Assessment of the Rural Market Based on BP Neural Network

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Abstract

This paper assess rural market of different development level based on the perspective of marketing, with the basis of all types of exchange obstacles, by using BP neural network. So that enterprises can make targeted marketing strategies for different levels of rural markets and improve marketing efficiency.

Keywords: Rural market; Exchange obstacles; BP neural network

1. Introduction

Chinese urban-rural dual structure of divide the urban and rural market into two very different ones . Compared with the urban market, the rural market has its own peculiarities in terms of marketing channels, brand attitudes, consumption patterns and so on. Overall, the rural market is a huge potential market where consumer trends is lagging, consumer demand is functional, market disorder, consumer environment is imperfect, etc. [1]. Companies want to gain greater competitive advantage in the rural market that has more than 900 million consumers, they must develop marketing strategies for the rural market according to the marketing environment. In addition, companies must pay attention to rural market regional differences due to the geographical environment, the level of economic development, regional subcultures. Only do companies recognize regional differences in the rural market, assess the rural market in different regions, develop appropriate marketing strategies, they can improve marketing efficiency, enhance share of products in the rural market , and enterprises can go further. Therefore, this article try to assess rural market under the perspective of exchange impairment, by using neural network tool.

2. The Basis of Assessment-- Exchange Obstacles

Overcoming exchange impairment, realize the potential exchange is the core meaning of the concept of marketing [2]. And in different markets, including urban markets and rural markets, differences in the rural market, will eventually be reflected in the type and extent of barriers on the exchange. Recognizing the obstacles of the exchange in different markets, will help us to grasp the development of different markets. Therefore, it can offer us a more systematic and comprehensive grasp of the various characteristics of rural markets, help us identify differences in the development of different rural markets based on the perspective switching barriers.

The main obstacles of the exchange can be subdivided into identify disorder, affective disorders, philosophy obstacles opportunity disorder, risk disorder, pay barriers , access barriers , mass disorders. Identify barriers refers to consumer concerns and the preferences about product ; affective disorder refers to a product which is rejected for consumer emotional obstacles ; philosophy obstacle refers to consumers personality, customs ; chance obstacle refers to the potential threat of similar products and substitute products ; risk barriers refers to insufficient reliability of the product ; pay obstacle refers to consumers' willingness and ability to pay ; access barriers include path barriers , environmental barriers and stock ; mass disorder refers to a group of consumers in the specification , reference , emulate aspects . Each exchange barriers can reflect the characteristics of the various different aspects of rural markets , identify barriers reflect differences levels of access to information in different rural market capacity ; pay barriers reflect the different levels of economic development of rural markets ; access barriers reflect different rural markets differences in geography, marketing channels , etc. while affective disorders, philosophy disorder, risk disorder and mass disorder primarily reflects the region 's rural market sub- cultural differences caused by differences in consumption .

As we survey the rural market, rather than a specific product , so we do not consider the opportunity obstacles.

3. Assessment Tool-- BP Neural Network

ANN (artificial neural network) is a mathematical model coupled to an information processing applications similar to the brain's synapses . BP (Back Propagation) neural network is an error back propagation algorithm by former training multilayer feed forward network. it is one of currently the most widely used neural network model [3]. BP network can learn and storage a lot of input - output model mapping without prior mathematical equations which describe the mapping. Its learning rule is the steepest descent method, through the back-propagation network to continuously adjust weights and thresholds, so as to keep the network square error be the minimum [4]. based on these characteristics of BP network, the study adopt such neural networks to access rural markets. And BP neural network topology including input layer, hidden layer and output layer.

4. Empirical Analysis

4.1. Data Processing

The foregoing analysis, the quality of the rural market environment is reflected in the size of the main obstacles of the exchange, so this paper use "cognitive disorders", "affective disorder", "concept obstacle", "risk disorder", "pay obstacle", "access barriers" , "mass disorder" seven indicators to evaluate a rural area as a major factor in the market. According to research information, the score is given through comprehensive evaluation, and set 12 rural markets as a representative sample of neural network learning, 3 as the test sample, the sample data are shown later in Table 1.

In order to ensure the convergence of the network, improve network computing speed, we need to do simple raw data preprocessing, divide the scores by 100 to convert in (0,1), which can be the input of the neural network. The former 12 samples the value denoted vector p, the last 3 denoted by the pl. Target neural network is divided into five categories, which can be used in the form of input vectors, where "A" for the [1 0 0 0 0], "B" for the [0 1 0 0 0], "C" for the [0 0 1 0 0], "D" for the [0 0 0 1 0], "E" for the [0 0 0 0 1], A represents the best overall situation of the rural market, E is the worst . The former 12 samples goal value are denoted by t, the last 3 denoted tl.

4.2. The Design, Initialization and Training of Neural Network

The design of BP neural network structure include determining the network input layer nodes, number of nodes in the hidden layer and output layer nodes. The number of nodes in the network switching barriers input layer is the number of input sample index, which is used to evaluate the above rural market. The number of nodes in the output layer is the target vector number, which is the number of levels of rural market assessed above, respectively 7 and 5.There is no fixed formula and criteria for hidden layer nodes selection, but determine the number better through experience and repeated experiment. According to the number of nodes in the input layer and output layer and several tests , hidden layer nodes of neural network model in this paper is more suitable choice of eight, when network performance is better.

As to the function selection, the training function network use TRAINLM, weights and thresholds of the training function use LEARNGDM, performance function use MSE, hidden layer and output layer neuron transfer functions use LOGSIG. Set the input and output vectors, network type and various function parameters respectively, in Matlab neural network toolbox. after the design of BP network structure is complete, click on the View button in order to show the structure of BP neural network as the Figure 1.

