THE CONSTRUCTION OF ECONOMIC MODEL EVALUATION SYSTEM BASED ON THE ECONOMIC MODEL OF RESOURCE PLATFORM

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Abstract: With the development of computer and information technology, more network technology have been applied into teaching area. The economic model resources platform is firstly built by schools of economics and management, which hosting a economic model library. And those models come from classical or innovation models and are built by teachers and students, using technologies such as Matlab and website development to display on the platform. As one kind of teaching resources, the economics model should be well built on the platform to enable the learners easily understanding. Then what standard can we find to determine the quality of the economic models? So we need construct a evaluation system to help students select models for learning. This article combines AHP with qualitative and quantitative method and Delphi to construct the evaluation system. Finally we applicate the system to evaluate the economic models. It can help the learners to select high quality models. And for the bad quality models, the managers can improve them.

1 INTRODUCTION

With the rapid development of information technology, network technology has been inserted in teaching (Huang Dequn, 2005). But how to raise the quality of growing teaching resources? It becomes a topic people concerns, especially the designing and evaluation of the network resources.

In order to study the interdependence quantitative relationship between economic phenomena and help people solve real economic problems, we build the economic model library. For example, Black_Scholes Options Pricing Model and Cartel model of oligopoly market. Its website is http://211.71.64.167/exper.

Now the quality of the models is uneven, how to judge those models' quality and give reference for the teachers and students has become the focus of the model management. This article gives researches on how to construct and use the economic model to evaluation system by using AHP from management and development perspective.

2 CONSTRUCT EVALUATION INDEX SYSTEM OF ECONOMIC MODELS

The economic model evaluation system is study on the economic models on the platform, and it is used by the manager and users of the platform. Whether a model has the value to learn, the standard we trust is very important.

We use analytical method (Sun Wenhong, 2010) and AHP (Jin Zhilong, 2009) to get the evaluation index system, following the two principles (Zhao Yang, 2006): comprehensive and independent.

According to the principle of AHP, we divide the system into three lever: target, rule and program layers (Xu Wenxue, 2010). After consulting criteria

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of teaching resources and combining the characteristics of the economic models, we get the target layer indicators. Then we use analytical method to decompose the target layer indicators one by one (Zhuang Yu, JI Meiru, 2008), and we get 11 indicators of the rule layer. Similarly as the program layer indicators. Evaluation is like the table 2.

3 THE WEIGHT DETERMINATION OF THE ECONOMIC MODEL EVALUATION SYSTEM

Because mature and easily to use, this article initially adopts AHP method after comparison. There are 5 steps to determine the weight:

Step 1: Structuring Variables

As mentioned above, the first-level indicators are assumed to A1, A2, A3, A4.then its corresponding second-level indicators were set to B1m, B2n, B3k (m, n, k are natural number). The same as the third-level. The corresponding weight of the first-level indicators are assumed as w_1, w_2, w_3, w_4, then:

$$\begin{cases} 0 \le \omega_i \le 1 \quad (i = 1,2,3) & (1) \\ \sum_{i=1}^{4} \omega_i = 1 & (2) \end{cases}$$

Step 2: Constructing the Matrix

When comparing the same level indicators, it can generally use "important", "slightly important ", "obviously important ", "extremely important " to describe the importance of one factor relative to another factor. The results of pair wise comparison is denoted in 1-9 scale (Wang Hao, Ma Da, 2003).

We invited 55 experts to rate economic model in order to create a comparison matrix by questionnaire and we got the initial data.

Steps 3: Calculating Index Weight and the Largest Eigen Value

Determine the matrix data (Table 3 2-5 data) in accordance with the formula and calculate the maximum eigen value of each index and weight, the results in Table 1.

Step 4: Consistency Test

Because the matrix structure made by the experts do not necessarily meet the matrix consistency. In order to limit this error, it is necessary to test the consistency. Denoted by:

$CI = \frac{\lambda_{\max} - n}{n-1}$, (n is equal to the number of indicators in matrix.)

If $n \le 2$,the matrix is always exactly the same, it means $CI = 0$ .When $n > 2$,the matrix's consistency index and the ratio of the average random consistency index are random consistency ratio. We denote it as: CR .

If $CR<0.1$, the comparison matrix has satisfactory consistency and the calculated feature vector is reliable. Otherwise it needs to re-adjust the matrix until with satisfactory consistency.

After calculation, all comparison matrix are consistent, and the results credible.

Step 5: Calculation of the Total Weight

Following the step4 we can calculate every indicator's weight and test its consistency.

Supposing the indicator i 's weight is equal to a_i, its j secondary-level indicator's relative weight is b_j.Then this secondary-level indicator's total weight is $a_i \times b_j$.

