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Development Trend Analysis on GDP of Shaanxi Province

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Abstract: The data of Shanxi GDP from 2009 to 2014 was analyzed Based on the model of GM(1,1) of Grey Theory. It calculates the development of GDP in next few yeas. Then again, we use Grey correlation analysis on primary, secondary and tertiary of Shanxi, discussed the correlation of GDP to them. Based on the results, we can provide scientific basis for the relevant decision-making departments.

Introduction

Eleventh Five-Year period, Shaanxi economy into the track of rapid development in 2010, the province's total GDP ranks first in the country, officially entered the domestic "trillion provincial club." Shaanxi Province in 2009 per capita GDP and broke the $ 4,000 mark. 2010 Shaanxi Province, the national GDP of 1001.2 billion yuan, a trillion yuan GDP province, is also the latest one into the trillion provinces. In May 2014, General Secretary Xi Jinping pointed out in Henan: "At present," China's social and economic development is still in the period of 'important strategic opportunity'. To enhance confidence, from the current stage of China's economic development characteristics, to adapt to 'new normal' To maintain the strategic general mindset. "Firm" rich Shaanxi, harmonious Shaanxi, beautiful Shaanxi "strategic plan, based on the" new normal "depicts the picture, take advantage of the momentum, and then create a new glory of Shaanxi's economic development is" new normal " The Significance of Shaanxi 's Economic Development Strategy. In the context of the new economic background, Shaanxi economy wants to be more stable and high-quality growth, want a more natural ecological environment, want people to live a more comfortable life, want to keep the national economy long-term, healthy and rapid development, The development trend of the national economy to carry out research to find out the objective laws of economic development and economic development to make scientific predictions, but also to identify the favorable and unfavorable factors affecting the national economy, the timely resolution of economic development process to the contradictions and problems , Timely coordination to solve all aspects of economic development relations.

Gray prediction method is a method to predict the system with uncertain factors. Gray system is a kind of system between white system and black system. It refers to a system in which some information is known, some information is unknown, and there are uncertain relationships among the factors in the system. The gray system theory is from the point of view of the system Starting to study the relationship between information, that is, how to use known information to reveal unknown information. Gray system model is characterized by the experimental observation data and its distribution is no special requirements and restrictions, is a very simple new theory, has a very wide range of applications. Since the beginning of the 1880s by Professor Deng Zulong founded and put forward the gray system theory, it has general system theory, information theory

and cybernetics viewpoints and methods extended to the social, economic, ecological and other abstract systems, combined with the use of mathematical methods of development Set the theory and method of solving the gray system. After a long period of development, the gray system theory has been successfully applied in many fields such as industry, agriculture, society, economy and so on, which has solved a lot of practical problems in production, life and scientific research, and achieved good results. (1) model in gray theory is used to predict the GDP of Liaoning Province from 2005 to 2020, and the gray model and the econometric model are combined to forecast the research. XU Xin-ling The GM (1,1) model is applied to the field of forecasting of professional and technical personnel in China, and the prediction accuracy of the model is optimized by adjusting the number of sequence samples. Gray prediction is a very effective method in economic forecasting. Its main characteristic is that the original data needed to build the forecasting model are few, easy to collect, the method is simple and has high accuracy. Based on the gray theory, taking the GDP data of Shaanxi Province from 2005 to 2014 as an example, the gray forecast model of GDP in Shaanxi Province was established. Based on this, the GDP of Shaanxi Province was forecasted from 2015 to 2019, GDP in Shaanxi Province in 2019 will exceed 4 trillion yuan. And analyzes the relationship between the first, second and the third industry of Shaanxi province on the development of the gross national product in order to make the province cope with the economic downward pressure, stabilize the consumer market and keep the people in the new economic background. Economic stability and healthy long-term rapid development, protection and improvement of people's livelihood, and comprehensively promote the structural adjustment and transformation and upgrading, and strive to do an early realization of the rich Shaanxi, Shaanxi, Shaanxi beautiful beauty, and its decision-making to provide scientific data reference.

Gray prediction method is a method to predict the system with uncertain factors. The gray model is a dynamic model composed of a set of gray differential equations. The gray model is GM (1,1), where G is gray (gray), M is model, GM (1,1) Order, a variable model. The model is essentially composed of a single variable of the original data column for gray generation after the production process is established by the first order differential equation.

Introduction to GM (1,1) Model

Gray generation: the data in the original data column, according to a request to do data processing. The objective world is complex, and the data that expresses its behavior may be disorganized, but it must be orderly, and there is some inherent law, but these laws are overshadowed by complex phenomena and it is difficult for the people to move directly from the original data To find some kind of inherent law. The production of raw data is an attempt to find its inherent laws from the chaotic phenomenon. Commonly used gray system production methods are: cumulative generation, cumulative generation, the average production, such as production level. This paper will use the GM (1,1) model based on the cumulative generation sequence.

