Journal of Theoretical and Applied Information Technology
15th December 2012. Vol. 46 No.1

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

A HEALTHY DEVELOPMENT MODEL OF REAL ESTATE MARKET BASED ON BP NEURAL NETWORK

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ABSTRACT

Based on the analysis of known literatures, this article constructs the sustainable development evaluation model of real estate market from four aspects, including the harmonious development with local economy, reasonable prices, structural balance and financial coordination. Second, This article empirical also analyzes the healthy development of Nanchang real estate market based on the BP neural network model. The results show that the Nanchang real estate market is healthy from 2008 to 2010. Finally, we explained the reasons based on the empirical results.

Keywords: *Impact factor, BP Neural Network, Real Estate Market*

1. INTRODUCTION

The real estate industry is the basic industry of national economy in china. Healthy and sustainable development of the real estate is not only the important material guarantee of constructing the harmonious society, but also directly related to the development of the national economy. However the current real estate market in China exists many phenomenon. for example, the real estate market is overheating, the development is not balanced, the price rises very rapid, the innovation of science and technology is very low, zoology environment is destroyed serious, resource consumed intensity. This is not conducive to the sustainable develop of real estate industry. On the other hand, the central government approved "Poyang Lake Ecological Economic Zone Planning "On 2010, this is the first national strategies development planning, is great milepost of the Jiangxi development history. And Nanchang has also been listed as demonstration area of China's first batch of low carbon city .

From the sustainable and healthy development perspective of the real estate, literature review can be summarized as follows: first from relationship between the real estate market and the harmonious development of local economy, foreign research can be divided into linear model and nonlinear model by the econometric model. Second, from the housing supply and demand balance and structural balance, on one hand, studied the relationship between contradiction of supply and demand and the prices from the total supply and demand on the other hand, from the point of supply and demand structure, studied purchase and transfer behavior By established the branch level housing model. Third, from the rationality of house price study angles is more, such as income, population, CPI, interest angle, More research is from the angle of the wealth effect based on " permanent income hypothesis "and "life cycle hypothesis " economic theory. Fourth, the coordination research about the relationship between the real estate market and finance market development is relatively rich, it not only relates to the interest rate, monetary policy, such as Murphy (1997), but also studied by the introduction of behavioral economics from the Expected and speculative perspectives. a large number of domestic research about the real estate market and the real estate industry pay more attention to the supply and demand in the real estate Markets, the development and investment in real estate, the development and management in real estate. The sustainable development study about the real estate is few recognized. More importantly, the domestic researches are mostly discussed from the qualitative point.

This paper innovatively put forward a standard index system about evaluating healthy development degree of the real estate market from the overall Situation of the sustainable and healthy development and introduces BP neural network analysis model, quantitative studied the real estate market healthy level, it have an important reference value to the real estate market participants and policy makers.

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2. THE ANALYSIS OF THE SITUATION

On April 17, 2010, the State Council issued the Office of Promoting the real estate market stable and healthy development, The notification message limit the speculative buying and guide the rational consume. Nanchang applied the house purchase restriction formally on February 1, 2011,and the new sales order which defined the two suite of house clearly executed in1st March. At present, Nanchang is the only city that limits the purchase in Jiangxi Province. Sales order had an important effect on the land market of Jiangxi Province especially for the Nanchang city land market.

2.1 Market Atmosphere

Wait-and-see atmosphere is grampus, and the sharp drop in trading volume. On the influence of new property, the real estate market of Nanchang residents chooses to wait and see . Some parts of the city's real estate markets even appeared the double-phenomenon, namely residents and developers is on the cautious wait-and-see. Judging from the volume, since the implementation of the Sales order puts into effect, the property market turnover of Nanchang city dropped. According to our data, residential area has decreased 885000 square meters from March to October , the reduced rate is up to 41.65%; especially in the traditional "golden nine silver ten " season, the decrease in Nanchang residential area is obvious, year-on-year decrease respectively 58.35%, 73.22%. From the secondary housing market, Nanchang City second-hand housing transaction sets 1056 in 2011 November, despite slightly decrease compared to the last month, but still cachexia, Nanchang City secondary housing average daily volume of only 30 sets for two consecutive months.

