

# A Model of Information Manipulation and Stock Issue Price Based on the Control of the Entrepreneur<sup>☆</sup>

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**Abstract:** Considering information asymmetry between the entrepreneur and external investors, this paper makes a hypothesis that the entrepreneur would manipulate information when issuing shares, and derives a stock issue price model based on information manipulation and effort the entrepreneur would make. Analysis of the model shows the level of information manipulation does affect the stock issue price. Market regulators should improve the capacity of identifying information manipulation and increase penalties for manipulators, so that the market can be more accurately pricing shares being issued.

**Key words:** control of the entrepreneur, information manipulation, stock issue price

## 1. Introduction

Information is the foundation on which investors and communities have learned the company's operation condition, and the bridge that links investors and company. The investors make investment decisions by acquired information. Equity financing is one of the main financing channels, thus the information associates the investment behavior of the investor with the financing behavior of the company. However, along with the occurrence of the finance scandals in Enron, Worldcom and Yinguangsha, authenticity and effectiveness of information disclosed by companies have been being queried. People realize that the capital customers can affect investors through information manipulation to acquire financing.

The relationship between information manipulation and equity financing is attracting many scholars. Kim and Verrecchia(1995)<sup>[1]</sup> argue that the company's financial and accounting information provides the basis for investors to assess the company value, and the better earning announcements reflect, the higher the stock's issue price is. Dye(1988)<sup>[2]</sup> believes that a company would inflate earnings before issuing shares, so investors optimistically estimate the valuation of stocks. Burgstahler(1997)<sup>[3]</sup> finds that stock value is a convex function of book value and earnings. Earnings reflect the usage of current resources and book value is the measure of the current value of resources, so earnings and book value determine the stock issue price. Thus, corporate managers can mislead investors through inflating assets, manipulating profits and whitewashing the financial statements and other information manipulation actions to enhance share issue price and get more revenue.

In China, the entrepreneur almost has the absolute control of the enterprise, which is reflected in: First, the entrepreneur holds very high stake and ownership structure has a "dominance" feature; second, the relationship between the entrepreneur and officers is very close and the entrepreneur often controls management of the company. Under the control of the entrepreneur, equity financing becomes the first choice while the company financing. As investors assess the value of the company on the basis of information released by the company, the entrepreneur can gain more through manipulating information. The existence of information asymmetry between the entrepreneur and external investors means the entrepreneur clearly knows the operation condition and estimates accurately value and prospect of the company, while external investors have a disadvantage, so the intermediaries, such as market rating agencies and certified public accountants, are very important to distinguish the information released by companies.

As growth enterprises market in China is opened, stock issue price gets more and more attention in academia and industry. The domestic scholars mainly study the relationship among stock issue price, heterogeneous beliefs and signal transfer, but the obtained results are not consistent<sup>[4]</sup>. In this paper, considering there exist absolute control of the entrepreneur and information asymmetry between

<sup>☆</sup> This paper is supported by the National Natural Science Foundation of China (Grant No. 71071010).

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entrepreneurs and external investors, which induce the entrepreneur to manipulate information while issuing stocks, we establish a stock issue price model based on the level of effort associated with corporate performance and information manipulation to analyze the mechanism of manipulation information. The entrepreneur affects the expected future of investment projects for external investors through information manipulation, which results in the rise in the stock issue price.

## 2. The hypothesis

To simplify the model, we don't consider the time value of investments.

(1) The entrepreneur has a project which requires an investment  $I$ . The entrepreneur has initial assets  $A$ ,  $A < I$ . In order to invest in the project, the entrepreneur will issue stocks to raise capital  $I - A$ .

(2) The entrepreneur provides a report about value of the project to the market, then the market estimates value of the project on the basis of the report and determines the company's stock price is  $S$ . When the project implemented, the total value is  $V$ , which shows the company's final total cash flow. The company's net cash flow is the final total cash flow minus the resources which is used to compensating the entrepreneur and affecting the report. The final net cash flow is  $V_I$ . The entrepreneur as the company's operator and manager, should receive the compensation  $w$ . Assume  $S$  and  $V_I$  to be linear functions,  $w = w_0 S$ . The utility functions of the entrepreneur and external investors are negative exponential utility functions, and the entrepreneur's absolute risk aversion coefficient is  $\gamma_1$ , while the external investors' is  $\gamma_2$ .

