such as going public in Lemma 1, then

we will make going public a zero-probability event and form a pure strategy, $q_\Omega^t = 0 \forall t$. Here, a firm going public will be associated with the belief of being low quality; thus, this makes "not going public" an equilibrium. Lemma 2 will eliminate the existence of a separating equilibrium. We define an equilibrium with a zero-probability event as a degenerate equilibrium. In this paper we are not going to focus on the degenerate equilibrium.[1]

Lemma 2 There exists no equilibrium such that one type of firm chooses to go public, while the other does not. That is, $q_\Omega^t = 1$ and $q_\Omega^{t'} = 0$.

Proof: See the Appendix

Lemma 2 eliminates the existence of a separating equilibrium and implies that no matter what type the firm is, the probability for a firm to go public is increasing in δ. This supports the existence of the equilibrium with mixed strategies. We define an equilibrium with mixed strategies as a non-degenerate equilibrium, because it excludes the degenerate probability distribution.

Proposition 1 There exists a unique non-degenerate equilibrium where both type-H and type-L firms will choose to go public. That is, $q_\Omega^t > 0 \forall t, \Omega$.

Proof: See the Appendix

Proposition 1 confirms a non-degenerate equilibrium, where for any level of firm's management quality and reputation, the probability to go public is positive.

Moreover, we will propose that the propensity to go public is increasing in management quality and in firm's reputation.

Proposition 2 For any possible outcome of a new project, the propensity to go public for a type-H firm is higher than that for a type-L firm. For any possible type of firm, the propensity to go public for a high reputation firm is also greater than that for a low reputation firm. That is, $q_{\Omega}^{H} \geq q_{\Omega}^{L} > 0 \forall \Omega$ and $q_{S}^{t} \geq q_{F}^{t} > 0 \forall t$.

Proof: See the Appendix

We will again not focus on the pure strategy (defined as the degenerate equilibrium) where both types of firms choose to go public.[2] The remaining mixed strategies, $q_{\Omega}^{H} = 1$ and $q_{\Omega}^{L} \in (0,1) \forall \Omega$, imply that the marginal benefit from going public is larger for a high management quality firm than that for a low management quality firm. Moreover, the other mixed strategies, $q_{S}^{t} = 1$ and $q_{F}^{t} \in (0,1) \forall t$, indicate that for a firm with a high reputation, its marginal benefit must be greater than that for a low reputation firm. Thus, a firm with high management quality as well as a firm with high reputation must choose to go public so as to generate the funds needed, since listing one's shares increases the firm's expected value.

4. Main Reputation Effects and Empirical Evidence

The probability to go public for any type of firm, q_{Ω}^{t}, is a function of the firm's

type (t=H,L) and its reputation ($\Omega = S, F$). The two semi-pooling equilibria in the previous section imply that, for a given level of a firm's reputation, the propensity to go public is increasing in the firm's management quality; while for a given level of a firm's management quality, the propensity to go public is increasing in the firm's reputation. Two reputation effects, the reputation-motivated effect and the reputation-enhancing effect, are proposed and both apply to explain the IPO phenomena discussed in the empirical research.

A. Reputation-Motivated Effect

The result in Proposition 2 shows that the probability to go public for a high reputation firm is greater than that for a low reputation firm. That is, $q_S^t = 1$ and $q_F^t \in (0,1) \forall t$. This implies that if the firm performs well, then outside investors are willing to pay a higher price for shares of the issuing firm, both in the primary and secondary markets. A firm's reputation increases the firm's expected values, both for IPOs and for the remaining equities. It is the firm's reputation that motivates a firm to go public. Consequently, no matter what type the firm is, a firm with a successful name takes advantage of its reputation to go public. We regard this as *the reputation-motivated effect*.

A study of the determinants of IPOs in Italy indicated that the likelihood of an IPO is increasing in firm size and the industry's market-to-book ratio (Panago, Panetta, and Zingales, 1998). Firms who grow faster and are more profitable before an IPO

also tend to go public. Hence, due to a lack of enforcement of minority property rights, Italian firms need a long track record in order to capture investors' trust before going public. Chemmanur and Fulghieri (1999) found that public firms are older and larger. Only firms whose entrepreneurs have accumulated a significant track record for successful performance will find it optimal to go public while those without such a record will remain private. These viewpoints are consistent with the reputation-motivated effect in our model. Firms with a good past are apt to go public so as to generate the funds needed since investors can observe a firm's past performance and update their beliefs about the firm's type.

