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**A Note on Firms' Strategic Behaviour During an IPO**

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# A Note on Firms' Strategic Behaviour During an IPO

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## Abstract

When potential shareholders cannot observe the business conditions of the firms, the latter desiring to acquire capital by an IPO and operating under less favourable business conditions have a strong incentive to appear more successful.

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*Keywords:* IPO, asymmetric information, signalling game

## 1 The background

Start-ups in innovative and highly risky industries as the "young" e-commerce branch require a substantial amount of capital. Asymmetric information in combination with informal opacity are the main reason for small firms being credit rationed (Stiglitz and Weiss, 1981), so that venture capital has become an important source to small start-up firms.

Clearly, the entire relationship between the venture capitalist and the firm is characterised by asymmetric information leading to problems of moral hazard, adverse selection or window dressing. A growing amount of literature studies the question of how contracts and special financing instruments should be designed to solve the associated problems.<sup>1</sup>

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<sup>1</sup> See e.g. Bergöf (1994); Bergmann and Hege (1997); Cornelli and Yosha (1997); Trester (1998); Schmidt (1999); Lüfemann (2000); Casamatta (2000).

Often, an initial public offer (IPO) is part of this relationship.<sup>2</sup> Normally, (potential) shareholders cannot directly observe the firm's business conditions (type). Therefore, firms wishing to acquire capital by means of an initial public offer (IPO) have to publish a number of key facts (e.g. the expected revenue) to inform the potential shareholders on the firm's situation. Part of the key facts are also not directly observable by the shareholders, so that the information asymmetry cannot entirely be removed. Hence, the key facts and, especially, the price of the shares can be regarded as strategic instruments. Keeping in mind that venture capitalists often desire to realise their returns during an IPO and are therefore interested in a high initial value, the break-down of the world stock markets in the year 2001 gives rise to the notion that asymmetric information during an IPO is indeed relevant. Surprisingly, the problem of strategic behaviour before and during an IPO has not received much attention.

The present model suggests that whenever the true business conditions are not observable by the potential shareholders, it is optimal for the firms and venture capitalists to hide it from the shareholders.

## 2 The model

Let the firm be faced by the following situation: Nature chooses the market conditions (type)  $\theta$ . With probability  $\rho$  they are favourable ( $\theta''$ ) and with probability  $(1 - \rho)$  they are unfavourable ( $\theta'$ ), where  $\theta'' > \theta'$ . The firm immediately learns about the realisation of the market conditions. However, this information is private so that the potential shareholder only knows the probability distribution, which is common knowledge. The IPO and the price  $p$  for the shares are announced when the firms discover their type. It is assumed that the price can only take two values:  $p \in \{p', p''\}$  with  $p' < p''$ . After the announcement, the potential shareholder decides whether or not to buy the shares. In the time following the IPO, the firms realise profits according to their business conditions and they distribute them among the owners for an indefinite time span.

$\theta''$ -firms are supposed to always choose the high price  $p''$  and individuals only buy shares of those firms.

The profits of a firm are positively correlated with  $\theta$ , so that  $\pi(\theta') =: \pi' < \pi'' := \pi(\theta'')$ . Without loss of generality the number of shares is normalised to unity. The firm sells a fraction  $\gamma$ ,  $\gamma \in (0, 1]$ , of shares and keeps the remaining one. All future profits are entirely distributed among the owners (the shareholder and the firm). The shareholder

<sup>2</sup> Several empirical papers confirm the positive role of a viable IPO market on venture capital activities. For example Jeng and Wells (2000) find that IPOs are the strongest driver of venture capital investing. Gompers (1998) argues that one reason for the increase in venture capital financing in the US during the last years is a surging market for venture-backed IPOs.

buying the fraction  $\gamma$  of shares receives future payments equivalent to the present value of  $\sum_{t=1}^{\infty} \gamma\pi/(1+r)^t = \gamma\pi/r$ , where  $r$  is the given discount factor. As the shareholder only buys  $\theta''$ -firm shares, the value  $W''$  of obtaining  $\theta''$ -firm shares has to be positive, i.e.  $W'' = -\gamma p'' + \gamma\pi''/r \geq 0$ , whereas the value  $W'$  of buying  $\theta'$ -firm shares has to be negative, i.e.  $W' = -\gamma p' + \gamma\pi'/r < 0$ . The inequalities are consistent if  $(\pi'' - \pi')/r \geq p'' - p' > 0$ , which is assumed to hold true. From the fact that  $W''$  is positive also follows that

$$\pi''/r \geq p''. \quad (1)$$

The potential shareholder is only willing to buy the shares of a  $\theta''$ -firm if the discounted stream of future profits is higher than or equal to the price for the shares.