2.2 Transaction Price

real estate transaction price remained relatively stable state, but the growth rate is at a monthly decline. From the Figure 1, the chain of funds is nervous, coupled with the first-tier cities reduction tide, Nanchang housing prices increase in three line monthly decline. According to the data of Nanchang real estate information network, the house price grows slowly from July to October .In October and August, the emergence of chain or phenomenon, but the overall price level is still higher than the same period last year. Non residential property prices trend to fell down after its rapid growth in the first half of the year, but the price level is still higher than the same period last year.

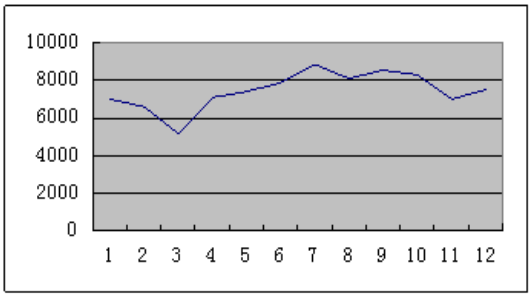

Figure 1: The Housing Price In 2011

2.3 Residential Area

residential area has been decreasing. As it shows in Figure 2, Nanchang residential area in 2011 to 2010 drop range bigger, especially the traditional "golden nine silver ten " season, the deal area fell 58% and 73%. combination of 3 can be drawn, Nanchang residential area decrease compared to the same period, not-residential area grew, This showed the Nanchang property restriction to buy your very marked influence of speculative funds, housing policy by extrusion, fight in the non residential property.

2.4 The Supply of Land

the supply of land and the volume have decreased greatly, all the deals clinch in a low price. In the meanwhile, there has been many continuous phenomenon of failed deals. Since the implementation of the new Nanchang property sales order has been put into effect from March 1th, new houses and second-hand housing turnover has reduced gradually. From March to October, Nanchang housing land area has decreased 759 mu compared to the same period , reduce the rate of 23%; in October, Nanchang City launched a total of 33 cases of land, land area of 1770.47 acres, 27 cases were only finally, deal area of 1305.48 acres, the turnover rate of only 73.74%. The upset bid and auction phenomenon highlights. In 2011 July, the Nanchang city supply of land 550.4 mus, 50.17% reduction over central; 2 of them were not finished, a deal actually area of 367.86 acres, 52.75% reduction over central.

3. THE INDEX SYSTEM CONSTRUCTION

Sustained and healthy development of real estate, refers to the development of real estate industry can satisfy contemporary person already living with the production real need, without compromising the offspring production and life on land, housing demand. Around the world in the real estate market development experience and lesson tells us, a regional real estate market lasts healthy progress,

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

the first and most important with the regional economic development in harmony, to avoid the real estate market is excessive financial support to produce overheat phenomenon, good real estate market should be useful in the area of Finance development; secondly, the real estate market have not continued to also should see the area of real estate price whether residents can pay, can withstand more than residents, the bearing capacity of the real estate price is not sustainable. Finally, the real estate market itself also has periodic, lack of self adjustment ability, need the government's macro-control. Therefore, this article from four aspects to build the Jiangxi real estate market health evaluation index system.

3.1 Local Economy Coordination Index

A country or a region's economic development and the real estate industry has a close relationship. A country or a region's economic growth will lead to the real estate demand increases, so as to promote the development of real estate; and the real estate industry chain length, the characteristics of high grade, so that the real estate industry 's contribution to economic growth and pulling effect remarkable. As the rapid development of real estate or overheat, make real estate and associated industry or sector overheating, causing the structure of whole countryman economy disorder, which affects the stable development of the national economy. In order to understand the Nanchang housing industry development with local economic development coordination, this article from the quantity and quality of the two selected indicators. Quantity index number is a reflection of the real estate of their own level and in the national economy, share, levels, including residential industry contribution rate, real estate investment growth rate of /GDP growth rate; quality index is to describe the real estate is right of relevant industry drives action and its development is not actual coordinated with the development of national economy in terms of the index, includes a housing industry and economic development speed coordination ratio, housing industrial pulling rate.

