

The Study of Social Stability Risk Assessment for Land Expropriation Project Based on the BP Neural Network Model

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Abstract—It is inevitable to make social risk assessment because the land acquisition project is as important matters. This paper is the analysis of social stability risk formation mechanism for land expropriation according to the related theory. It is built that social stability risk assessment index system of land expropriation project based on formation mechanism. Due to that social stability risk is not quantitative, this paper makes the BP neural network model of past project indicators of land expropriation prove the model is effective. Land expropriation jingle river project in the Guanyun County is evaluated that making use of effective model. The key risk factors and related Suggestions are put forward on this paper. The model is made of reference significance.

Keywords—land expropriation; Social stability risk; The BP neural network

I. INTRODUCTION

With the accelerating process of urbanization in China, social contradictions and disputes produced in the process of land acquisition and demolition resettlement increase day by day, triggered social problems have become increasingly prominent. It impacts on the social harmony and stability seriously. Foreign scholars Valerie Jaffee Washburn^[1] found that the relationship of land expropriation conflicts and social stability risk needs improving by the government playing a better role in the process of land expropriation in order to reduce social stability risk of land acquisition; Pu. Q. & S. J. Scanlan^[2] researched that the correlation researches network and social struggle between and how it may affect the social stability risk taking the conflict arising from the land expropriation as an example. Many scholars have gradually realized the importance of social stability risk assessment to the land expropriation and the risk assessment is applied to the practice on the study of land expropriation problems in China. For example: Social risk assessment of the second phase of surrounding land expropriation project for the new Guangzhou Railway Station as an example was written by Peng Zhang; Tan Shukui [3] selected indexes to construct the index system of the evaluation and early warning of land expropriation conflict; [4] Ding Ning tried to build more standardized risk assessment system for land expropriation based on the analysis of existing method of social stability evaluation.[5]

II. SOCIAL STABILITY RISK FORMATION MECHANISM OF LAND EXPROPRIATION

Professor Niu Wenyuan first proposed the social combustion theory that is fundamentally the uncoordinated relationship of "man and nature" and the disharmonious relationship between people result the social instabilities which like inflamers. [6] Improper network information dissemination, irrational judgment and wanton amplification of social psychology etc are all propellants promoting the social instability in the era of network media. Some contingencies exacerbating the problem have become the fuse of social instability under the premise of inflamers and propellants fully. Coser's social conflict theory attributed the conflict to the inequalities of the rights, status, resource allocation and the inconsistent of the values and beliefs. Therefore, the emotion from Material and non material conflicts of different social subjects will become a social conflict destroying the social stability if it can't be released through the appropriate channels. [7]

According to "social combustion theory" and "social conflict theory", the main body of social stability risk is farmers. Land acquisition project itself leads to changes on the farmers. Farmers' material conflicts include the unfair distribution of compensation for farmers, unsatisfied compensation costs and declining land income and life security after land requisition. Farmers' immaterial conflicts include gap flu facing the changes of the living environment and ecological environment deterioration. The public opinion will be different in the different stages of land expropriation. Personal dissatisfaction of the farmers and even individual person who is bought by developers meddling maliciously, medias and public opinion form catalysts for social stability risk collectively. The conflict of the social subjects gradually forms the corresponding demands of the social subjects under the power of catalysts. And these demands need to release through the appropriate channels. These channels include one type is normal petition, opinion polls, intergovernmental communication platform (hearings, network publicity) and the other one is the appearance of contingencies, such as group events. [8]

In summary, social stability risk formation mechanism in land expropriation is that demands which are formed by the conflict between the material and the material of the social subject in the presence of a catalyst such as social media and public opinions have not been met through many channels

