Research on the improvement of the stock equity model based on the difference of niche between shareholders

Tingli Liu, Beijing University of Technology, Pingleyuan 100, Chaoyang District, Beijing, CN, 100124,13641029975, liutingli@bjut.edu.cn
Lu Chen, Beijing University of Technology, Pingleyuan 100, Chaoyang District, Beijing, CN, 100124,13552162408, chenlu_alou@163.com
Songling Yang, Beijing University of Technology, Pingleyuan 100, Chaoyang District, Beijing, CN, 100124,13810979616, yang.sl@bjut.edu.cn
Hongwu Wang, Beijing University of Technology, Pingleyuan 100, Chaoyang District, Beijing, CN, 100124,13601076393, wanghw6688@hotmail.com

ABSTRACT

Heterogeneity is a common attribute of company shareholders. This paper analyzed the logical relationship of the appearance of the differences in the cost of equity, based on the differences of the niche, discovering that the innate individual difference and the difference after the implementation of shareholder's behavior of the heterogeneous shareholders aggravate the difference of niche breadth among shareholders. The way and number of resource that shareholders could get would also change because of changed-niche-breadth. Finally the differences of resource affect the cost of equity. According to the changes in the same direction of shareholder's niche breadth and the cost of equity, this paper used the shareholder's niche breadth to revise the traditional shock equity model. A more accurate measure of the cost of equity is helpful to the differentiation between the shareholders.

Key words: Shareholder's Niche; Cost of Equity; Heterogeneity

INTRODUCTION

Cost of equity is a vital element of the components of the cost of capital in one company, which plays the important role in the aspects of the budget of capital, decision making relevant to financing, evaluation of performance, and estimation of valuation, etc. As the core content of modern corporate finance, cost of equity has become the heat-discussed topic in terms of financing empirical study. The past studies had been proved the differences of policy system, marketing environment and the features of industries could influence the cost of equity. However, these studies have the limitations of being studies under the circumstance of the assumption that based on homogeneity. In fact, with the development of equity heterogeneity studies and relevant evident being richen, new challenges relevant to the studies of homogeneous calculation for equity of cost have been emerged as well. That is, can equity of cost be influenced by the consisted differences of shareholders?

This article is based on the niche theory in order to differentiates the heterogeneous features of shareholders, according to the differences of niche width calculating heterogeneity, which further modifying the traditional model of equity of cost. The revised model could better differentiate the required rate of return according to the different niche shareholders, which expresses the differences of shareholder through the cost of equity. This revision realized the recognition of different types of risk for shareholders, further promoting the decision making by utilized the cost of capital.

CURRENT RESEARCH STATUS OF EQUITY COST

Modigliani and Miller have put forward the MM theory, which create the source of cost of equity studies. Nowadays, the mainstream model based on risk premium and profit of company has been emerged. Due to the complex influences on cost of equity, types of model have the limitation from original assumption. None of them can be used on dealing every relevant question or replaced the other model completely. Although, scholars still revise and optimize the calculation model of cost of equity, in order to deal with the empirical problems better in real life. On another hand, the empirical study of equity cost was mainly focus on the mathematical relationship between the variety of ratios and the correlation between the factors, which could lead to the convergence of results. However, it seems less refer the theoretical differences between cost of equity. For instance, in the study of equity structure, the equity structure were mainly stand by the proportion of share holdings, however, the evidence of the internal mechanical theory were not sufficient enough.

It can be seen that the current studies were more concentrated on the complex factors that influence the cost of equity. Whereas, the method that how to successfully integrate such factors into the calculated model of cost of equity were still hard.

SHAREHOLDERS' HETEROGENEITY AND NICHE CHARACTERISTICS ANALYSIS

Ecological System Composed of Heterogeneous Shareholders

Berle and Means[1] pioneered the agency theory research which implying the assumption of the homogeneity of the shareholders. Grossman and Hart [16] proposed the concept of control benefits. The focus of the agency problem began to shift to the major shareholders as the representative of the internal and small shareholders as the representative of the relationship between the external people. Shareholder's heterogeneity surfaced. With the abundance research results of the shareholders' behavior, like the major shareholder's tunneling and propping, minority shareholders' free-riding and voting with their feet, and institutional investors' collusion and supervision, Shareholders' heterogeneity has gradually become one of the common consensus of corporate governance research. Although scholars have formed a consensus on the heterogeneity of shareholders, but the perception of the heterogeneity of shareholders is derived from the performance of the behavior of shareholders.

