Venture Capital Investment in High-tech Firms and Corporation Valuation

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Abstract

This paper, using modern investment theory and valuation analysis method, analyzed the characteristics of venture capital in high-tech firms and the relationship between the characteristic and the investment income. We discussed the internal relationship and influence between corporation valuation and venture capital investment income. Based on the analysis, we built a model to forecast the income of venture capital in high-tech firms, which provides a systematic and overall analysis method to project investment in high-tech companies.

Our paper is structured as follows:

First, we analyzed the specialties of venture capital in high-tech companies and the factors that influence the value of venture capital. Venture capital analysis must involve the special and systematic investigation and evaluation. By value analysis, we found the factors that influence the value of venture capital. These factors include technique, management, market and the operation mode of the companies. We discussed these factors and how they affect the value of venture capital in detail.

Based on the analysis, we developed a method to evaluate the value of venture capital. As the factors that affect value are related to each other and influence each other, and they are all dynamic and changeable, we utilized the fussy set theory to judge synthetically. The empirical research is followed to prove our evaluation method.

Finally, we worked on the valuation of the company, since the increase of value is the core aim of corporations. By contracting the value before and after the investment, we will find if the investment is valuable. Thus, our model and theory provide a systematic and overall evaluation method on the project investment of high-tech firms, which is much useful for project managers in high-tech firms.

1. Introduction

Investors must consider the risk and income of venture capital. Risk analysis is a very important part in project evaluation.

High-tech venture capital evaluation should be analyzed from the aspects such as project, investment institution, investment method and so on.

We use modern investment theory and valuation analysis method, analyzed the characteristics of venture capital in high-tech firms and the relationship between the characteristic and the investment income. We discussed the internal relationship and influence between corporation valuation and venture capital investment income. Based on the analysis, we built a model to forecast the income of venture capital in high-tech firms, which provides a systematic and overall analysis method to project investment in high-tech companies.

Our paper is structured as follows: First, we analyzed the specialties of venture capital in high-tech companies and the factors that influence the value of venture capital. Based on the analysis, we developed a method to evaluate the value of venture capital. Finally, we worked on the valuation of the company, since the increase of value is the core aim of corporations. By contracting the value before and after the investment, we will find if the investment is valuable. Thus, our model and theory provide a systematic and overall evaluation method on the project investment of high-tech firms, which is much useful for project managers in high-tech firms.

2. Qualitative analysis of high-tech venture capital

2.1 the risk, strategic and financial traits of high-tech venture capital

The risk of high-tech venture capital is mainly because of the uncertainty of technology development. Venture capital has the strategic trait as industrial investment and it also has financial trait as stock investment.

2.2 the method of high-tech venture capital

To compute the equity ratio and the investment to get this ratio, investors must evaluate the overall value and consider its income and development potential. And, they should evaluate the risk and income of investment. Finally, they should confirm the equity ratio and cost of investment according to the contract of income and the market price of the corporation.

3.the risk analysis of high-tech venture capital

3.1 the factors which influence the risk

The risks of high-tech venture capital include R&D risk, produce risk, market risk, management risk and development risk. According to the research result of Chen, Li[3] (1998), the risk and successful ratio for each process is presented in table 1.

Table 1 the risk analysis of high-tech venture capital

Risk factors	Main content	Successful ratio	
R&D risk	The quality of personality, R&D investment, Experiment condition etc.	P_1	Entrepreneur
Produce risk	Technology foundation, investment, the quality of technology personality etc.	P_2	Entrepreneur
Market risk	Management structure, the belief of operation, expectation income etc.	P_3	Investor and Entrepreneur
Management risk	Target market, customer market, competition, accessibility etc.	P_4	Investor and Entrepreneur
Development risk	Operation achievement, efficiency of product, government tax policy etc	P_5	Investor and Entrepreneur

The successful ratio was got by Delphi method, market investigation and evaluation. The detailed computation method is shown in reference 3.

2.3 the risk evaluation of high-tech venture capital

There are two evaluation methods that are usually used.

2.3.1 the probability evaluation method

Suppose the risk of stage j of project I is R_{ij} (j=1, 2, 3, 4, 5) and each P_1 (l=1, 2, 3, 4, 5) is dependent. Then, we have

$$R_{ij}=1-\prod_{l=1}^{5} Pil$$, and the risk for stage j is $Rj=\sum_{i=1}^{5} Rij$.

2.3.2 the risk evaluation model for high-tech project

The scholars in our countries formulated a method to evaluate the risk for high-tech project and they built the computer system also. The software includes information management, financial analysis and risk analysis.

The results of risk analysis can be used on two sides: risk management and income forecast. It can also provide the basic information for insurance and it provides the entrepreneur the direction for risk management.

3. the analysis of relationship between risk and income

3.1 the overall analysis of relationship between risk and income

Risk and income are the two aspects of investment. When invest, investors should pay attention to the principles that

risk and income are corresponding.

If the risk analysis object is a project, then, the income forecast also should to the same project. Then, the risk should be adjusted by income and the income also should be adjusted by risk.

Income is from project risk directly. The larger the risk, the larger the income. Then, the relationship between investment income, investment risk, project income and project risk is very complex. Table 2 presents this relationship.

The same direction of the arrows indicates change in the same direction. The vertical arrow indicates cause and effect relation.

