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Research on Option Pricing Model Method of Top Management Team in New Ventures

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Abstract

Top management team is a special kind of team, has a big influence to the survival and the sustainable development of the new ventures. From a new perspective of the human capital options, the article uses the character of human capital options of the TMT from new ventures and introduces the Binomial model method into the human capital options of the TMT so as to build a pricing model method adapting the TMT from new ventures, and improve the everlasting of new ventures.

Keywords: new venture, top management team, option pricing model method, binomial model

1. Human Capital Options of Top Management Team in New Ventures

The human capital options of top management team (TMT) of new enterprises are important link of human resources management in new enterprises. Researches on human capital options are just unfolding in recent industrial researches. TMT's human capital options of new enterprises mean the current human capital investment (such as training, incentive) can make the enterprise gain the strategic investment or the right to choose investment and enterprise can use the option or not according to the foreseen circumstances. While the expected cash brought by TMT's human capital investment is greater than the human capital investment cost, enterprise should grasp the opportunity to further investment. Not vice-versa. Balkin & Logan (1988) believes that human capital pricing of large enterprises is not suitable for new enterprises when comparing it in new enterprises with others in large enterprises. Chandler et al. (2000) discriminates culture characteristics supporting innovation and emphasizes the effect of incentive mechanism in particular. Heneman et al. (2000) finds the significance of CEO or empire-builder post characteristics, cultural factors and organizational learning capacity in the human capital pricing. Graham et al. (2002) thinks that TMT's human capital pricing should be consistent with corporate goals and competitive advantages. Balkin & Swift (2006) are particularly concerned the problems of equity allocation and salary of TMT in new enterprises and also point out that the risk investments have important effects on executive team. In conclusion, the existing researches show that human capital pricing of the team of senior executives from new enterprises is as important as it in large enterprises. They can significantly influence the acquisition of outside talent and the cohesion of the top management team in an organization. At the same time, we should see the researches of human capital pricing of TMT from new enterprises are scattered and short of integrity and systematic frames.

2. Influencing Factors of New Ventures' Human Capital Options of Top Management Team

New venture's TMT is a collection of core employees with unmatched value, who are an important part of the core competitiveness of the enterprise. It is necessary to consider many factors when the human capital of the top management team of an enterprise is priced. Generally speaking, there are the following three major aspects needed to be considered: the new enterprise itself, the external market environment and the team of senior executives.

1) The new enterprise/new venture. New venture is a company that integrates the most current market research data with strong analysis that is based on comprehensive experience. The new enterprise is a platform for the top management team to create value. It is of little significance without the pricing for the top management team. And even the same team may create different value in different enterprises. The profits and value that a team makes in a well-functioning large enterprise is quite different from the profits and value that the same team makes in a relatively bad-functioning new enterprise. However, the shareholders cannot judge the value of the

core top management team only by the quality of their enterprise. Specifically, the following changes will be caused by the management team on the condition that other factors are unchanged: firstly, the addition of the value of the enterprise. The involvement of the TMT can improve efficiency of the enterprise, eliminate its potential threats and help it to achieve its strategic objectives; secondly, the enterprise has to burden the acquisition cost for TMT, so the shareholders firstly must pay some fees for the team can work for their enterprise. The shareholders have to bear the costs.

2) The connected market environment. Because of the increasing globalization of the economic development, the growing fierce market competition, the complicated and changeable demand of consumers and the development of the Internet technology, the traditional modes of corporate management are facing serious challenges. It is definitely an extremely difficult question for the entrepreneur's lack of experience, skills and resources to make their new enterprises outstanding in the fierce market environment. Neither can we reward those incomplete managers only because the enterprise has not made profits due to the prosperity of the relevant industry, nor can we punish the competent managers because of the downturn in the industry.

3) The top management team of new enterprises. It is undoubtedly that, the team of senior executives is very important to the enterprise, and even it sometimes is the key to decide the success or failure of the enterprise. Which aspects on earth can we study the human capital value of the team? This paper holds that the impacts of the team of senior executives on the human capital options can be interpreted from the following two aspects: firstly, the investment of the team of senior executives in a new enterprise can greatly help the enterprise identify and seize the market opportunities, and guide it to reach its expected strategic objectives; secondly, If the members of the team of senior executives leave, the strategy for the development of the new technology or product may be stopped or even fail. Therefore, the value of team of senior executives not only shows the cash flow brought about by the development of the new product or the new technology ,more importantly, it also shows in the value of the options.

