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Research on the Economic Vitality of the Northeast China

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ABSTRACT

Economic vitality is an important indicator of regional competitiveness. The demand for talents and the vitality of enterprises in different regions are obvious to all and have practical significance. Therefore, it is necessary to establish a survey data model and conduct in-depth study on improving regional economic vitality from the perspective of policy. Based on a variety of forecasting methods, this paper analyzes the short-term and long-term impact of economic policies in Northeast China, and finally puts forward the factors that affect the economic vitality of northeast policies. Finally, the paper puts forward the feasibility and targeted suggestions of strengthening regional economic vitality, obtaining long-term development and building a more competitive city in the new era.

1. Introduction

In recent years, different regions have introduced relevant economic policies for different regional resources to enhance regional economic vitality and regional competitiveness. This paper analyzes the short-term and long-term impact of economic policy transformation on economic vitality, and further studies the influencing factors of improving regional economic vitality.

The title requires an analysis of the short- and long-term effects of economic policy transition on the economic vitality of a region. Choose two indicators that have more impact on economic vitality: household consumption level, GDP, and sort out the annual indicator data in Northeast China to analyze the impact, that is, analyze how the economic vitality has changed after the policy was introduced. Therefore, we first look for economic policies issued by the state in recent years, and then use the forecasting method to predict the short-term and long-term economic vitality changes after the policy is issued, and explain the related impacts according to the changes.

2. Apply Forecasting Methods to Analyze Impact

2.1 Policy Background

The Trinity of the traditional economic system is the reason for adopting the planned economy in a capital-poor economy. The main shortcomings of the economic system are economic inefficiency caused by structural imbalances and incentives, and the transformation of economic policies affects regional economic vitality.

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2.2 Short-term Impact

The short-term forecast method is used to compare the data of a certain short-term indicator in a future year with the actual data to obtain a comparison result, which illustrates the impact of the introduction of policy on economic vitality. This forecast comparison uses the level of household consumption as an indicator of changes in economic vitality.

Based on the short-term forecasting method of residents' consumption level in Northeast China from 2000 to 2004: the method of combining adaptive filtering and gray forecasting is used to analyze the short-term impact of economic policy transition on the economic vitality of Northeast China [1]. The adaptive filtering method was used to predict the residents' consumption levels in 2005 and 2006, and the actual results were compared based on the prediction results. The grey prediction method was used to predict the residents' consumption levels in 17 years to verify the short-term impact of economic policies on economic vitality. Here is the specific analysis:

2.2.1 Adaptive Filtering

Theoretical Basis

The adaptive filtering method is to use the formula from a set of initial estimates of the autoregressive coefficients:

$$\varphi'_{it} = \varphi_{i(t-1)} + 2ke_ix_{t-i}\ (i = 1, 2, 3\ldots, P)$$

Successive iterations, through the residual e value, continue to adjust the iteration until the appropriate coefficients are obtained to optimize the autoregressive coefficients.

Model Building

(1) Based on selected data of residents' consumption levels in Northeast China in 00-04, the model weights and initial coefficients were determined as:

$$N=2, \quad \varphi_1 = \varphi_2 = \frac{1}{N} = \frac{1}{2} \tag{1}$$

Based Box-JenkinsBasic knowledge of method

$$k \leq \frac{1}{\left[\sum_{i=1}^{2} Y_i\right]_{max}} = \frac{1}{18347 + 17200} = 0.000028 \tag{2}$$

Take the learning constant here k=0.000028.