The reputation-motivated effect can be applied to explain the phenomenon of "hot- issue" markets. Ritter's study (1984) showed that entrepreneurs time their decisions to go public. IPOs tend to cluster during periods in which investors place relatively high values on the cash flows of the firms that go public (Loughran, Ritter, and Rydgvist, 1994). "Hot" IPO markets arise when there is an unanticipated increase in the productivity for a particular industry (Chemmanur and Fulghieri, 1999). Benninga, Helmantel, and Sarig (2000) reported that entrepreneurs choose to go public when the "public" cash flow valuation of their firm is relatively high. If the market expects a low valuation of the cash flows, then firms will generally remain private. Thus, high values on the cash flows of the firms as well as high growth

before the IPO will motivate a firm to list their shares publicly since going public adds value to the firm's equity.

B. Reputation-Enhancing Effect

The other result in Proposition 2, $q_{\Omega}^{H} = 1$ and $q_{\Omega}^{L} \in (0,1) \forall \Omega$, shows that the probability to go public for a type-H firm is greater than that for a type-L firm. This implies that the high management quality firm anticipates its value increasing as long as it chooses to go public. In fact, no matter if they were good or bad in the past, high-quality firms have the confidence that they will succeed in their new project. An expectation that the new project will be successful increases investors' posterior that the firm has high management quality and this feedbacks to an increase in the firm's remaining equity. Thus, going public enhances the firm's reputation as well as its value. We regard this as *the reputation-enhancing effect*.

In an overview of the decision to go public, Roell (1996) summarized that a public listing could be regarded as a marketing device and enhances a company's image and publicity. This publicity induces outside investors to learn more about the firm and will lead to a run-up in the share price on the first trading day (Chemmanur, 1993). Maksimovic and Pichler (2001) found that public trading can add value to the firm as it would inspire more faith in the firm from other investors, customers, creditors, and suppliers. Ritter and Welch's study (2002) showed that from 1980 to 2001, the average first-day returns of IPOs in the United States reached 18.8 percent.

Though the returns varied over time, they exceeded 10 percent after 1990 and reached a peak of 71.1 percent in 1999.

Theoretical explanations of high first-day returns focus on the deliberate underpricing of IPOs (Ritter and Welch, 2002). That is, the issuers sell their shares at a lower price than the market believes they are worth and create abnormally high first-day returns on their first trading days. Since underpricing costs a lot to the issuing firms, high-quality firms signal their quality by underpricing their IPOs to distinguish themselves from low-quality firms (Allen and Faulhaber, 1989; Welch, 1989; Grinblatt and Hwang, 1989). In this paper we find that, due to the reputation-motivated effect, low-quality firms with successful names choose to go public with low magnitudes of IPO underpricing. For these low-quality firms, the imitating costs from underpricing are low, since a good reputation makes the market over-value their shares.

What about the abnormal first-day returns? If we measure the first-day returns from the offer price to the first listed closing price as most empirical researchers do (Welch and Ritter, 2002), then it should be regarded as "nominal" first-day returns based on the "under-valued" offering price, instead of on the firm's real value. A firm with a high "nominal" return does not necessarily enjoy a high "real" first-day return. Only that firm with a low magnitude of IPO underpricing as well as a high

first listed closing price enjoys a "real" first-day return. The reputation-enhancing effect constitutes a high first listed closing price and adds value to the remaining equities, as shown by a proportion of $1-\alpha$ to a firm's total equity in our model.

5. Over-Going public

Due to the existence of asymmetric information, investors cannot identify the quality of a firm. Extended in corollary 1, we propose that a low-quality firm may mimic a high-quality firm in order to go public as long as it has a good name. This causes a phenomenon of over-going public.

Corollary 1 From the proof of Proposition 2, $q_S^L = 1$ causes the situation of over-going public.

Considering the case when there is no information asymmetry between the firm and outside investors, then the investors could fully identify a firm's management quality. In the case where δ equals approximately one, the expected value of a type-H firm, V_Ω^H, would be $\delta - K$, which is positive. The expected value of a type-L firm, V_Ω^L, would be $1-\delta-K$, which is negative. It is straightforward that firms choose to go public as long as the expected values are high. That is, the propensity to go public will increase in the management quality. Thus, investors are able to distinguish a type-H firm from a type-L firm by observing a firm's financing decision. Moreover, asymmetric information exists and induces firms to go public

by taking advantage of good names. We regard this as a phenomenon of over-going public.