3. Construction of Binomial Model of Human Capital Options of New Venture's TMT

Which means the price movement of securities is Binomial Model, based on the assumption of non-arbitrage and the basic assumption of risk neutral world, and has two possible directions-increasing or decreasing during a given time. The model derivation is relatively simple and the binomial pricing model of the human capital options is suitable to deal with more complex options since it can subdivide the given time period into smaller time units. The expected return of assets in the market is risk-free rate and options value is the discounted value of the expected revenue by the risk-free rate when fixing the price for options. Note that the model supposes the value of human capital has only two changing conditions: rising and falling. Then we introduce the computational method taking the one-period binomial model for example. C represents the expected present value of cash flow brought by the human capital investment in chart 1 and $uC(C^{+})$ represents the value after the human capital rising T years later. The expected sales revenue in the future which brought by the technology transfer or technology commercialization after human capital investment can be got by multiplying unit cost of product with the expected sales. $uC(C^{-})$ Represents the profit value which is decreasing due to the human capital loss. The ascertainment of C^{-} should consider the influence of every member in TMT on the final value of strategic decision.

$$uC(C^{-}) = W_1\beta_1 + W_2\beta_2 + W_3\beta_3 + \ldots\ldots W_n\beta_n \tag{1}$$

n is the number of members from TMT in the formula of 3.1. β_i is the demission rate of every member. We can estimate the future demission rate of every member in TMT according to the actual demission rate of every member in TMT over the years, while combining the indicator of workers' attitude, working achievements from the members of the team of senior executives with the incentive degree to the TMT from the enterprise and the work satisfaction. Wi=uC +L-S-R-WX (i=1, 2, 3, …, n) represents the proceeds creating by the human capital after members leaving in the Formula 3.1.L represents the demission damage of the members in TMT, which is provided definitely in the labor contract of enterprise. S represents the salary and bonus of executive members. R represents the replacement cost of human capital, which is called the cost to rehire workers, including recruit, instate, cultivate and so on. W_X is the lost value of human capital value, which is caused by the member quitting, and then there is $C(1+r) = q\ C^{+} + (1-q)\ C^{-}$.

$$q = \frac{C(1+r)^{t} - C^{-}}{C^{+} - C^{-}} \tag{2}$$

q is the risk-free probability and r is the risk-free rate in the formula of 3.2.We can conclude that nation debt are regarded as the risk-free rate according to the enterprise itself and historical data of related investments.

As a corollary, if making W^+ is the option value brought by the investment of human capital when the cash flow is rising. X is the capitalized cost of human capital including salary, bonus, training investment and so on. We can calculate the final option value.

$$W=\frac{qW^{+}+(1-q)W^{-}}{(1+r)^{t}} \tag{3}$$

By the above formula, we can learn the value of the human capital options as long as we know the risk-free rate of q , X , C^{+} , C^{-} . The paper simply explained the principle of binomial pricing model of the human capital options from TMT. The principle also can be extended to the N stage of the pricing model of the human capital.

4. A Case Study of Construction of TMT's Option Pricing Model in a New Venture

Supposing a typical example that, TMT of a new enterprise develops a technology, whose planning period is two years and company elevated cost of relevant training and learning is 50 million at the beginning of the first year. If the technology develops successfully, TMT will launch high-tech products after a year. But the investment of the development of this technology is 1,000,000 Yuan and the anticipated income is 3,000,000 Yuan. We estimate that the risk-free rate is 5% and weighted average cost of capital is 10% according to the investment data of the products available for reference provided from similar enterprises in the market. The cash flow of this project is showed in figure 1.

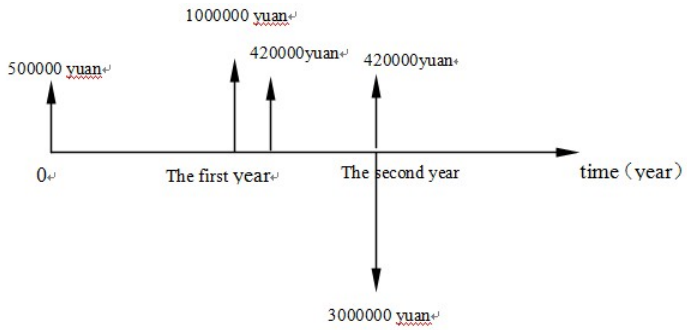

Figure 1. Cash flow of investment projects chart

This example finally gets the whole team value by the option value, which is created by three executives in the future. Alteration in the value of the whole team is determined by CEO, artisans and operators in the new enterprise. Supposing the attrition rate within the project planning period of executive of CEO, technical managers, production managers is 5%, followed by 7%, 3% and the average wastage rate for the team is 5% that we can get. At the same time, the contract clearly stipulates that a one-time payment of salaries of CEO, technical managers and production managers from enterprise are 200,000, 120,000 and 100,000, while the contract clearly stipulates that executives should pay ten month's salary as penalty when they leave their office automatically. The replacement cost after the executive running off is 150,000 Yuan. According to the Binomial model from TMT, we can calculate as follows: supposing W_{21} is the value creating by human capital of TMT after CEO leaving their office when the new enterprise is founded in the second year. W_{22} is the value creating by human capital of TMT after technical managers leaving their office. W_{23} is the value creating by human capital of TMT after production managers leaving their office. Firstly, CEO can make an integrated evaluation for the feasibility of investment to promote the development of high-risk technology, and can't go so far as to miss the opportunities to gain a high return. Secondly, technical managers will cause the development of the whole technology products to fail and lead the future value of human capital is zero once leaving their office. It is because the knowledge they master can't be imitated. Whether production managers leave their office will affect the yield of new technology products. Once production managers leaving their office, the output of high-tech products will decline, which means value loss of human capital of the whole TMT is the loss caused by the difference between the expected yield and effective productions. Loss in this example is 1,200,000 Yuan. Calculating W_{21} , W_{22} and W_{23} from this.