Then use the following formula to calculate the total random consistency index:

$$CR = \frac{\sum_{i=1}^{n} a_i CI_i}{\sum_{i=1}^{n} a_i RI_i}$$

While: a_i : the i first-level indicator's weight. CI_i : the i first-level indicator's consistency index value. RI_i : the i first-level indicator's average random consistency index values.

The final overall consistency test result is 0.028312 which is far less than 0.1. So it is consistent with consistency. Evaluation index system's weights are shown in Table 2.

4 VALIDATIONS AND APPLICATION OF THE EVALUATION SYSTEM

4.1 Example Demonstrating of the Evaluation System

When an evaluation system is established, we need to verify its validity and rationality. We do a sampling survey and use two methods (lever evaluation and evaluation system) to test the quality of the models. By comparing the two groups, they match very well. Through this validation, it indicates

Table 1: Single evaluation index weights and the largest Eigen value.

Indicators	A	B	C	D	Mi	Wi	(AW)i	maximum Eigen value	weight
A	1	2	2	1	1.41	0.34	2.04	0.696	0.505
B	0.5	1	2	2	1.19	0.29	1.58	0.451	0.327
C	0.5	0.5	1	1	0.71	0.17	0.51	0.087	0.063
D	1	0.5	1	1	0.84	0.20	0.71	0.144	0.104
total					4.15	1		1.378	

Table 2: Evaluation of economic models and the corresponding weight.

A Target layer		B Rule layer		C Project layer	
1 content	0.276	11 Integrity	0.124	111 Theoretical source	0.029
				112 Assumptions	0.017
				113 Theory to explain	0.048
				114 Analysis	0.047
		12 Accuracy	0.089	121 Interpretation accuracy	0.038
				122 The accuracy of the understanding	0.018
				123 Whether to seize the essence	0.027
		13 Understandability	0.063	131 Example	0.018
				132 Analogy to explain	0.009
				133 Whether has interpretation of the academic term	0.036
2 Technical	0.455	21 Operability	0.256	211 Whether the output of experimental operation	0.148
				212 Whether the result is that the process	0.053
				213 Whether has input data validation	0.053
		22 Friendly interface	0.067	221 Tips range of input data	0.028
				222 Sample data	0.016
				223 The reasonable of the control	0.022
		23 Experiment to explain	0.131	231 Experiment description	0.041
				232 Interpretation of results	0.057
				233 whether is the steps to explain logical	0.030
3 effectiveness	0.102	31 Intuitive	0.027	311 Text	0.015
				312 Graphic description	0.008
				313 Other visual presentation methods	0.004
		32 Data Validation	0.075	321 The length of time to get result	0.054
				322 Error rate	0.018
4 application	0.167	41 Case relevance	0.096		0.096
		42 Case Study	0.035		0.035
		43 Questions	0.035		0.035

that the evaluation system is reasonable and available.

4.2 The Application and Achievement of the Evaluation System

After constructing the evaluation system, this article introduced the correlation coefficient method (Wang Sufen, 2007) and use the weighted average to represent the quality. And we use the Asp and Ajax technology to set up the system on the platform and let it function on the management of the models.

5 CONCLUSIONS

After constructing the evaluation system, we apply it in the evaluation of economic models on the platform. By evaluating all models on the platform, we can get a overall understanding of the quality of all the economic models. Also we can know the quantity of models on every lever. According to the statistical results, now there are 22 models in good lever, 110 models in middle and 38 models needing to be improved. The evaluation result helps the learners to select high quality models to learn, also it provides foundation of model management for manager.

Building a suitable and scientific evaluation system for the pioneering economic models has been finished, but its follow-up work which how to make the evaluation system function well need continuing researching. So next step we need to study the operating mechanism of the evaluation system.

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REFERENCES

Huang Dequn. The research based on the network teaching evaluation [J]. *Journal of remote education magazine 2005*, (4): 23-26.

Jin Zhilong, Li Duanmei. Local research institutions performance evaluation indicator and its weight calculation [J]. *Journal of technical management research*, 2009, (12): 103-106.

Sun Wenhong. The safety evaluation index weight study based on the analytic hierarchy process (AHP) railway dangerous cargo standing[J]. *Railway operation technology*, 2010,(2): 55-58.

Wang Hao, Ma Da. AHP scale-free evaluation and new scale method [J]. *Journal of system engineering theory and practice*, 2003, (9) : 82-86.

Wang Sufen. The methods using the correlation coefficient to improve the principle and grading [J]. *Journal of simulation experiment on information technology, 2007*, (17): 37.

Xu Wenxue. AHP in financial warning index weight the design application [J]. *Journal of accounting new horizons*, 2010, (1): 20-2

ZhaoYang. Project management achievement evaluation system [D]. Beijing: university of north China: electric power management science &engineering, 2006.

Zhuang Yu, JI Meiru. A Data Analysis of the Index System of Assessment Water environmental Carrying Capacity *The National Social Science Foundation* 2008 pp 1-4.