Ecological theory provides a theoretical research framework for the positive study of shareholder's heterogeneity. Yang and Liu[30] proposed the theory and research framework of shareholders' symbiosis based on the idea of ecology. The concept of niche, which was first proposed by Krebs [31], was defined as "different species in the same area can occupy different niches in the environment". Subsequently, the related theories and methods of ecological niche have been gradually introduced into the study of social organization and economic issues[32][35].

From the perspective of ecology, the listed companies and shareholders can be regarded as a virtual ecosystem. In this ecosystem, different types of shareholders can be considered as biological individuals or groups with different ecological characteristics, including individuals, groups or institutions. Corporate entities, producers in the system, whose purpose is to gain a profit, can provide resources for the survival of shareholders. The acquisition and circulation of income can be regarded as necessary resource for the survival of shareholders. The company's agent is another group. There is a special interaction between the agent and the shareholders of the company. At the same time, this is also an open system which will be affected by the company's external environment, including impacts of social, political, economic, legal, cultural and other elements. In this system, under certain rules, various ecological factors affect and restrict each other, and finally keep in the

Corresponding to the concept of niche, the position and status of the heterogeneous group of shareholders in the company's internal environment is called the ecological niche of the shareholders. It is the ecological niche of shareholders that determines the ways in which the revenue is gained. Different niche results in difference in revenue, such as the controlling shareholder in the company can rely on his or her control status to obtain additional stock transfer discount or premium, while medium and small shareholders may not have such an opportunity. At the same time, large shareholders who can control the vote can also operate the company to adopt a profit distribution scheme in his or her favor. It can be seen that through analyzing shareholders from the perspective of ecological niche, we can get much closer to the source of the problem. It can also provide a possible path for the formation of heterogeneous shareholders.

Shareholders' Niche Width

Niche width is among the most important descriptive parameters of group characteristics in ecological theory. Niche width can be understood as a measure of groups to occupy resources through certain corresponding relationship. Based on Levins[36] and Hurlbert's [37]classical measurement model of niche width, this paper has added resource-utilizing capability factor of species and defined shareholders' niche breadth as the breadth and ability of shareholder groups or organizations to obtain resources (profits) in niche space. The measurement model of shareholders' niche breadth simultaneously includes the proportion of species obtaining resources as well as the amount of each resource that can obtained by each species, which is shown in formula 1.

$$B_i = \frac{(N_{i1}+N_{i2}+\cdots+N_{is})^2}{\sum_{j=1}^{s}\left(\frac{N_{ij}^2}{r_{ij}}\right)} \quad (1)$$

In the formula, B_i is the niche width of the i-type shareholders, r_{ij} is their rate of return to obtain resources j, while calculation method is: the proportion between the sum of money of a certain type of resource acquired by shareholders against the sum of money of shareholdings held by shareholders. N_{ij} is the scale of money the i-type shareholders using resources j, m is the total number of types of shareholders, s is the types of resources. The ecological niche width calculated by the formula can comprehensively reflect the source which a certain type of shareholder can get and income situation of the shareholder.

DYNAMIC IMPROVEMENT OF EQUITY COST MODEL

Shareholders' heterogeneity is reflected in the rate of return between shareholders: the difference of capital cost, and consequent differences in corporate governance and management behaviors[12]. The heterogeneous shareholders have different objective functions, take different risks and expect to obtain corresponding benefits. For example, the majority of shareholders can gain more useful information relying on theirs advantages of equity. They have the power and ability to implement the supervision of the operator. Or they can also improve the company's value by increasing the integration of resources, injecting high-quality assets and other supportive behaviors. If the cost of supervision and support behavior of major shareholders cannot be compensated, or if they have to take greater risks because of the small shareholder's voting with their feet. Under the circumstance of "one share one vote", shareholders, correspondingly, would gain maximum extra revenue by means of their advantage of voting rights which could sacrifice creditors' and other shareholders' interests [41]. Obviously, there is great variation in rate of return required by different types of shareholders, while the difference in expected return rate will require the company to pay the differentiated equity cost for heterogeneous shareholders. Reasonable definition of the cost of equity, can not only help to distinguish between shareholders differently, but is also conducive to reducing the profit expropriation behaviors of shareholders by reasonable pricing.