(2) Based on known data x_i={ 13628, 14641, 15821, 17200, 18347} After standardization:

$$x_i^* = \{-1.21074, -0.67735, -0.05602, 0.67008, 1.27403\} \tag{3}$$

Calculate the forecast value for t + 1 period at t = 2:

$$\hat{x}_{t+1} = \hat{x}_3 = \varphi_1 x_2 + \varphi_2 x_1 = 0.94405 \tag{4}$$

(3) Residual：

$$e_{t+1} = e_3 = x_3 - \widehat{x_3} = 0.888025 \tag{5}$$

(4) according to $\varphi'_i = \varphi_i + 2ke_{t+1}x_{t-i+1}$ adjustment coefficient:

$$\varphi'_1 = 0.499966 , \quad \varphi'_2 = 0.49994 \tag{6}$$

The above steps are both an iterative adjustment, and then use the new weights Calculate the forecast value of $t+1$ period at $t=3$:

$$\hat{x}_{t+1} = \hat{x}_4 = \varphi'_1 x_3 + \varphi'_2 x_2 = -0.36664$$
$$e_{t+1} = e_4 = x_4 - \hat{x}_4 = 1.036722 \tag{7}$$
$$\varphi''_1 = 0.499963 \quad \varphi''_2 = 0.4999$$

Then use the new weight to calculate the forecast value of $t+1$ period at $t=4$.

This repeated iterations until the prediction error did not improve significantly, it was considered that a set of optimal weights were obtained [2], which could be used to actually predict the average annual consumption level of the residents in Northeast China in 2005 and 2006.which is:$x6$, $x7$.

During the adjustment process, after 137 rounds of iteration, the error can be reduced to zero (rounded up), and the weights have reached a constant value：

$$\varphi_1 = 0.56434, \varphi_2 = 0.48934$$
$$x_6 = \varphi_1 x_5 = 21500, x_7 = \varphi_2 x_4 = 23561 \tag{8}$$

In Conclusion:

The calculated predicted value is not much different from the true value x6 = 21427, x7 = 23523, and it shows a short-term growth trend, indicating that under the premise of no change in policy and no other market changes, Policy 1 for the Vitality has the effect of driving its growth, and we can see that the economic effect of policy regulation is remarkable.

2.2.2 Grey GM (1, 1) Prediction Model

(1) data processing: make $x^{(0)}(1)$={$x^{(0)}(1),x^{(0)}(2),x^{(0)}$

(3),$x^{(0)}(4)$}

Corresponds to the observations of the original sequence data time series from 2000 to 2004. For raw data columns $x^{(0)}(t)$ Do cumulative generation, which is

$$x^{(1)}(t)=\sum_{i=1}^{t}x^{(0)}(i), \text{among the t=1,2,3,4,}$$

Get a new sequence, $x^{(1)}(1)=\{x^{(1)}(1), x^{(1)}(2), x^{(1)}(3), x^{(1)}(4)\}$ Bring in raw data $x^{(0)}(t)=\{14641,15821,17200,18347\}$ is $x^{(1)}(t)=\{14641,30462,46283,63483\}$

(2) GM (1, 1) 1 model of dynamic differential equations: $\dfrac{dx^{(1)}}{dt}+ax^{(1)}=u$

(3) Form data matrix B and data columns: $Y_n : \hat{a}=\begin{bmatrix}a\\u\end{bmatrix}$,

Solved using the least squares method: $\hat{a}=\left(B^{T}B\right)^{-1}B^{T}Y_n$ among them:

$$B=\begin{bmatrix}-\dfrac{1}{2}\left[x^{(1)}(1)+x^{(1)}(2)\right]\dots1\\-\dfrac{1}{2}\left[x^{(1)}(2)+x^{(1)}(3)\right]\dots1\end{bmatrix}, \quad Y_n=\left[x^{(0)}(2),x^{(0)}(3)\right]^{T}$$

(9)

Calculated：

$$\hat{a}=\begin{bmatrix}-0.3821\\97.2491\end{bmatrix} \tag{10}$$

(4) Building a time response model：

$$\hat{x}^{(1)}(t)=(x^{(0)}(1)-\frac{u}{a})e^{-at}+\frac{u}{a}$$

(5) Discretize the time response:

$$\hat{x}^{(1)}(k+1)=(x^{(0)}(1)-\frac{u}{a})e^{-at}+\frac{u}{a}$$

Calculated by MATLAB:

$$\hat{x}^{(1)}(k+1)=14836.4878e^{k}-254.5122 \tag{11}$$

(6) Substituting the k value into a discrete model to calculate the predicted cumulative value: $\hat{x}^{(1)}(t)$