Let the time column have an observation value, make it the original sequence, generate a new sequence by accumulating, Then the corresponding differential equation of GM (1,1) model is: for the development of gray number, for the endogenous control gray number.

For the solution of the equation, first use the least squares and use the Matlab software to estimate the parameters from the following equation. ,among them

$$X^{(1)} = \{X^{(1)}(1), X^{(1)}(2), \cdots X^{(1)}(n)\} = \{X^{(1)}(1) = X^{(0)}(1), X^{(1)}(1) + X^{(0)}(2), \cdots X^{(1)}(n-1) + X^{(1)}(n)\}$$

$$B=\begin{bmatrix} -\frac{1}{2}[X^{(1)}(1)+X^{(1)}(2)], & 1 \\ -\frac{1}{2}[X^{(1)}(2)+X^{(1)}(3)], & 1 \\ \vdots & \vdots \\ -\frac{1}{2}[X^{(1)}(n-1)+X^{(1)}(n)], & 1 \end{bmatrix} \quad Y_n=\begin{bmatrix} X^{(0)}(2) \\ X^{(0)}(3) \\ \vdots \\ X^{(0)}(n) \end{bmatrix}$$

Solving the differential equation, we can get the prediction model:

$$\hat{X}^{(1)}(k+1)=[X^{(0)}(1)-\frac{\mu}{a}]e^{-ak}+\frac{\mu}{a} \quad (k=0,1,2,\cdots n)$$

So the predicted value is reduced to:

$$\hat{X}^{(0)}(k+1)=\hat{X}^{(1)}(k+1)-\hat{X}^{(1)}(k)$$

According to the above formula, we can get the future forecast value, but the prediction is reliable to test the model, the gray prediction model of the test generally include residual test, correlation test and posterior test.

It is Calculated by the prediction model and the accumulation of the original sequence and absolute error sequence and relative error sequence.

$$\Delta^{(0)}(i)=|X^{(0)}(i)-\hat{X}^{(0)}(i)|, \quad \phi(i)=\frac{\Delta^{(0)}(i)}{X^{(0)}(i)}\times 100\% \quad (i=1,2,\cdots n)$$

In the objective world, there are many factors between the relationship between the gray, can not tell which factors are closely related, which factors are not so close, so it is difficult to find the main contradiction, found its main features, the main relationship. Correlative degree analysis is the method of analyzing the degree of association of various factors in the system. In the correlation test, the correlation coefficient is calculated first.

$$\eta(k)=\frac{\min\min|\hat{X}^{(0)}(k)-X^{(0)}(k)|+\rho\max\max|\hat{X}^{(0)}(k)-X^{(0)}(k)|}{|\hat{X}^{(0)}(k)-X^{(0)}(k)|+\rho\max\max|\hat{X}^{(0)}(k)-X^{(0)}(k)|}$$

among them:

(1) $|\hat{X}^{(0)}(k)-X^{(0)}(k)|$ is the absolute error of the first point $X^{(0)}$ and $\hat{X}^{(0)}$.

(2) $\min\min|\hat{X}^{(0)}(k)-X^{(0)}(k)|$ is the minimum difference between the two levels. Where $\min|\hat{X}^{(0)}(k)-X^{(0)}(k)|$ the minimum difference is the first level, indicating the minimum difference between the points on the sequence; the second level of the smallest difference, said $\hat{X}^{(0)}(k)$ the sequence to find the minimum difference on the basis of all the sequences to find the smallest difference.

(3) $\max\max|\hat{X}^{(0)}(k)-X^{(0)}(k)|$ is the second largest difference, its meaning and the minimum difference is similar.

(4) ρ become the resolution, $0\langle\rho\langle 1$ the general take $\rho=0.5$.

Calculate the standard deviation of the original sequence: $S_1 = \sqrt{\frac{\sum[X^{(0)}(i) - \overline{X}^{(0)}]^2}{n-1}}$

Calculate the standard deviation of the absolute error sequence: $S_2 = \sqrt{\frac{\sum[\Delta^{(0)}(i) - \overline{\Delta}^{(0)}]^2}{n-1}}$

Calculate the variance ratio: $C = \frac{S_2}{S_1}$

Calculate the probability of small errors: $P = p\{|\Delta^{(0)}(i) - \overline{\Delta}^{(0)}| < 0.6745S_1\}$

GDP Forecast Model of Shaanxi Province

In this paper, the GDP data of Shaanxi Province from 2005 to 2014 are analyzed, and the original data sequence.

We use the data in Table 1 as the original data sequence, and then add it to generate the sequence, and then by the least squares method $X^{(0)}$, with MATLAB software to estimate the parameters of the vector as follows: $\hat{b} = (\hat{a}, \hat{\mu})^T = (-0.156, 4347.4)^T$

$X^{(0)}(1) = 3933.72$, $\frac{\hat{\mu}}{\hat{a}} = -27810$, $X^{(0)}(1) - \frac{\hat{\mu}}{\hat{a}} = 31744$

According to (1) and combined with the above calculation principle can be estimated the original data set and the model test to be used in the residual, relative error, see Table 2.