Effects of shareholder's behavior on the ecological niche of shareholders

In practice, excepting the shareholding ratio of shareholders, difference between different types of shareholders is also presented in their own natures, concerns about the company, method and pattern of obtain profits [42]. Therefore, shareholders with different interest demands will strive for higher profits within their reaches, which can be directly manifested in behaviors' variation of different shareholders in the company. For example, "tunneling behavior" of major shareholders, "voting by feet" of medium and small shareholders, and collusive practices of institutional investors. The generation of these behaviors will lead to evident variation in ecological niche width due to different means to obtain profits and the amount of profits, while difference among heterogeneous shareholders will become more evident. So to speak, variation in formed status inside the company due to congenital individual differences of heterogeneous shareholders and implementation of shareholders' behaviors will further aggravate ecological width of the shareholders.

Effects of niche width on the resource-acquisition ability of shareholders

According to the definition of the ecological niche of the shareholders, when the niche breadth of the shareholders is increased, it shows that shareholder group or organization's ability to obtain the breadth and capability of resources (benefits) in the niche space is increased. The derivation process is as follows.

According to the shareholders' niche width model (1)

Take $\mathrm{S_{ij}}$ as value of resources that can be obtained by the i-type shareholders, $\mathrm{C_i}$ as the amount of money of holdings of the i-type shareholders, there is $\mathrm{r_i} = \sum$（$\mathrm{S_{ij}}/\mathrm{C_i}$）. Then, substitute $\mathrm{r_i}$ into shareholders' niche width model, and we can obtain the width of shareholders' niche:

$$B_i = \frac{(N_{i1}+N_{i2}+\cdots+N_{is})^2}{\mathrm{C_i}\sum_{j=1}^{s}\left(\frac{N_{ij}^2}{S_{ij}}\right)} \qquad (2)$$

In the formula, take B_i as niche width of the i-type shareholders, while $\mathrm{S_i}$ as the total value of resources that can be obtained by the i-type shareholders. By calculating the derivative, we find that for any $\mathrm{S_i}$, there if $\frac{\partial S_i}{\partial \mathrm{B}_i} > 0$.Therefore, we can see that resource that can be obtained by any shareholder is incremental for niche width B_i, that is, increase of B_i will lead to the increase ofS_i, decrease of B_i while will lead to the decrease of S_i. As a result, increase in shareholders' niche width will lead to corresponding increase in resources occupied by shareholders.

Effects of Shareholders 'Resource-Acquisition Capability on Equity Cost

In terms of heterogeneity of shareholders, the following relationship exists from the perspective of niche:

$$\mathrm{R}_{s_i} = \mathrm{R}_{s_{i_\mathrm{Y}}} + \mathrm{R}_{s_{i_\mathrm{N}}} \qquad (3)$$

In the formula, take $\mathrm{R}_{s_{i_\mathrm{Y}}}$ as risk rewards of cash flow expected by all shareholders, while $\mathrm{R}_{s_{i_\mathrm{N}}}$ as variation in expected risk rewards of cash flow caused by behaviors of the i-type shareholders. The functional relationship represented by $\mathrm{R}_{\mathrm{s}_{\mathrm{i}_{异}}}$ in the formula is:

$$\mathrm{R}_{\mathrm{s}_{\mathrm{i}_\mathrm{N}}} = \mathrm{g}(\text{Types of shareholder behavior}, \text{Measurement of the behavior})$$

$\mathrm{R}_{\mathrm{s}_{\mathrm{i}_\mathrm{N}}}$ will change with different resources obtained by the i-type shareholders and therefore influence necessary return rate of the i-type shareholders -- changes of equity capital cost. In this case, major shareholders can obtain more resources and profits. At this time, they will expect a further increase of cash flow's risk premium in the future if continue to implement tunneling behaviors; thus, they will increase necessary return rates, resulting in elevated equity cost that should be paid by the company for those major shareholders. Obviously, when shareholders 'behaviors occur, both resources obtained by performative shareholders and meanwhile necessary return rates required by themselves will increase, which will lastly lead to an increase of equity cost of those shareholders.