Consider a  $\theta''$ -firm. The value of selling a fraction of  $\gamma$  shares is  $U(\theta'', p'') = \gamma p'' + (1 - \gamma)\pi''/r$ . If the firm were to announce a price  $p'$ , the shareholder would mistake the firm as a  $\theta'$ -type one and not buy the shares. Hence, the value of announcing  $p'$  is  $U(\theta'', p') = \pi''/r$ . For the  $\theta''$ -type firm to always announce the high price  $p''$  it is necessary that  $U(\theta'', p'') \geq U(\theta'', p')$ . This condition is satisfied iff

$$p'' \geq \pi''/r. \quad (2)$$

Both conditions (1) and (2) can only be satisfied if

$$p'' = \pi''/r, \quad (3)$$

which is supposed to hold true henceforward.

In the **separating equilibrium**, the firms reveal their type by the choice of the price  $p$ . The  $\theta''$ -type firm chooses  $p''$ , whereas the  $\theta'$ -type firm announces the low price  $p'$ . The shareholders' belief functions are given by  $\mu(\theta'', p'') = 1$  and  $\mu(\theta', p') = 1$ . As the potential shareholder only buys shares of a firm operating under favourable conditions, a type  $\theta'$ -type firm does not sell any shares. In this case, its the value of setting  $p'$  is  $U(\theta', p') = \pi'/r$ . If the firm were to announce the high price, it would receive  $U(\theta', p'') = \gamma p'' + (1 - \gamma)\pi'/r$ . Consequently, a  $\theta'$ -type firm reveals its type iff  $U(\theta', p') > U(\theta', p'')$ . Using the payoff functions, this condition can be simplified to

$$\pi'/r > p''. \quad (4)$$

The  $\theta'$ -type firm reveals its type only if the discounted future profits from the unfavourable business conditions are higher than the price for the shares of the  $\theta''$ -type firm. Inserting equation (3) into the condition (4) shows that this condition can only be satisfied if  $\pi'' < \pi'$ , which violates the consistency condition. Hence, a separating equilibrium does not exist.

In a **pooling equilibrium**, both types of firms announce the same price of shares. As the  $\theta''$ -type firm always chooses the high price  $p''$ , the  $\theta'$ -type firm will do so as well

in a pooling equilibrium. In this case, the shareholders belief functions are not updated and equal the probabilities, with which the types are drawn by nature. Consequently, the shareholders will buy shares with probability  $\rho$ . The  $\theta'$ -type firm will hide its type if the expected payoff is higher than or equal to the payoff received when truly signalling its type. Therefore, it has to be true that  $\rho[\gamma p'' + (1 - \gamma)\pi'/r] + (1 - \rho)\pi'/r \geq \pi'/r$ . Rearranging yields  $\gamma\rho[p'' - \pi'/r] \geq 0$ . Inserting (3) ensues in  $\gamma\rho[\pi'' - \pi']/r \geq 0$ , which is always satisfied.

Since a separating equilibrium does not exist, the firms operating under the unfavourable business conditions always hide their type. It is interesting to note that this result is independent of the fraction  $\gamma$  of shares offered as well as of the probability  $\rho$  with which a favourable business condition is drawn.

### 3 Conclusion

The present note demonstrated that the firms operating under unfavourable conditions have a strong incentive to hide them whenever potential shareholders cannot observe the business conditions of the firms. In the context of an IPO, this result has meaningful consequences. The firms are obliged to publish certain key facts, as e.g. the expected revenues, when an IPO is announced. If the potential shareholders have no means to verify the truth of these key facts which is indeed a difficult task the publishable key facts themselves become a strategic instrument. Clearly, the firms operating under favourable conditions have an incentive to transmit this fact to the potential shareholders. However, this will turn out to be a difficult task as the firms operating under unfavourable business conditions will just imitate the actions of the firms facing favourable conditions. Hence, the publication of key facts is meaningless when they are a strategic instrument.

In addition, as individuals cannot distinguish potentially successful and potentially unsuccessful firms, they buy shares at random, i.e. they buy according to the probability distribution of the types. As a consequence, some promising firms cannot acquire capital whereas less successful firms are listed at the financial markets. Since a firm cannot hide their business conditions for an indefinite time and the shareholders will eventually learn the true market conditions, the share price of firms in unfavourable conditions will be adjusted.

This line of argumentation can be applied to the problem of the "young" e-commerce branch. Associating firms in the traditional sectors as the  $\theta'$  types and the firms in the e-commerce business as  $\theta''$  types, e-commerce firms have an incentive to appear more successful than they really are. At the time the shareholders realise the true conditions, most of the share prices of e-commerce firm would have to be adjusted downwards. Keeping in mind the huge share price corrections in the "new market", the problem of asymmetric

information in connection with the role of information as a strategic factor seems to be relevant.

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