Table 2 Model test:

In this paper, we use posterior test to get: variance ratio $C = \frac{S_2}{S_1} = 0.0719$

Small probability of error $P = p\{|\Delta^{(0)}(i) - \overline{\Delta}^{(0)}| < 0.6745S_1\} = 1 > 0.95$

With reference to the posterior test theory, when $P = 1$, $C = 0.0719 < 0.35$, according to this description of the forecast model of the test standard is $\hat{X}^{(1)}(k+1) = 31744e^{0.156k} - 27810$ "good", the test passed, this model can be used for practical prediction. Below we will be based on the model of Shaanxi Province in 2014 to 2018 GDP forecast, the forecast results in Table 3.

In this paper, we specify the GDP data as the reference data column

$X_i = \{X_i(1), X_i(2), \cdots, X_i(n)\} \quad (i = 1, 2, \cdots, m)$, the comparison data is recorded as. We have selected six comparative data, namely, agriculture, forestry, animal husbandry and fishery gross output (unit: million), all industrial output, tertiary industry increase, fixed assets investment, total retail sales of social consumer goods, The total amount of foreign trade import and export (unit: million), see Table 1.

Table 1 2009 - 2014, Shaanxi Province, GDP and the impact of the original data

Year	X_0	X_1	X_2	X_3	X_4	X_5	X_6
2009	8169.80	13372200	9553.7	3143.74	6553.39	2699.67	840539
2010	10123.48	16660575	12421.8	3688.93	8561.24	3195.67	1208283
2011	12512.3	20586024	15811.48	4355.81	10023.53	3789.99	1462344
2012	14453.68	23032043	18591.89	5009.65	12840.15	4383.75	1479854
2013	16205.45	2562.51	20820.07	5832.14	15934.21	5245.04	2012881
2014	17689.94	2741.82	21944.58	6547.76	18709.49	5918.71	2740847

The third step, sorting the degree of relevance

As can be seen from Table 7, $r_5 > r_3 > r_2 > r_4 > r_6 > r_1$ Total retail sales of social consumer goods> Increase in tertiary industry> All industrial output value> Investment in fixed assets> Total foreign trade import and export> Gross output value of agriculture, forestry, animal husbandry and fishery

Summary

According to the gray relational analysis criterion, it can be concluded that if the correlation value between each factor and GDP is smaller, the closer the relationship is to GDP, the greater the degree of association is, the more important it is to GDP and the greater the impact. According to the order of the degree of correlation found above we can draw the following conclusions:

(1) From the we can see that the relationship between the most closely, that is, the total social consumer goods and GDP development trend closest to its impact on the province's GDP, indicating that in the current new normal economic situation, the steady growth of Shaanxi consumer market The

(2), compared with their total social consumer goods, their correlation coefficient is slightly smaller, but also a little bit, but also greater than 0.9, which shows that the impact of these two GDP is also very important, although China's economic growth Continue to slow down, but the industrial structure is more optimized. The tertiary industry growth has played a significant role in solving the employment problem in our province and stimulating economic development. Facing the complex and severe economic situation inside and outside the province, Shaanxi adhere to the goal of industrial province, carry out the industrial steady growth policy to comprehensively promote the structural adjustment and transformation and upgrading, from the correlation coefficient value can see the industrial economy has entered a new stage of high growth.

(3) It is known that it is one of the six factors with the smallest value of GDP correlation, ranking last, which shows that the relationship with GDP is not as close as the previous aspects, but the impact is not small. The reason why the last ranking, which is currently in Shaanxi Province is currently in the transformation and upgrading of the economic form of gradual consolidation, with the urbanization and rural land transfer to speed up the land to further intensive agglomeration, the gradual decline of traditional agricultural development This is the inevitable result.

In short, through the use of gray forecasting model of GDP in Shaanxi Province to do short-term forecast results, the next few years, Shaanxi Province, GDP will continue to grow faster, 2019 Shaanxi Province, the national GDP will be more than 4 trillion. This paper analyzes the main factors influencing the development trend of GDP in Shaanxi Province by using the gray relational analysis, and finds out the main contradictions and problems in the current economic operation. In

the context of the new normal economic context, in the face of the complex situation of the domestic economic downturn, Shaanxi Province has made great efforts to promote the steady growth, adjust the structure, promote reform, benefit the people and prevent the risk of the implementation of the policy, the steady growth of the consumer market , The slowdown in the tertiary industry, the growth of traditional agriculture, forestry and animal husbandry and other phenomena, indicating that the province's economy has slowly to adapt to the new normal, new impetus is about to highlight, I hope the province's economy can continue to healthy growth.

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