Research Article
Based on Markov Chain of Agricultural Enterprise Risk Investment Profit Forecast Economic Model

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Abstract: The Markov chain empirical prediction results of economic models based on agricultural enterprises, so as to avoid investment risks. Venture capital investment as a new investment tool, its earnings forecast method is better than the traditional finance investment prediction, which is more complex, more professional. This study constructs a risk investment based on Markov chain prediction of economic model, the fitting matrix method to estimate one-step transfer probability matrix. Finally taking Shaanxi Huasheng Group's actual earnings data as an example, a calculating example is given, which shows the effectiveness of the method. This study presents the economic model for the development of the venture capital industry has certain positive role.

Keywords: Fitting, forecasting, Markov chain, venture capital

INTRODUCTION

Venture capital (Venture Capital Companies) is money raised by companies to finance a new great potential, higher risk venture item and development of research, product, production and feasibility of successful project results from successful management and also keeping an investment behavior whether it is produced by surplus or loss. It is called as a high risk, a high yielding financial services, a high technique and a rapid growth of items. It is an accelerating agent for the development of venture capital industry and brings high profit for the venture capital service providers (Jun and Xi, 2008). It is also existent in capital of rights and interests, it is typical finance capital by transferring shares right to gain lasting capital increment, which is a sort of capital of expert manage to aim at starting carve out enterprise.

In recent years, many scholars have conducted a lot of research on risk investment (Zhang and Si, 2007), using the system theory and GERT neural network theory and its principle, established risk portfolio model, bringing forward risk of a portfolio of series, parallel and hybrid combination model. And then analysis of risk investment portfolio optimization and risk management (Xu, 2007). This study will apply the game theory and method for the operation of risk investment, revealing the venture investors and entrepreneurs to take some action reason and how both sides adopt corresponding strategy, how to communicate with each other. Many scholars to be a real option model applied in risk investment decision (Shen and Liu, 2005), Black-Scholes and Merton proposed that is partial differential equation model for

solving the current agricultural high-tech enterprises' value, traditional agricultural methods of enterprise value evaluation is insufficient. Analysis of the defects of the traditional NPV method, the establishment of risk investment projects of the binomial options pricing model (Liu *et al.*, 2005).

Based on the risk investment yield, the first presents a method based on Marco chain prediction model, analysis of risk investment industry operation process, the fitting matrix method for the estimation of one-step transfer probability matrix, combined with the national agricultural leading enterprises-Shannxi Huasheng Group over the years the actual earnings are calculated, this study shows that the model is correct and effective.

The process of venture capital: According to the characteristics of risk investment industry and risk investment behavior stage, the development of the venture capital industry can fine division, that can form seed stage, its period, growth period and mature period, As shown in Fig. 1 (Zhou, 2007). Risk investment is inseparable from the venture entrepreneur and venture capitalist, the entrepreneur is the early scientific research achievements of possession, in the home of venture capital investment funded by the research and development, product development, the results will turn into new technology products. After the company registration, the official production and put in the market, with the expansion of market demand and expand the scale of production and sales. Finally, the listing of enterprises or by the acquisitions of other companies, home of venture capital investment to recover funds profit and exit enterprise operation.
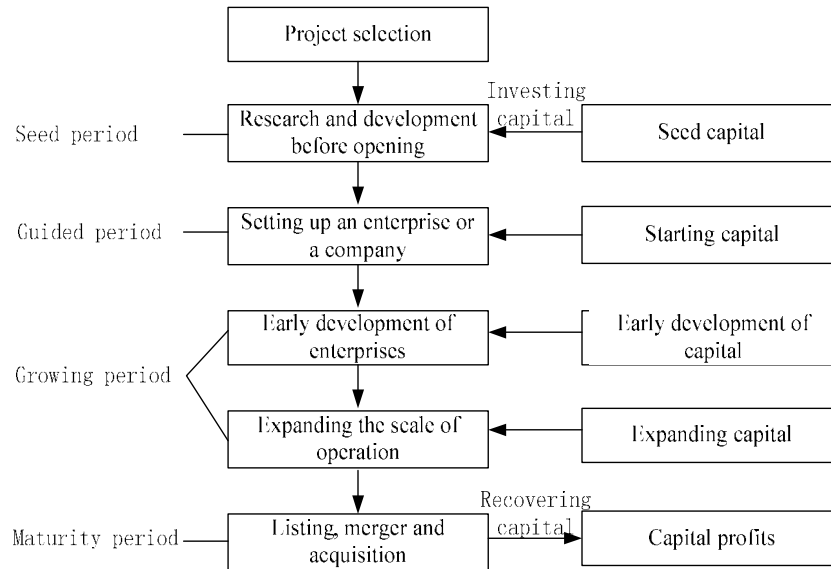
Fig. 1: Operation of the venture capital

Marco chain prediction model: Known systems in the presence of n states, the state space for i = {0, 1, 2,..., n}. Hypothesis in n observation, the system is in the i state of a total of n_i times, n_i system from i by one step transfer to state j frequency, then n_{ij} (i, j∈I) is composed of a matrix (n_{ij}) is called metastasis frequency matrix (Yu *et al.*, 2007). Will shift the frequency matrix of the line i j column element n_{ij} by dividing the i row each element sum of income numerical called transfer frequency, denote by p_{ij}, i, j∈I, that is $p_{ij} = n_{ij}/n_i$. So we can get the one-step transfer probability matrix p_1, similarly we can get the two step transition probability matrix p_2 …n step transition probability matrix p_n. In order to obtain more accurate one-step transfer probability matrix, on the basis of transfer probability matrix $p^{(n)} = P^n$. Where $p^{(n)}$ for n transition probability matrix, p for one-step transfer probability matrix. Using optimization theory, the one-step transfer probability matrix of $p^{(n)}$ with the n transition probability matrix $p^{(n)}$, the norm of the difference between and reach the minimum standards, establishing economic model following as:

$$\min f(P) = \sum_{i=1}^{n} \left\| p^{(i)} - P^i \right\|$$

$$ever \begin{cases} \sum_{i=1}^{n} p_{ij} = 1, i = 1,2,\cdots,n \\ P_{ij} \geq 0, i, j = 1,2,\cdots,n \end{cases}$$