3.2 The Housing Market Supply and Demand

On the housing market, not only to study the balance of gross of supply and demand, but the key is to supply and demand structure analysis. Housing supply, the for profit for the purpose and orientation and to demand, according to the different types of housing preferences to choose to accept the type and function of the housing. Thus, in the ideal of complete competition market, housing supply gross and structure will reach an equilibrium state. However, when the housing has become an extremely scarce goods shortage of goods consumer demand, demand caused by market supply and demand, supply and demand to determine the decision of market price and the optimal allocation of resources to achieve the role of link in the first Link will appear disjointed, investment demand, Investment speculation will lead to unbalance of structure of supply and demand. Therefore an effective housing market supply and demand indicators should include gross balance index and structure of two kinds of balance index. The gross balance indicator includes supply and demand than, commercial housing vacancy rate ; structural balance index including affordable housing area / residential area, various types of housing supply area ratio.

3.3 Real Estate Price Rationality Index

In general, prices reasonable or not should satisfy three aspects: commodity residential must reflect its value, because the price is determined by the value of and reflects its value; the price of commercial housing should be adapted to the social development of the level of consumption; the commercial housing price changes along with supply demand relations changes, namely the market is effective. Therefore, this article choose the house price to income ratio, more than rental, real estate price growth rate of real /GDP growth rate three index as the representative index.

3.4 Financial Market Harmonious Development Index

Because the real estate market characteristic and the important role, has determined that the real estate development and the financial industry is closely linked to, must rely on the financial industry can develop healthily, real estate and financial industry is complementary. On one hand, the real estate production and consumption needs a lot of financing, financial industry financing service real estate development is the guarantee, for the development of the real estate market provides an indispensable " blood ". The development of the real estate market scale is large, the financial market becomes more and more close contact, also more and more depends on the. On the other hand, the development of the real estate market also promote the financial market reform and development, make its financial products become increasingly diversified, personalized service, for the financial market provides more opportunities and profit. According to the author of the real estate

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

market and financial market development understanding, this article choose real estate loans / financial institutions loans, its own funds scale / bank credit scale real estate development as the representative index.

4. EARLY WARNING STUDY

4.1 Neural Network

In recent years, artificial intelligence based on objective data and data mining technology has been widely applied in the field of management Evaluation which the BP neural network is a typical method.BP neural network is a kind of effective tools which deals with complex nonlinear problem. It has strong self-adaptive, self-learning function, which mainly used for solving problems in the multivariable nonlinear system model with a wide range of applications, in which the rules implied in a lot of data mapping approximation, and has a great advantage in the evaluation and prediction. The evaluation of real estate market's health degree is affected by many factors. These factors are not independent, they connect with each other, restrict with each other, and form a very complex nonlinear system. Neural network, namely artificial neural network, is an information processing system, the model is composed of a plurality of basic unit connected into the hierarchical network structure in some rules. It simulates biological neurons in the brain with its basic unit, and by exchanging the unit information to simulate the brain neural network learning, memory, reasoning, induction and other functions. It does not require any mathematical model, only learn with past experience, and has strong fault tolerance, has good adaptability in incomplete information, noisy information, superiors the simulation of the nonlinear relationship. From the structure of the network, the neural network can be divided as feed forward neural networks and feedback neural network. BP neural network is the most mature and most widely used as a feed forward network, the BP neural network used BP algorithm. BP algorithm is the most basic training method in BP neural network, consists of two parts: input data forward propagation and error back propagation. In the forward propagation, the input data is transmitted to the output layer from the input layer hidden layer by layer by calculating the output data, each layer of neurons under the influence of the state is only a layer of neurons in the state. Total error function is less than a predetermined allowable error, then the learning of training process ends, and obtains the desired output value. If the total error function is greater than the allowed error, it cannot achieve the desired output, then calculates each layer node output error, which calculates the change values of the actual output and the expected output error, then the output error transmits to the opposite path propagation, modify the network connection weights and threshold of W B until it reaches expected error.