It can be seen that shareholder's heterogeneity determines characteristics of shareholders' niche width and thereby affects acquisition pattern, means and amount of resources by the shareholders. When changes take place in shareholders' resource-acquisition capability, equity cost will be affected. Through further reasoning, it can be indicated that shareholders' niche width and equity cost move towards the same direction. Figure 1 has listed variation of parameters brought by differences in shareholder's behaviors.

Figure 1 Statement of Changes of Related Parameters under Different Shareholders' Behaviors

Shareholders' Category	Shareholders' Behavior	Niche Width	Resource Acquisition	Equity Cost
Major Shareholders	Tunneling	↑	↑	↑
	Propping	↓	↓	↓
Institutional Investors	Collusion	↑	↑	↑
	Supervision	↑	↑	↑
Minority Shareholders	Hitchhiking	↑	↑	↑
	Voting by Feet	↑	↑	↑

IMPROVED MODEL AND DEMONSTRATION

Through the above analysis, we can see that there is associated relationship between shareholders' niche, obtained resources and equity cost. It is necessary to relax homogeneity assumption of equity cost and improve single equity cost.

(i) Shareholders' Heterogeneity Deformation of Equity Cost R_s

Based on traditional calculation of equity cost R_s, the formula of R_s after deformation of heterogeneity can be obtained through introducing different types of shareholders.

$$\mathrm{R}_s{}^* = \sum \mathrm{w}_i * \mathrm{R}_{s_i} \quad (4)$$

Shareholding ratio of the i-type shareholders w_i and equity cost in optimization model $\mathrm{R}_s{}^*$ are shown in the formula.

In this case, heterogeneity of shareholders is concerned and thus reflected through equity cost.

(ii) Initial Ecological Niche Width of Shareholders

Under the condition of homogeneity of shareholders, all shareholders possess the same capability to obtain resources, rate of return and niche width. That is:

$$B_1 = B_2 = \cdots = B_p = B_0$$

p is the amount of available resource types, and B_0 is the benchmark niche width under homogeneous shareholders and the same capability of shareholders to obtain resources.

According to the formula of niche width of shareholders, it can be obtained that:

$$B_0 = p^2(r_1 + r_2 + \cdots + r_p) \quad (5)$$

(iii) Optimization of Equity Capital Cost Model

In previous theories and derived formulas, we can find that shareholders' niche breadth and equity cost change towards the same direction. Therefore, we can fit variation of equity costs through changing shareholders' niche width.

Taking ecological niches of homogeneous shareholders B_0 as the benchmark, niche width of the i-type shareholders refers to the variation extent of shareholders' width B_i relative to that under homogeneous condition when compared with B_0.And take the ratio as the variation extent of equity costs transforming from homogeneous to heterogeneous assumption. Then change the equity cost of the i-type shareholders into:

$$\mathrm{R}_{s_i} = \frac{B_i}{B_0}\mathrm{R}_{s_0} \qquad (6)$$

In the formula, R_{s_0} is the equity cost under the condition of homogeneous shareholders.

Taking the proportion of the amount of equity of the i-type shareholders against full shares w_i as the weight, we can calculate the equity cost after optimization of the model, namely, the weighted average equity cost. R_s^*:

$$\mathrm{R}_s^* = \sum \left(\mathrm{w}_i * \frac{B_i}{B_0}\mathrm{R}_{s_0}\right) \qquad (7)$$

CONCLUSIONS

This paper has broken through the idea in traditional equity cost model which takes shareholders' homogeneity as a premise assumption, extended ecological niche theory to a research on shareholders' behaviors, discussed congenital factors of shareholders' heterogeneity and acquired differences brought by their behaviors, analyzed impacts of their behaviors on the width of shareholders' niche, further deduced influences of the width of niche on shareholds' resource-acquisition capability and improved the equity cost model, so as to display shareholders' difference through equity cost, realize risk identification of different types of shareholders, and promote more accurate use of capital cost for decision making.

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