Table 2 the relationship between risk and income

	Project risk	Project Income
Investment Risk	↑ ← ↑	↑ ← ↑
Investment Income	↑ ← ↑	↑ ← ↑

	Investment risks	Project risk
Investment income	↑ → ↑	↑ ← ↑
Project Income	↑ ← ↓	↑ ← ↑

3.2 income forecast model adjusting by risk

According to our analysis above, the investment income can be determined by project risk, project income and investment risk. Normally it was done by forecast the future cash flow of project. If we consider the risk, we can forecast it as follows: adjusting cash flow, adjusting the income ratio and the overprice income.

Suppose the cash flow of every year is a variable, X_{ti} is the cash flow of project i for stage t. The average value for X_{ti} is u_{ti}, variance is σ_{ti}^2, (i=1, 2, $\cdots$, m), then the cash flow of stage t is

$$X_t = \sum_{i=1}^{m} X_{ti}$$

$$\text{Expectation value } E[Xt] = E[\sum_{i=1}^{m} X_{ti}] = \sum_{i=1}^{m} u_{ti} = u_t$$

$$\text{Variance } V[X_t] = \sum_{i=1}^{m} \sigma_{ti}^2 + 2\sum_{i \neq j} \text{cov}(X_{ti} + X_{tj})$$

(1) Adjusting discount rate method

According to modern investment theory, the risk level of project can be reflected by the ratio of β, which is the risk of the project versus the whole market.

$$\beta = \frac{\text{Risk of Investment Portfolio}}{\text{Risk of Stock Market}}$$

According to Capital Assets Price Model (CAPM), the discount rate of project i is $r_i = r_f + \beta_i(r - r_f)$

The expectation income of m projects is

$$r_m = r_f + \beta_m(r - r_f)$$

r_f is the income of security assets such as deposit rate. β_m is the risk coefficient of m projects. The current net value is:

$$Pn = \sum_{t=0}^{n} [\frac{atXt}{(1+rmt)t}] = \sum_{t=0}^{n} \sum_{i=1}^{m} \frac{atXt}{(1+rmt)t} \sum_{t=0}^{n} [\frac{atXt}{(1+rmt)t}] = \sum_{t=0}^{n} \sum_{i=1}^{m} \frac{atXt}{(1+rmt)t}$$

And, we can compute the current net value of each project by r_i.

(2) Risk Overvalue Method

Risk income is the compensation of undertaking higher risk. According to the evaluation method of stock market, the methods are as follows:

1.Sharp Rule

Sharp rule shows the income of the risk unit. The formula is:

$$S_p=(R_p-r_f)/\sigma_P$$

S_p is Sharp rule, R_p is the income ratio of the investment profile, r_f is the income of security assets such as deposit rate and σ_P is the standard deviation of investment profile. Sharp rule is to compute the income of the risk unit.

2. Dulena rule

Dulena rule uses market risk β_m, to represent the overvalue income of each risk unit. The formula is:

$$T_p=(R_p-r_f)/\beta_P$$

T_p is Sharp rule, R_p is the income ratio of the investment profile, r_f is the income of security assets such as deposit rate and β_P is the market risk of investment profile.

3. Jason Rule

The theoretical foundation of Jason Rule is the CAPM model. It is the difference between the real income ratio of investment profile and the theoretical income ratio of CAPM model.

$$\alpha_P=R_p-r_f-\beta_P(R_m-r_f)$$

R_m is the market index income ratio

Risk overvalue equals to the risk value and the rule, that is

$$\Delta P=R\times S_p \text{ (or } T_p,\ \alpha_P\text{)}$$

The income adjusting by risk

$$P=P_n+\Delta P$$

P_n is the normal income ratio when there are no risk.

4. The overall analysis of Corporation Value and Investment Income

After the analysis of investment risk and income, investors should evaluate the investment cost and the equity ratio they will get. The determination of equity ratio is just the process of valuation the corporation.

The process of determination of valuation is as follows:

1. Consider the risk that connects with financing and determine the estimate income ratio.
2. Estimate the price to equity ratio and the value of the corporation equals P/E multiply the income that year.
3. The entrepreneurs' equity ratio equals the market value of the corporation divides the income the entrepreneurs required.

In a word, the capital need in the initial stage is less and the risk is bigger, it mainly relied on the investment of entrepreneurs. So, the income ratio they required and the equity ratio is higher. But, with the development of products, other companies and investors join, the risks the entrepreneurs undertake reduce, so the income ratio reduces too. According to the experience of foreign countries, in the seventh year, the equity ratio of entrepreneurs is reduced from 77% to 54%, and this ratio dropped to 21% in the eighth year and they begin to withdraw.

5. Conclusion

(1) According to the investigation to many investment agencies, among the investment evaluation software, the risk analysis is far from enough. It cannot meet the needs of high-tech investment. Risk analysis should be the focus of investment research and new models should be developed.

(2) The risk of high-tech venture capital is lies in many aspects. The main purpose of risk analysis is the measurement of the impersonal risk. The personal risk only can be hold by investors themselves.

(3) The valuation of corporation relies on the efficient stock market, the healthy agency and better inside control system. But, now, the environment is not perfect for our valuation, and it effects the valuation of corporation. To make our valuation more standard, our outside environment must be better.

References

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