Ritter and Welch's study (2002) indicated that from 1973-2001, the three-year average market-adjusted return on IPOs was –23.4%, whereas the average style-adjusted return was –5.1%.[3] Welch's study (1999) showed that almost half the firms that go public are de-listed within five years after their IPO, showing that the long-run underperformance of IPOs does exist. Schultz (2001) offered an explanation that more IPOs follow successful IPOs. When the followers carry a large fraction of the sample and also underperform in the market, then the average returns of all the IPOs tend to be low. Shefrin (2002) summarized the reason for the long-term IPO underperformance from the viewpoint of behavioral finance. He suggested that firms are more likely to issue new shares when they face a window of opportunity and that their stocks are overvalued. The investors at the same time expect a continuation and bet on trends. They overweight the recent past when making long-term projections, and thus suffer from long-term underformance.

Our reputation model concludes a similar implication regarding the long-run underperformance of IPOs. Going public signals high quality. Low-quality firms take advantage of their high reputation to go public, while poor post-IPO stock performance causes IPOs' underperformance. We suggest that the phenomenon of

over-going public is a reason for the underperformance and delisting of IPOs.

6. Conclusion

The determinants of IPOs have generated a significant amount of literature. In this paper we try to emphasize the importance of the firm's reputation when a firm makes a going-public decision. Some findings are summarized as follows.

(1) For a given level of management quality, high reputation firms are more likely to go public than low reputation ones. Reputation drives a firm to go public, which is known as the reputation-motivated effect. This effect reduces the magnitude of IPO underpricing and partly explains the phenomenon of the "hot" issue market.

(2) For a given level of a firm's reputation, high management quality firms are more likely to go public than low management quality ones. Going public further enhances a firm's reputation as well as its value, which is known as the reputation-enhancing effect. The reputation-enhancing effect provides a good explanation for the phenomenon of the abnormal first-day returns.

(3) Due to the existence of asymmetric information, low management quality firms tend to take advantage of their reputation to go public, which is known as over-going public. This explains the long-run underperformance and delisting of some IPOs.

Appendix

Proof of Lemma 1

Suppose that, by observing a firm going public, investors believe the firm to be type-L. Therefore, $p_{\Omega_1}^G = 0$. It follows that from (3), $NV_{\Omega_1}^t = \delta$ and from (6) and (7), $V_\Omega^H = V_\Omega^L = 1 - \delta - K$. By the assumption of $\delta > 1/2$, no matter what type the firm is, no firm will choose to go public.

Q.E.D.

Proof of Lemma 2

In Lemma 1 the assumptions, $q_\Omega^L > 0$ and $q_\Omega^H = 0$, form a pooling equilibrium, $q_\Omega^t = 0$. Considering the other assumptions, $q_\Omega^L = 0$ and $q_\Omega^H > 0$, it follows that from (3), $NV_{\Omega_1}^t = 1 - \delta$ and from (6) and (7), $V_\Omega^H = V_\Omega^L = \delta - K$. Thus, no matter what type the firm is, the probability to go public is increasing in δ. That is, a type-L firm is likely to go public, which contradicts with the assumption, $p_{\Omega_1}^G = 1$. Q.E.D.

Proof of Proposition 1 and Proposition 2

The proofs in Lemma 1 and Lemma 2 imply that, in a non-degenerate equilibrium, $q_\Omega^t > 0 \forall t, \Omega$. The marginal benefit from going public is strictly greater for a type-H firm than that for a type-L firm as shown below.

$$
\begin{aligned}
MB_{\Omega} &= (V_{\Omega}^{H} - NV_{\Omega_1}^{H}) - (V_{\Omega}^{L} - NV_{\Omega_1}^{L}) \\
&= [\alpha \cdot v(p_{\Omega_1}^{G}) + (1-\alpha) \cdot v_H(p_{\Omega_1\Omega_2}^{G}) - K - v(p_{\Omega_1}^{N})] \\
&- [\alpha \cdot v(p_{\Omega_1}^{G}) + (1-\alpha) \cdot v_L(p_{\Omega_1\Omega_2}^{G}) - K - v(p_{\Omega_1}^{N})] \\
&= (1-\alpha)(2\delta - 1)[v(p_{\Omega_1 S}^{G}) - v(p_{\Omega_1 F}^{G})] > 0
\end{aligned}
\tag{8}
$$

From the inequality above, the signaling game results in three equilibria.

(1) $V_{\Omega}^{H} - NV_{\Omega_1}^{H} \le 0$ and $V_{\Omega}^{L} - NV_{\Omega_1}^{L} < 0$. These two inequalities will cause q_{Ω}^{L} to be zero, which contradicts the fact that $q_{\Omega}^{t} > 0 \forall t, \Omega$.