The constraint condition is composed of state transfer probability matrix of nature by this model, the above model is used for solution of MATLAB. Based on the above ideas, Marco chain forecast economic model algorithm is as follows:

1) Using S-Plus statistical software, application of K-mean clustering method to generate data classification standard. According to the generated classification standard to determine the data from the state.
2) According to (1) the state sequence and economy models, using MATLAB software to solve a Marco chain transition probability matrix p.
3) Respectively, before some data for the initial state of surface, combined with the corresponding state transition probability matrix, which can predict the next state probability p_{ji}, i, j for state, i, j∈I, max{p_{ij}, i, j∈I}, corresponding state is the stage of the predicted state.

MATERIALS AND METHODS

Now we take Shaanxi province Huasheng Group during 1986~2008, in 23 year profit data as an example, analysis and forecasting, to illustrate the economic model procedures for specific applications and prediction results.

The research is based on the 1986~2008 in all 23 years of the high-tech enterprise's profit, predicting 2009 the enterprise's profit, steps are as follows:

- Using S-Plus statistical software in the k-means clustering method all data will be divided into 5 intervals and determine their state (Table 1).
  On account, it can be obtained according to the frequency estimates for a variety of step state transfer probability matrix p_i, i = 1, 2, …5, into the economic model, using MATLAB to achieve a state of transition probability matrix in p.
- Table 1 shows, in 2008 for the state. By fitting the one-step transfer probability matrix p, know

Table 1: A region 1986~2008 with a risk investment industry income and status classification

Year		1986	1987	1988	1989	1990
Profit (million Yuan)		2238	2284	1549	912	876
State		1	1	1	3	2
1991	1992	1993	1994	1995	1996	1997
1235	1637	1781	1984	1632	1533	1629
1	1	1	1	1	1	1
Year			1998	1999	2000	2001
Profit (million Yuan)			1830	1607	1012	919
State			3	4	4	4
2002	2003	2004	2005	2006	2007	2008
427	225	169	225	287	489	696
3	5	2	2	4	5	5

max $\{p_{5i}\} = 0.6038$, where i = 5. In 2009 the predicted state 5, even $299 \leq x \leq 752$. 2009 profit measured value is 5,610,000 Yuan and the actual situation is completely consistent with the economic model, illustrate the correctness of the model.

RESULTS AND DISCUSSION

In the following, we will take the earnings data of a high-tech enterprise between the year of 1986 to 2008 in Huasheng Group, Xi'an City, Shaanxi Province, China, as an example to show the specific application procedure of the mathematical model and its forecast results (Chen, 2005):

$$P_1 = \begin{pmatrix} 4/5 & 0 & 1/5 & 0 & 0 \\ 1/3 & 1/3 & 0 & 1/3 & 0 \\ 0 & 1/3 & 0 & 1/3 & 1/3 \\ 0 & 0 & 1/4 & 1/2 & 1/4 \\ 0 & 1/2 & 0 & 0 & 1/2 \end{pmatrix}$$

$$P_2 = \begin{pmatrix} 3/5 & 1/10 & 1/5 & 1/10 & 0 \\ 1/3 & 0 & 0 & 1/3 & 1/3 \\ 1/3 & 1/3 & 0 & 1/3 & 0 \\ 0 & 0 & 1/4 & 1/4 & 1/2 \\ 0 & 1 & 0 & 0 & 1/2 \end{pmatrix}$$

$$P_3 = \begin{pmatrix} 1/2 & 1/10 & 1/5 & 1/5 & 0 \\ 1/3 & 0 & 0 & 0 & 2/3 \\ 1/3 & 1/3 & 0 & 1/3 & 0 \\ 0 & 1/3 & 1/3 & 0 & 1/3 \\ 0 & 0 & 0 & 1 & 0 \end{pmatrix}$$

$$P_4 = \begin{pmatrix} 1/2 & 1/10 & 1/10 & 3/10 & 0 \\ 1/2 & 0 & 0 & 0 & 1/2 \\ 1/3 & 0 & 1/3 & 1/3 & 0 \\ 0 & 2/3 & 0 & 0 & 1/3 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$

$$P_5 = \begin{pmatrix} 1/2 & 0 & 1/5 & 3/10 & 0 \\ 1/2 & 0 & 0 & 0 & 1/2 \\ 1/3 & 0 & 1/3 & 1/3 & 0 \\ 0 & 2/3 & 0 & 0 & 1/3 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$

$$P = \begin{pmatrix} 0.8364 & 0.1389 & 0 & 0.0247 & 0 \\ 0.4012 & 0.1325 & 0 & 0.1153 & 0.3510 \\ 0.3235 & 0.0375 & 0.4327 & 0.0764 & 0.1299 \\ 0 & 0.0248 & 0.0037 & 0.6128 & 0.3587 \\ 0 & 0 & 0 & 0.3962 & 0.6038 \end{pmatrix}$$

CONCLUSION

Through example calculation, we obtain the forecast result and the actual situation of full compliance with the economic model, in order to show the effectiveness and accuracy of the economic model. This study put forward the economic model can be applied to the prediction of risk investment, as the home of venture capital investment to provide basis for decision making.

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