4.2 Empirical Research

many studies show that 3 layer BP network model can realize any arbitrarily continuous mapping.Therefore, the early warning model of this article chooses a single hidden layer BP neural network.BP neural network model structure about real estate early warning is shown as below:

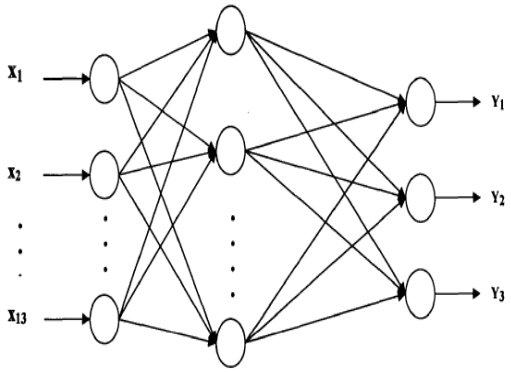

Figure 2: BP Neural Network Structure

In this study, we collects and collates the calculation 2004 -2010 year data about real estate market operation of Nanchang City from the "Statistical yearbook of Jiangxi. " and "Nanchang statistical yearbook" data, as shown in the following table:

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

Table 1 2004-2010 Year Data Of Market Operation

	2006	2007	2008	2009	2010
Index	0.205	0.165	0.162	0.148	0.125
	0.322	-0.296	1.51	1.928	1.871
contribution rate	1.007	1.258	0.728	0.8	2.007
Real estate investment growth rate /GDP growth rate	0.987	1.272	0.232	0.488	1.671
Premium growth rate /GDP growth rate	1.593	1.521	0.224	0.678	2.127
The average growth rate/GDP growth rate	1.195	1.134	1.631	1.201	1.206
The average growth rate/ per capita disposable income growth rate	0.065	0.034	0.066	0.11	0.091
Supply demand ratio	0.083	0.094	0.09	0.113	0.113
Real estate loans/loans of financial institutions	0.064	0.09	0.064	0.059	0.063
Free capital scale / credit scale real estate development	0.08	0.068	0.09	0.08	0.083

4.2.1 Determine the training and testing samples

Table 1 shows the phenomenon of white mice brain discharging, but its signal to noise ratio is low the corresponding frequency spectrum diagram is as shown in Figure 12. As can be seen the EEG signal is always present in low frequency intermediate frequency and high frequency parts and relatively concentrated, which obviously has certain deviation with theoretical analysis. This is mainly because the EEG has little interference introduced, whose frequency is also in the signal band, so that the existing system filtering method is difficult to remove interference, thereby affecting the accuracy of the system output. At this time, we can use technical method to reduce the partial interference effect.In order to ensure that BP neural network in the training process of the stability, the network needs to be input values are normalized, that is each index time series values normalized to [-1,1] or [0,1], the index sequence value is normalized to [-1,1]. When adding new index sequence, we can achieve by conversion method the numerical conversion to [-1,1]. Normalization method uses the premnmx(P) function in Matlab7.1, normalized data is shown in the following table. For every sample, there are input and output, the input layer is each year's alarm index data of 2004-2010, corresponding to the output layer alarm degree for the years of 2005-2011. This article will divide alarm affection into three levels: "cold ", " normal ", and " hot ". And uses three dimensional feature vector representation of alarm, (0,0,1) said " cold ";(0,1,0) said " normal "; (1,0,0) said " hot ". Synthesis of previous research and expert evaluation give the Nanchang City real estate market warning of 2005-2011. Select the input and output of 2010 as a set of test sample.