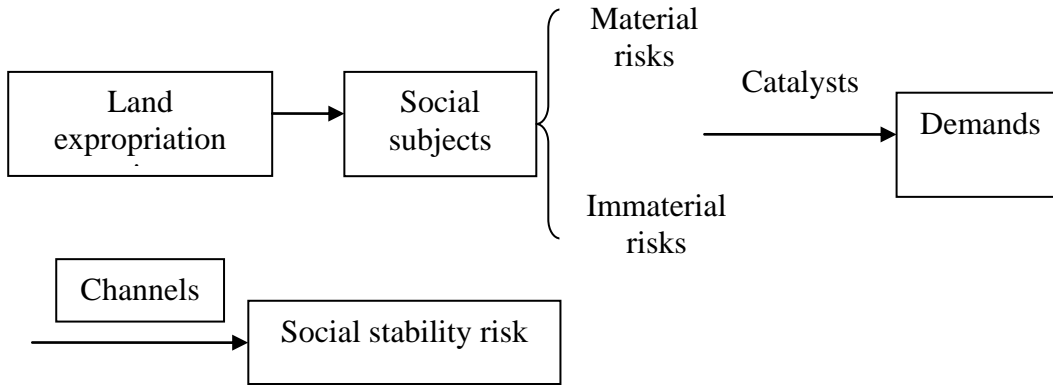


Figure 1 Land expropriation project of social stability risk formation mechanism

III. THE CONSTRUCTION OF THE INDEX SYSTEM OF THE SOCIAL STABILITY RISK ASSESSMENT FOR LAND EXPROPRIATION

The index system of social stability risk assessment was constructed by consulting the experts based on social

stability risk formation mechanism. Very safe, safe, normal risk, high risk, high risk. The corresponding risk comprehensive value range is [0, 0.2), [0.2, 0.4), [0.4, 0.6), [0.6, 0.8), [0.8, 1.0].

TABLE I. LAND EXPROPRIATION PROJECT RISK EVALUATION INDEX SYSTEM OF SOCIAL STABILITY

Resources of social stability	Primary index of social stability risk assessment	Secondary indexes of social stability risk assessment
Land expropriation project itself	Legal risks	Approval content in the land expropriation X1
		Acquisition procedure risk X2
		Land proposes being Incompatible with standard risk X3
Farmers, government, developers	Material risks	Compensation standard for Land expropriation risk X4
		Justice for compensation risk X5
		Land income and life security after land requisition X6
	Immaterial risks	Ecological environment risk X7
Catalysts	Social consensus risks	Life and environment change risk X8
		Public recognition of land acquisition risk X9
	Media opinion risks	Validity of information risk X10
Channels	Information announcement and Public participation risks	Media credibility risk X11
		Public participation right and the right to know risk X12
	Communicational channels risks	Petition being not resolved risk X13
	Contingencies risks	Major security incident appearance risk X14

A. Data Sources

The quantitative value of evaluation index is determined by the following formula: The full mark is 5 points for comprehensive risk value and the full range of the value is 100%. It was got in the use of Data X1-X9 and X12-X13 in accordance with the formula:

$$P_j = \sum_{q=1}^{r_j} (A_{jq} * B_{jq}) / M_j \quad [9]$$

r_j indicates the number of options for the J-th scores points, A_{jq} , B_{jq} separately indicates the score and questionnaire score chose of the q-th option for the j-th scores points, M_j is the total number of questionnaires for the j-th score points..

X10, X11, x14, and the comprehensive risk value were obtained by the expert scoring. According to the expert advice, land expropriation social stability risk classification is divided into five grades: very safe, safety, normal risk, the higher the risk, the risk high. The range of corresponding

comprehensive risk value is [0, 0.2), [0.2, 0.4), [0.4, 0.6), [0.6, 0.8), [0.8, 1.0].

1) Sample data generation

TABLE II. SAMPLE DATA OF NEURAL NETWORK

Number	1	2	3	4	5
X1	0.300	0.297	0.45	0.07	0.625
X2	0.175	0.3125	0.625	0.1	0.550
X3	0.5125	0.625	0.781	0.345	0.5025
X4	0.12	0.206	0.660	0.294	0.583
X5	0.23	0.271	0.44	0.013	0.493
X6	0.767	0.625	0.510	0.43	0.7
X7	0.25	0.25	0.339	0.01	0.28
X8	0.475	0.5	0.809	0.4	0.27
X9	0.65	0.6875	0.610	0.6	0.963
X10	0.17	0.2	0.36	0.15	0.30
X11	0.153	0.16	0.23	0.10	0.34
X12	0.46	0.444	0.596	0.266	0.824
X13	0.15	0.258	0.573	0.2	0.625
X14	0.1	0.1	0.23	0.07	0.868
Comprehensive risk value	0.244	0.27	0.6767	0.41	0.769

2) Processing sample data and reducing dimension

in the use of principal component analysis

Drawn by the risk assessment index more land

acquisition projects, there are totally 14 indicators because the BP neural network needs a large amount of data to study and adjust. If the 14 indicators are input into the network, it will make the neural network structure become more complex, more pressure for processing data, the learning rate decreased and network performance deteriorated. This article uses the SPSS software to carry on the analysis. It is obtained that the cumulative contribution rate is 99.276% of first three principal components so that we select 3 principal components.