Calculated by MATLAB:

$$\hat{x}^{(1)}(t)\{14641,30245,47892,62718,83215\} \tag{12}$$

(7) Restore the predicted cumulative value to the predicted value: $\hat{x}^{(0)}(k)=\hat{x}^{(0)}(k)-\hat{x}^{(0)}(k-1)$,

Calculated by MATLAB:

$$\hat{x}^{(0)}(k)=\{14641,15234,16822,18592,20541\} \tag{13}$$

Through matlab, the consumption level of residents in Northeast China in 2005 is predicted. According to the predicted value obtained by theoretical analysis and gray prediction method, the relative error of the prediction is about 0.0079%, indicating that the model is extremely sensitive [2]. Comparing the predicted value with the real value, it can be seen that the predicted result is more accurate, and the trend of analysis has also increased year by year, indicating that policiy have promoted economic vitality in the short term, and also proved that the economic effect of policy regulation is significant.
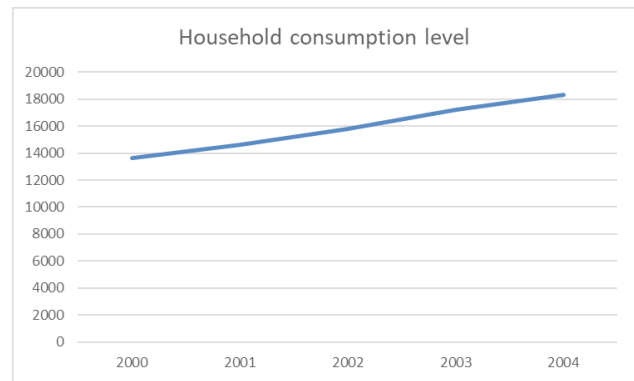

Figure 1. Forecast chart

By plotting the time series of residents' consumption levels in 00-04 in excel, it can be seen intuitively that the residents' consumption levels are increasing year by year. After using the adaptive filtering method and the gray prediction method and calculating through matlab and excel, it can be concluded that using the short-term prediction method, the predicted value is basically the same as the actual value, and the trends are gradually rising, which proves that economic policy reform for the Northeast region is With obvious effects of economic vitality, the release of the policy has increased the economic vitality of the Northeast year by year, and the economic effects of policy regulation have been remarkable.

2.3 Long-term Impact

The long-term forecast method is used to compare the data of a certain long-term indicator in the future with the actual data to obtain a comparison result, which illustrates the impact of the introduction of policy on economic vitality [3]. In this comparison, the GDP of Northeast China was selected as an indicator representing the changes in economic vitality.

According to the long-term forecasting method of GDP

of Northeast China from 2000 to 200115: trend extrapolation method. Analyze the long-term impact of economic policy transition on the economic vitality of the Northeast. The trend extrapolation method is used to predict the 17-year resident consumption level, and the prediction result is compared with the actual value, and the gray prediction method is used to predict the 17-year resident consumption level to verify the long-term impact of economic policies on economic vitality. Here is the specific analysis:

Trend extrapolation

That is, the trend limit is a method of inferring future trends based on past and current time series. After comprehensive analysis of the research object's past and present development, a model is used to describe the change law of a parameter, and then this law is used to infer. To fit the data points, the most commonly used are simple functional models, such as linear models, exponential curves, and growth curves [4]. When the economic vitality changes with time in this paper, there is a certain upward or downward trend, there is no obvious seasonal fluctuation, and a suitable curve can be found to reflect this trend. Meet the conditions for using trend extrapolation. Establish a trend extrapolation model with time t and time series value y as independent and dependent variables, respective :y=f (t)

Using the extended time as a known condition, the predicted value can be obtained from the fitted model diagram.