$W_{21}=C^{+}$ +L-W-S-W_X=300+16.67-20-15=2,816,700 Yuan

$W_{22} = C^{+}$ +L-W-S-W_X=0+10-12-15=-170,000 Yuan

$W_{23} = C^{+}$ +L-W-S-W_X=300+8.33-10-15-120=1,633,300 Yuan

Thus value of C_2^{+} is known, which is 3,000,000 Yuan and we can figure out that

$C_2^{-} = W_{21} * \beta_1 + W_{22} * \beta_2 + W_{23} * \beta_3$=281.67*5%+(-17) *7%+163.33*3%=14.08-1.19+4.90=177,900 Yuan.

We also figure out that $C_1^{+} = \frac{qC_2^{+} + (1-q)C_2^{-}}{1+R} = \frac{95\% * 300 + 5\% * 17.79}{1+10\%}$=2,599,000 Yuan by the C_2^{+} and C_2^{-} in the second year. The departure of production managers doesn't have influence on the output of high-tech products because production projects don't run. Therefore, $W_{13} = C^{+}$ +L-S-R-W_X=300+8.33-10-15-0=2,833,300 Yuan.

In the same way, we can figure out $C_1^{-} = W_{11} * \beta_1 + W_{12} * \beta_2 + W_{13} * \beta_3$=281.67*5%+(-17) *7%+283.33*3%=213900 Yuan and then $C = \frac{qC_1^{+} + (1-q)C_1^{-}}{1+R} = \frac{95\% * 259.9 + 5\% * 21.39}{1+10\%}$=2,254,300 Yuan.

We can figure out that $q_1 = \frac{C(1+r) - C_1^{-}}{C_1^{+} - C_1^{-}} = \frac{225.43*(1+5\%) - 21.39}{259.9 - 21.39}$=90.27%,

$q_2 = \frac{C_1^{+}(1+r) - C_2^{-}}{C_2^{+} - C_2^{-}} = \frac{259.9*(1+5\%) - 17.79}{300 - 17.79}$=90.4% according to the related count of the expected revenue of the first year and the second year, while the option value brought by the human capital investment of new enterprise in the second year is $W_2^{+} = \max\{300 - 100*(1+5\%) - 42, 0\}$=1,530,000 yuan. The option value of human capital when the cash inflows decline is $W_2^{-} = \max\{17.79 - 100*(1+5\%) - 42, 0\}$=0 yuan, and the option value of the first year on this basis is $W_1 = \frac{q_2 W_2^{+} + (1-q_2)W_2^{-}}{1+r} = \frac{153*90.4\% + 0*(1-90.4\%)}{1+5\%}$=1,317,300 Yuan. Moreover, we can calculate the option value brought by the human capital investment of new enterprise in the first year. $W_1^{+} = \max\{131.73 - 50*(1+5\%) - 42, 0\}$=372,300 Yuan. The option value brought by the human capital investment of new enterprise when the cash inflows declines is $W_1^{-} = \max\{17.79 - 50*(1+5\%) - 42, 0\}$=0 yuan, and we can finally figure out that

$W = \frac{q_1 W_1^{+} + (1-q_1)W_1^{-}}{1+r} = \frac{37.27*90.27\% + 0*(1-90.27\%)}{1+5\%}$=320,100 Yuan. In conclusion, the human capital value of new enterprises what we get by option pricing model is 320,100 Yuan. That is the option value of human capital of TMT.

5. Conclusions

From the perspective of uncertainty creating value, option pricing models try to unearth the uncertainty about the value of advanced human capital of the TMT from new enterprises. As we can see, methods of previous traditional human capital assessment relatively ignore human capital, especially the uncertainty in the human capital value of the top management team is failed to understand the value of strategic decision brought by the investment of human capital, which causes the underinvestment in executive human capital. It not only make enterprises miss good investment and preemptive opportunities, but also affect TMT's enthusiasm seriously, which cause the drain of talent and store up problems for the long-term development of enterprises and especially the new enterprises. The profound analysis of efficient pricing avoids the horrific outcomes of underinvestment in human capital. This paper is only a preliminary, exploratory study. The study of top management team of new enterprise and its pricing is a new topics and worthy of scholars' further exploration, and also is a very meaningful further research direction.

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