And, according to the principal component coefficient matrix, the corresponding three principal components are:

$$F1=0.106X1+0.103X2+0.062X3+0.087X4+0.107X5+0.034X6+0.087X7+0.012X8+0.074X9+0.098X10+0.104X11+0.105X12+0.102X13+0.088X14$$

$$F2=-0.05X1+0.094X2+0.235X3+0.083X4+0.019X5-0.162X6+0.091X7+0.315X8-0.23X9+0.126X10-0.087X11-0.079X12+0.028X13-0.175X14$$

$$F3=0.091X1-0.062X2+0.209X3-0.332X4+0.115X5+0.497X6+0.335X7+0.079X8-0.027X9-0.104X10-0.041X11+0.04X12-0.214X13-0.141X14$$

Using F1 ,F2 ,F3 instead of 14 original values has played the role of dimensionality reduction. It makes the process of analyzing problems more simplified.

TABLE III. CORRELATION MATRIX EIGENVALUE AND CUMULATIVE VARIANCE CONTRIBUTION RATE

Component	Total Variance Explained					
	Initial eigenvalue			Extraction square and loading		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	9.190	65.643	65.643	9.190	65.643	65.643
2	3.110	22.214	87.857	3.110	22.214	87.857
3	1.599	11.419	99.276	1.599	11.419	99.276
4	.101	.724	100.000			
5	5.536E	3.954E-15	100.000			
6	4.253E	3.038E-15	100.000			
7	3.552E	2.537E-15	100.000			
8	7.857E	5.612E-16	100.000			
9	-2.792	-1.994E-16	100.000			
10	-7.373	-5.266E-16	100.000			
11	-1.522	-1.087E-15	100.000			
12	-1.829	-1.307E-15	100.000			
13	-2.521	-1.801E-15	100.000			
14	-6.380	-4.557E-15	100.000			

TABLE IV. PRINCIPAL COMPONENT COEFFICIENT MATRIX

Component matrix			
	Component		
	1	2	3
X1	.106	-.050	.091
X2	.103	.094	-.062
X3	.062	.235	.209
X4	.087	.083	-.332
X5	.107	.019	.115
X6	.034	-.162	.497
X7	.087	.091	.335
X8	.012	.315	.079
X9	.074	-.230	-.027
X10	.098	.126	-.104
X11	.104	-.087	-.041
X12	.105	-.079	.040
X13	.102	.028	-.214
X14	.088	-.175	-.141

3) Then, the sample data were standardized and put into the formula substituting F1 F3 to get standardized scores of the first three principal components of each sample as shown in the Table 5.

The data of the sample with the principal component analysis was discrete in order to remove redundant attributes and simplify the operation of neural network. The specific Table 6 is obtained.

TABLE V. PRINCIPAL COMPONENT SCORE TABLE

Number	F1	F2	F3
1	-0.509	-0.298	1.302
2	-0.248	0.162	0.657
3	0.779	1.536	-0.281
4	-1.227	-0.177	-1.277
5	1.242	-1.223	-0.401

TABLE VI. DISCRETIZATION PROCESS THE DATA

Number	F1	F2	F3
1	3	2	1
2	2	2	1
3	1	1	2
4	3	2	3
5	1	3	3

IV. THE ESTABLISHMENT OF BP NEURAL NETWORK MODEL

A. Parameter setting of the model

1) Determining the number of units in the input layer^[10]

The number of principal components is 3. The number of neurons in the input layer is 3, which is corresponding the index of the risk factors of the model respectively.

2) The design for hidden layer

This selection is based on Kolmogorov theorem to determine the number of neurons in the hidden layer that is namely twice the number of the neurons in the input layer plus 1. So the number of neurons in the hidden layer is 7.