The entrepreneur as the manager responsible for business management, for his own interests, will choose: (1) the effort level  $e$ ; (2) the resources affecting the report  $\theta$ . The effort  $e$  will affect the final total value of the project,  $V = \beta e + \varepsilon$ , where  $\beta$  is a productivity factor and  $\varepsilon \sim N(0, \sigma_\varepsilon^2)$  is an independent random variable. When choosing the effort level  $e$ , the entrepreneur do not know the ultimate realization of  $\varepsilon$ .  $e$  and  $\theta$  are the entrepreneur's private information, which external investors can not observe.  $\beta$  and  $\sigma_\varepsilon^2$  are public information, which both the entrepreneur and external investors know. The entrepreneur as a rational economic man is "lazy" and his labor aversion level is  $\delta$ . The information set observed by the entrepreneur is  $\Omega_0^C$ , while the external investors  $\Omega_0^M$ .

(4) External investors are homogeneous, whose number is  $N$ . The number of shares owned by investor  $i$  is  $X_i$ . To simplify the model, we assume that the average holdings of external investors is 1.

(5) After the entrepreneur publishing the report on the value of the company, the market regulators review it. The entrepreneur has an incentive to manipulate information about value of the company. Information manipulated would make the total market value overstated by the amount  $\alpha$ ,  $\alpha \geq 0$ . The cost of information manipulation is  $\theta$ ,  $\theta = \phi\alpha$  ( $\phi > 0$ ), which means the final total cash flow is reduced by  $\theta$ . For ethical reason (collusion between the regulators and the entrepreneur) or limited capacity, market regulators do not always identify the information manipulation in the report.  $\rho$  ( $0 < \rho < 1$ ) is the probability of identifying the information manipulation. If identified, the enterprise will be subject to a penalty. The amount of the penalty is  $\varphi\alpha$ ,  $\varphi$  ( $\varphi > 0$ ) is marginal penalty amount.

## 3. The model derivation

The entrepreneur's income consists of two parts, capital gains of the initial assets and the compensation  $w$ . The expected utility for the entrepreneur is

$$E[U(V_0^M | \Omega_0^C)] = w_0 S + \frac{A}{I} * E[V_I | \Omega_0^C] - \frac{\gamma_1}{2} \left(\frac{A}{I}\right)^2 \text{Var}[V_I | \Omega_0^C] - \rho\varphi\alpha - \gamma_1\rho(1-\rho)\varphi^2\alpha^2 - \frac{\delta}{2}e^2 \quad (1)$$

The first three terms represent the expected utility for the entrepreneur as the shareholder and manager receiving capital gains and management compensation. The fourth and fifth terms represent the disutility from information manipulation. The last term represents the disutility from exerting effort.

$$\text{Therefore, when market clears, there must be } \sum_i^N X_i = N * 1 \quad (2)$$

For external investor  $i$ , the expected utility is

$$E_i[U(X_i V_0^M | \Omega_0^M)] = X_i (E[V_1 | \Omega_0^M] - S) - \frac{\gamma_2}{2} X_i^2 \text{VAR}(V_1 | \Omega_0^M) \quad (3)$$

The stock holdings of investor  $i$  is  $\tilde{X}_i = \text{argmax} E_i[U(X_i V_0^M | \Omega_0^M)]$ . Calculate the first derivative of equation (3), there is

$$\tilde{X}_i = \frac{E[V_1 | \Omega_0^M] - S}{\gamma_2 \text{VAR}(V_1 | \Omega_0^M)} \quad (4)$$

Put equation (4) into equation (2), that is when the market clearing, there exists the following equation.

$$\frac{E[V_1 | \Omega_0^M] - S}{\gamma_2 \text{VAR}(V_1 | \Omega_0^M)} = I \quad (5)$$

Through the hypothesizes we know  $V_1 = V - W$ , so

$$E[V_1 | \Omega_0^M] = E[(V - w_0 S) | \Omega_0^M] = E[V | \Omega_0^M] - w_0 E[S | \Omega_0^M] = \beta e + \alpha - w_0 S \quad (6)$$

$$\text{Var}(V_1 | \Omega_0^M) = \text{Var}(V_1 | \Omega_0^M) = \sigma_e^2 \quad (7)$$