Table 2 The Input And Output In 2010

		Input node						
		X1	X2	X3	X4	X5	X6	X7
The training set	1	0.3	2.1	1.11	-0.04	-0.1	1.22	0.06
	2	0.3	1.4	0.56	0.48	0.49	1.36	0.04
	3	0.2	0.3	1.01	0.99	1.59	1.20	0.07
	4	0.2	-0.3	1.26	1.27	1.52	1.13	0.03
	5	0.2	1.5	0.73	0.23	0.22	1.63	0.07
	6	0.2	1.9	0.8	0.49	0.68	1.20	0.11
Test set	7	0.1	1.9	2.01	1.67	2.13	1.21	0.09

		Input node			Output node		
		X8	X9	X10	Y1	Y2	Y3
The training set	1	0.08	0.04	0.07	0	1	0
	2	0.08	0.04	0.08	0	0	1
	3	0.08	0.06	0.08	0	0	1
	4	0.09	0.09	0.07	1	0	0
	5	0.09	0.06	0.09	0	1	0
	6	0.11	0.06	0.08	0	0	1
Test set	7	0.11	0.06	0.08	0	0	1

With the help of the software Matlab7.1 in artificial neural network toolbox , the paper writes out program of BP network training . The transfer function of BP neural network hidden layer and output layer respectively select Tansig function and logsig function , learning algorithm selects "The Pillars of the gradient descent back propagation algorithm", variance of ending the training is set for the 1e-6 . Import a training set of samples to the program and start network training , through repeated trial, when we find that the number of hidden layer is 9 times, the network performance is best. After 396 this iteration, the error between the Actual network output and the target output meets the requirements, training network stops.

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

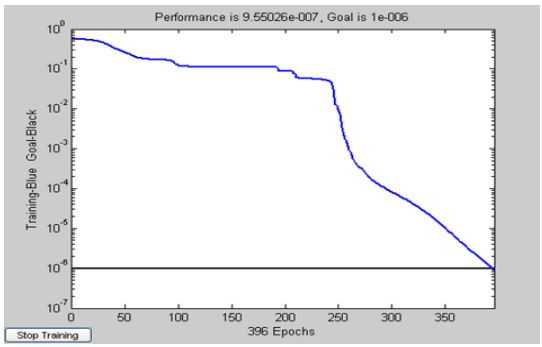

Figure 4: The Convergence Process

4.2.2. The network test

Network test is designed to determine whether the network meets the requirements of the real estate market early-warning. Using 2010 data for network test. As follows:

p2=[-0.9399 0.7519 0.8837 0.5581 1.0000 0.1076 -0.9729 -0.9516 -1.0000 -0.9806];

p2=[-0.9399;0.7519;0.8837;0.5581;1.0000;0.1076;-0.9729;-0.9516;-1.0000;-0.9806];

t2=sim(net,p2)

The operation results are shown as follows:

	X1	*X2*	*X3*	*X4*	*X5*
Data set	*-0.915*	*-0.781*	*-0.203*	*-0.626*	*-0.520*
	X6	*X7*	*X8*	*X9*	*X10*
Data set	*1.000*	*-0.934*	*-0.884*	*-1.000*	*-0.922*

Compared to the output of Test sample set and the output of BP neural network prediction model, we can find the difference of the two output nodes is Very small. therefore, early warning model Established in this paper based on the BP neural network real estate has good generalization ability, which can be used as early warning model of the Nanchang City real estate market early-warning system.

4.2.3. real estate early warning in 2012

The establishment of the real estate early warning system 's role is to forecast the real estate market warning yet to happen in the next year . The author collects related indicators of 2011 Nanchang City real estate market through consulting relevant information , and arranges for early warning sign index value of warning system in accordance with the requirements and carries it on the normalization process, in order to meet the output requirements of the BP neural network prediction model. As shown in the table:The normalized index value is for the input of BP neural network prediction model . we receive the output of early warning model hrough internal processing of the model. As shown in the table:

Output of BP neural network prediction model			*Output of Target*		
0.0004	*0.9966*	*0.0014*	*0*	*1*	*0*

Judging from the actual output of the BP neural network prediction model , the output results show that Nanchang City real estate market 2012 alarm belongs to (0,1,0) that "normal " state.