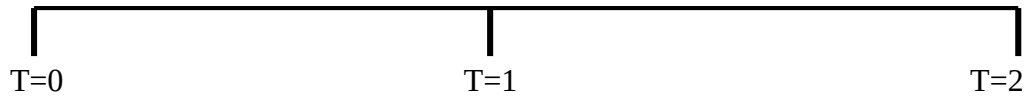
(2) $V_{\Omega}^{H} - NV_{\Omega_1}^{H} > 0$ and $V_{\Omega}^{L} - NV_{\Omega_1}^{L} < 0$. These inequalities support a separating equilibrium where the type-H firm goes to public and the type-L one does not. This equilibrium is eliminated by Lemma 2.

(3) $V_{\Omega}^{H} - NV_{\Omega_1}^{H} > 0$ and $V_{\Omega}^{L} - NV_{\Omega_1}^{L} \ge 0$. For the type-H firm, the inequality, $V_{\Omega}^{H} - NV_{\Omega_1}^{H} > 0$, implies $q_{\Omega}^{H} = 1 \forall \Omega$. For the type-L firm, the inequality, $V_{\Omega}^{L} - NV_{\Omega_1}^{L} \ge 0$, implies either $V_{\Omega}^{L} - NV_{\Omega_1}^{L} > 0$ or $V_{\Omega}^{L} - NV_{\Omega_1}^{L} = 0$. Either $q_{\Omega}^{L} = 1$ or $q_{\Omega}^{L} \in (0,1)$ will be true. Thus, $q_{\Omega}^{H} \ge q_{\Omega}^{L} > 0 \forall \Omega$, which confirms the equilibrium.

The same reasoning in Proposition 1 applies well to prove Proposition 2.

$$
\begin{aligned}
MB^{t} &= (V_{S}^{t} - NV_{S}^{t}) - (V_{F}^{t} - NV_{F}^{t}) \\
&= [\alpha \cdot v(p_{S}^{G}) + (1-\alpha) \cdot v(p_{S\Omega_2}^{G}) - K - v(p_{S}^{N})] \\
&- [\alpha \cdot v(p_{F}^{G}) + (1-\alpha) \cdot v(p_{F\Omega_2}^{G}) - K - v(p_{F}^{N})] > 0
\end{aligned}
\tag{10}
$$

Equation (10) also implies that $V_{S}^{t} - NV_{S}^{t} > 0$, and thus $q_{S}^{t} = 1 \forall t$. At the same time, $V_{F}^{t} - NV_{F}^{t} \ge 0$ such that $q_{F}^{t} = 1$ or $q_{F}^{t} \in (0,1)$. Thus, $q_{S}^{t} \ge q_{F}^{t} > 0 \forall t$, which confirms the equilibrium. Q.E.D.



T=0	T=1	T=2
Firm established, either as type-*H* or type-*L*. Investors form their belief of the firm's reputation, either as *S* or *F*.	Firm needs funds for new investment. Decides whether to go public or remain private.	Outcome of new project realized.

Figure 1. Time Line of the Economy

Table 1: Notation of the Model

t (H, L)	Firm's type depending on the quality of a firm's management (High or Low).
Ω (Ω_1, Ω_2)	Firm's performance set as a signal of a firm's reputation, either as success or failure, $\{S,F\}$. Ω_1: firm's performance in the first period. Ω_2: firm's performance in the second period.
δ	Probability that a type-H firm will succeed. $\delta \equiv P(S\|H) = P(F\|L)$.
p_Ω^d	Posterior that the firm is type-H, given the firm's financing decision $(d \in \{G, N\})$ and firm's reputation $(\Omega \in \{\Omega_1, \Omega_2\}, \Omega_1 \in \{S, F\}, \Omega_2 \in \{S, F\})$.
q_Ω^t	Probability that a firm will go public at time 1, given $t \in \{H, L\}$ and $\Omega \in \{S, F\}$.

Footnotes

1. The degenerate pooling equilibrium is due to the assumption of the investor's homogeneous belief regarding a firm's type such as $p_{\Omega_1}^G = 0$ in Lemma 1. We avoid discussing the homogeneous belief case since it hardly happens in the real world.

2. The reasoning for footnote 1 applies here.

3. Market-adjusted returns are calculated as the buy-and-hold return on an IPO minus the compounded daily return on the CRSP value-weighted index of Amex-, Nasdaq-, and NYSE-listed firms. Style-adjusted buy-and-hold returns are calculated as the difference between the return on an IPO and a style-matched firm (Ritter and Welch, 2002).

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