Put equations (6) and (7) into equation (5), there is

$$S = \frac{\beta e + \alpha - \gamma_2 \sigma_e^2}{I + w_0} \quad (8)$$

Because the entrepreneur knows the extent of the information manipulation, it is  $E[V | \Omega_0^C] = \beta e - \phi \alpha$ ,

so

$$E[V_1 | \Omega_0^C] = \beta e - \phi \alpha - w_0 S \quad (9) \quad \text{VAR}(V_1 | \Omega_0^C) = \sigma_e^2 \quad (10)$$

Put equations (8), (9) and (10) into equation (1), there is

$$E[U(V_0^M | \Omega_0^C)] = \frac{w_0 - \frac{A}{I}}{I + w_0} (\beta e + \alpha - \gamma_2 \sigma_e^2) + \frac{A}{I} * (\beta e - \phi \alpha) - \frac{\gamma_1}{2} (\frac{A}{I})^2 \sigma_e^2 - \rho \phi \alpha - \gamma_1 \rho (1 - \rho) \phi^2 \alpha^2 - \frac{\delta}{2} e^2 \quad (11)$$

While the motivation of the entrepreneur is to maximize their own utility, so his action strategy is

$$(e^*, \alpha^*) = \text{argmax}_{(e, \alpha)} E[U(V_0^M | \Omega_0^C)] \quad (12)$$

Calculate the partial derivatives of equation (11), there are

$$\frac{\partial E[U(V_0^M | \Omega_0^C)]}{\partial e} = \beta \frac{w_0 - \frac{A}{I} + w_0}{I + w_0} - \delta e \quad (13)$$

$$\frac{\partial E[U(V_0^M | \Omega_0^C)]}{\partial \alpha} = \frac{w_0 - \frac{A}{I}}{I + w_0} - \frac{A}{I} \phi - \rho \phi - 2\gamma_1 \rho (1 - \rho) \phi^2 \alpha \quad (14)$$

$$e^* = \frac{\beta}{\delta} \frac{w_0 + w_0 - \frac{A}{I}}{I + w_0} \quad (15) \quad \alpha^* = \max\{0, \frac{w_0 - \frac{A}{I} - \frac{A}{I} \phi - \rho \phi}{2\gamma_1 \rho (1 - \rho) \phi^2}\} \quad (16)$$

## 4. Conclusion

Under the control of the entrepreneur and information asymmetry between external investors and the entrepreneur, we study stock issue price with the existence of information manipulation for the entrepreneur, and derive a stock issue price model based on information manipulation and effort of the entrepreneur. The model shows that the stock issue price is positively correlated with the effort, labor productivity and information manipulation of the entrepreneur, and negatively correlated with the extent of external investors'

risk aversion and the entrepreneur's compensation. In addition, this paper analyzes impact factors of information manipulation and the optimal effort level, as is shown that the optimal effort level is positively correlated with labor productivity, initial assets and the compensation of the entrepreneur, and negatively correlated with the extent of his effort aversion and the amount of the project investment; the optimal level of information manipulation is positively correlated with the entrepreneur's compensation and the amount of the project investment, and negatively correlated with the entrepreneur's initial assets and effort aversion level, market regulatory capacity and punishment for information manipulation.

According to this paper, the market regulators should improve their own regulatory capacity and increase the penalties for information manipulation in order to reduce or even eliminate the information manipulation behavior. It will reduce information asymmetry between internal investors and external ones and make stock issue priced more accurately.

## 5. References

- [1] Kim, R. Verrecchia. Market liquidity and volume around earnings announcements. *Journal of Accounting and Economics*.1995,(1): 41-67
- [2] R. Dye. Earnings management in an overlapping generations model. *Journal of Accounting Research*, 1988, 26(2):195-235.
- [3] D. Burgstahler, D. Dichev. Earnings, adoption and equity value. *The Accounting Review*, 1997,72: 187-215.
- [4] G. Chen, Y. Zhang, J. Wang. Heterogeneous beliefs and earning momentum: evidence from China's stock market. *Contemporary Finance& Economics*, 2008(7):43-48