Samplenumber	*Test results*			*Target output*		
7	*0.0006*	*0.0009*	*0.9985*	*0*	*0*	*1*

5. CONCLUSION

Through the real estate market early-warning model empirical analysis based on the BP neural Network , we concluded 2012 Nanchang City real estate market operation is in a normal state.Its reason basically has the following:

After the starting in 2011 February the implement of " purchase order", Nanchang prices is still in year-on-year growth, but growth is more and more slow, appearing even negative growth phenomenon chain; at the same time, turnover fell significantly.

In the second half of 2011, a large number of listed property, greatly expanded the for sale real estate stock. And the buyer's market generally adopted a wait-and-see attitude,second-hand housing turnover is not ideal. Obviously, Nanchang real estate market is deeply impacted by market regulation policy, speculative buying demand sharp decline, The developers financing difficulties , adjusting Control to cooling the past two years prices fluctuate purpose. Predict 2012, severe real estate macro-control measures is still continuing,

Nanchang real estate market large stock market is to " spit ", but in view of Nanchang real estate development is preliminary, still exists a lot of rigid demand market, so in 2012 the real estate market in Nanchang is in roughly normal smooth develop Trend.

statistical data in some errors. The relatively developed city , Nanchang real estate market development degree is relatively low, in the continuous improvement, constantly mature stage but more data exits the problem that the statistics is not uniform . In addition, although in the process of writing,author tries to make the model to reach the acme of perfection, but this quota system still need

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

to be put to the test of practice, still need further optimization index system, to make the model calculation results and is closer to the real.

REFERENCES:

[1] Jianfeng Hu, Dan Xiao, Zhendong Mu, "Application of Energy Entropy in Motor Imagery EEG Classification", *JDCTA: International Journal of Digital Content Technology and its Applications*, Vol. 3, No. 2, 2009, pp. 83 -90.

[2] Yu Zhou, Jun Li, Xiaoming Zhou, "Study on EEG Password based on AR Power Spectrum and BP network", *JCIT: Journal of Convergence Information Technology*, Vol. 7, No. 9, 2012, pp. 6-14.

[3] Wang min, Gao guang-hong, "A Miniaturized System for Neural Signal Acquiring and Processing", *Chinese Journal of Biomedical Engineering (English Edition), Biomedical Engineering* , Vol.17, No.3, 2008, pp.114-119.

[4] Wang min, Zhang xiao, Zhang chunfeng, "An Analog Front End For Recording Neuronal Activity in Freely Behaving Small Animals", *Chinese Journal of Biomedical Engineering (English Edition), Biomedical Engineering*, vol.16, no.12, 2007, pp.138-141.

[5] Bagozzi, R.P., "On the concept of intentional social action in consumer behaviour", *Journal of Consumer Research*, Vol.27, No.3, 2000, pp.388.

[6] Baryla,E.A.and L. V. Zumpano. "Buyer search duration in the residential real estate market: The role of the real estate agent", *Jouranl of Real Estate Research*,Vol.10, No.1,1975, pp.1-13.

[7] Benjamin, J.D.and P.T.Chinlo, "Pricing, exposure and residential listing strategies", *Journal of Real Estate Research*,Vol. 20, No.1/2, 1985, pp. 60-74.

[8] Bergen,M. S. Dutta and O. J.Walker, Jr."Agency relationships in marketing: A review of the implications and applications of agency related theories", *Journal of Marketing*, Vol. 56, No.3, 1992, pp. 1.

[9] Christian, R.C., "Industrial marketing:Have we forgotten how to train?", *Journal of Marketing*, Vol. 10, No. 5, 1962, pp. 81-82.

[10]Connell Stanley, "NLP Techniques for salespeople", Training and Development Journal,Vol. 38, No.11,1984, pp. 44-46.