3) Determining the number of units in the output layer

Because this paper requires the output is risk assessment results which are expressed to represent the degree of comprehensive risk as the value of 0-1 range, the numerical method is used to determine that the number of neuron in the output is 1.

4) Setting training parameters

The transfer functions which are commonly used in BP neural network structure are the “Tansig” function, “logsig” function and “purelin” function. This paper selects the “purelin” (linear function) as the transfer function in the hidden layer and the “logsig” as the transfer function in the output layer. Because the result of the neurons in the output layer is between 0 and 1 for range, just meeting the requests for the data, “Trainscg” function which is studied with scaled conjugate gradient is selected as the training function.

B. BP neural network for matlab practice

The modal was obtained with first three groups of sample data. The training accuracy of the model reached 0.000787771; lower than 0.001 after ten time's iterative training. The established model was tested by inputting the remaining two sample groups to get the forecasting results. F=0.5698 0.8512

TABLE VII. THE OUTPUT OF THE SAMPLE PREDICTION RESULT CONTRAST

Predicted value	True value	Error
0.5698	0.56	1.75%
0.8512	0.85	0.14%

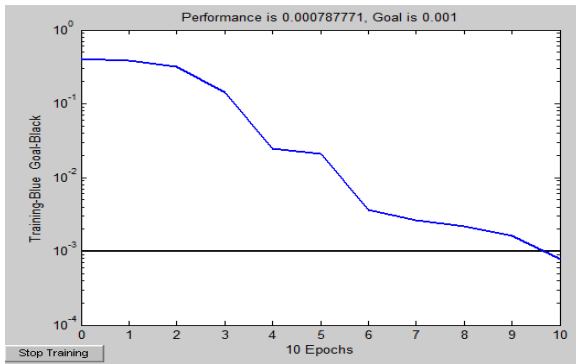


Figure 2 Training error curve

V. CONCLUSION

The error respectively is 1.75%, 0.14% based on the broad consistence output prediction results with BP model and the actual sample risk. It means the effect of the forecast model is more ideal. It is feasible that social stability risk management research for land expropriation is studied with BP neural network method.

The risk assessment index system of social stability for land expropriation project was established and the data collected were collected. We can use the BP neural network model to assess the social stability risk of the actual land expropriation project and take measures to reduce the corresponding risk.

REFERENCES

- [1] Valerie Jaffee Washburn, "Regular Takings or Regulatory Takings: Land Expropriation in Rural China", *PacificRim Law&Policy Journal Association*, vol.20, pp. 73-81, Jan. 2011.
- [2] Pu.Q. & S.J.Scanlan, "Communicating injustice? Framing and online project against Chinese government land expropriation", *Information, Communication and Society*, vol.15, pp. 572-590, Apr. 2012.
- [3] Zhang Peng, "Social risk assessment of the second phase of surrounding land expropriation project for the new Guangzhou Railway Station", *Science and technology management of land and resources*, Dec, 2010.
- [4] Tan Shukui et al, "Evaluation and early warning of land expropriation conflict", *China land science*, vol.26, pp. 24 - 19, Feb.2012.
- [5] Ding Ning et al, "Standardized research on social stability risk assessment of land expropriation", *China land science*, vol.27, pp. 20 - 25, Jan. 2013.
- [6] Niu Wenyuan, "Social physics and early warning system of Chinese social stability", *Journal of the Chinese Academy of Sciences*, Jan., 2001.
- [7] Song Linfei, "Design and operation of Chinese social risk early warning system", *Journal of Southeast University*, Jan., 1999.
- [8] Yang Fangyong, "On the application of social combustion theory in 'major issues' -- the theoretical basis and method model of the social stability risk assessment of major events", *Journal of Party School of the CPC Provincial Committee of Zhejiang*, Apr., 2012.
- [9] Wang Liangjian, "Study on the social stability risk assessment of the current rural land expropriation based on household survey", *China land science*, Nov., 2014.
- [10] Lin Lin, "Risk management research on water conservancy project based on the BP neural network", *Jiangxi: Jiangxi University of Science and Technology*, pp. 25-41, 2015.