After designing a good network structure, initialize the network through the neural network toolbox "Network / Data Manage" window "Initialize", turn on "Get From Input" drop-down list to select the input vector "p", and then click "Set Ranges" and "Initializes weight". Thereafter, Click "Train" in the "Network / Data Manage" window to start neural network training ,while seting number of steps as 2000, the training goal is 0.0001. Training error shown in Figure 2.

4.3. Neural Network Simulation and Prediction

As can be seen from Figure 3, the network complete the training process with 0.0001 error objective in 28 time steps, indicating that the neural network model can simulate and predict.

Click the "Simulate" to begin simulation experiment ,in which "Input" select the test samples, i.e. a vector pl, and output is TL, then we can start the simulation, and output the result to the instruction Matlab workspace. Therefore, we can get a vector:

TL = [0.0005   0.0004   0.0005
       0.0051   0.0439   0.0000
       0.1263   0.9377   0.0000
       0.9992   0.0369   0.9243
       0.0000   0.0000   0.4653]

The results are consistent with the test sample and the simulation results were quite good. So we can use the network to predict the assessment. Due to space limitations, this article only conduct forecast evaluation of eight rural market in following table, the data shown in Table 2.

Through Network Toolbox in Matlab, using the same steps of neural network simulation above. The input vector is F, the input vector FL, and outputs FL to the Matlab command workspace:

FL = [0.1280 0.4811 0.1887 0.4915 0.0161 0.0035 0.0001 0.0008
      0.0992 0.0000 0.0000 0.0822 0.0167 0.0000 0.0000 0.0000
      0.8932 0.4012 0.3121 0.0005 0.9965 0.8332 0.9671 0.0232
      0.0000 0.9325 0.9436 0.0002 0.0000 0.9050 0.1432 0.9872
      0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0013]

We can get each level of the rural market assessments of the sample ,as shown in Table 3.

5. Summary

Based on the perspective of exchange barriers, we can be more comprehensive and systematic to study of mutual differences between the various rural consumer market, and make the appropriate classification and evaluation, Which can be a basis for making appropriate marketing strategies ,and the strategies will be more targeted and more efficient. The use of neural network tool can not only evaluate the work more objectively and accurately, but also conducive to the further development of the latter assessment. How to improve rural market marketing efficiency better which have 900 million farmers is crucial. There are a lot of questions worth exploring in the field of differences between China's rural market. whether it has a better basis to assess ,whether the evaluation factors can be further improved. Which can be studied further in the future.

Table 1: Rural Marke Sample

Number	Pay Obstacle	Access Barriers	Cognitive Disorders	Affective Disorder	Concept Obstacle	Risk Disorder	Mass Disorder	Grade
01	86	81	82	83	81	84	87	B
02	95	84	81	85	90	87	83	A
03	85	86	83	83	84	82	84	B
04	76	71	74	75	72	81	84	C
05	66	69	71	66	73	72	76	D
06	74	67	73	67	65	73	71	D
07	56	63	67	64	56	78	79	E
08	82	75	77	79	75	83	78	C
09	71	81	77	81	81	75	74	C
10	56	61	71	62	56	72	79	E
11	93	80	82	84	81	81	83	B
12	76	71	77	68	73	75	78	C
13	76	71	73	69	64	65	74	D
14	86	71	76	73	79	73	79	C
15	66	62	71	61	59	69	77	D

Table 2: Assessment of Sample Rural Market

| Number	Pay Obstacle	Access Barriers	Cognitive Disorders	Affective Disorder	Concept Obstacle	Risk Disorder	Mass Disorder	Grade
16	76	87	86	77	86	83	75	
17	86	72	73	79	81	74	73	
18	74	73	73	81	74	78	68	
19	93	82	79	86	87	84	84	
20	64	86	83	78	87	76	73	
21	86	81	71	71	75	79	76	
22	84	77	73	75	77	75	81	
23	67	68	71	72	74	73	75	

Table 3: Market Assessment Rural Sample Grade

Number	16	17	18	19	20	21	22	23
Grade	General	Qualified	Qualified	Excellent	General	Qualified	General	Qualified
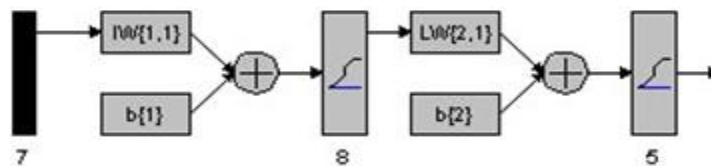
Figure 1: BP Neural Network Structure
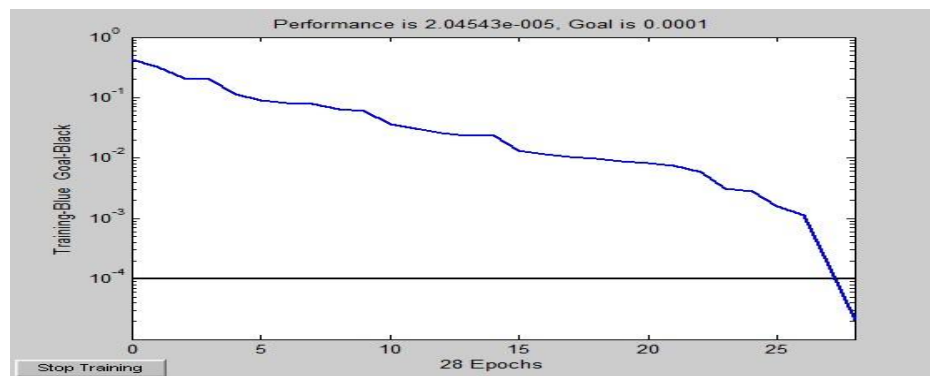
Figure 2: Figure Neural Network Training

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