In this paper, we use Northeast China's GDP data from 2000 to 2015 to draw a time series diagram of Northeast China's GDP from 2000 to 2015 (see the figure below).
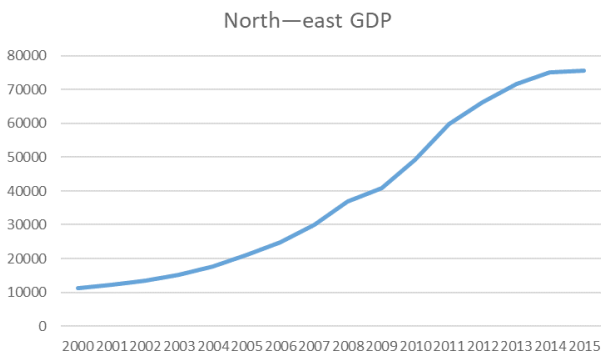

Figure 2. Forecast chart

Observing Figure 2, it can be seen that the per capita GDP has a significant growth trend over time, which is similar to the growth trend of the quadratic curve and the cubic term curve, and similar to the trend of the annual growth curve. Therefore, considering the number of time periods as the independent variable and Northeast China's GDP as the dependent variable, a prediction model such

as a quadratic curve, a cubic curve, and a growth curve are established.

2.4 Model Establishment and Prediction

Linear trend models, nonlinear trend models, and curve trend models with growth caps are trend extrapolation models commonly used in time series [5]. Among them, the non-linear trend model is usually a quadratic curve model, a cubic term curve model, a power function curve model, a logarithmic curve model, a hyperbolic model, an exponential curve model, and so on. Model, Gompertz curve model and Logistic curve model. In this article, the data of Northeast China's GDP from 2000 to 2015 is used for analysis and elaboration. Six models of linear curve, quadratic curve, cubic term curve, compound type, growth type, and exponential type are considered for the applicable test. The effect of model fitting is shown below
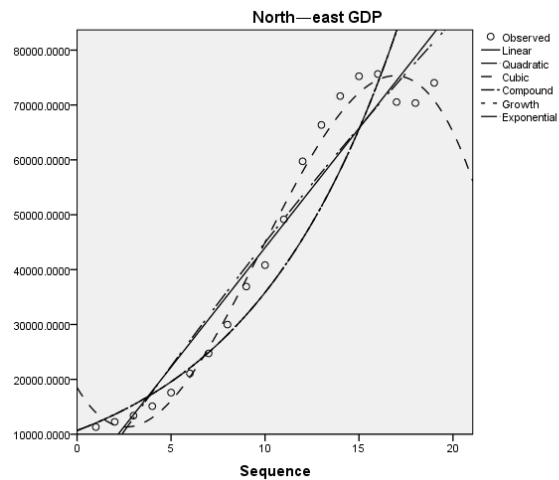
Figure 3. Curve Fitting

As can be seen from the figure above, the linear model fits the actual value with a very low degree of fit. The cubic term curve model has the highest fit with the actual value, which is better than the growth curve model. This is the lowest in the determination coefficient R of the linear curve in Figure 3. Are consistent. Figure 3 shows that among the six fitting models, the determination coefficients of the regression equations of the various curve models are all above 0.95, and the determination coefficients of the regression equations of the cubic term model are closest to 1, and the cubic term curve model can be seen [6]. Regression equations work best for sample data points. From the coefficient test, the P-value of each curve model coefficient is less than 0.001, which is statistically significant. Considering the two aspects of fitting test and coefficient test, the cubic curve model is the most ideal. The test of the fit of the regression equation and the sig-

nificance test of the regression coefficient have statistical significance, and the model selection is reasonable. The final regression equation is:

$$GDP=17055.670-4679.701t+1085.516t^2-34.571t^3.$$

In the formula, t is the number of time periods, and the GDP of Northeast China in 2016 is forecasted, and t is taken to be 17. The forecast result is 81367.544 billion yuan.

However, the actual GDP of the Northeast region in 2016 is 70,537.89 billion yuan, which indicates that the changes in economic policies over time have little effect on the regulation and control of economic changes over time. May be affected by other factors.

3. Countermeasures and Suggestions

According to the analysis results, a certain policy will play a positive role in promoting the economy in the short term. By combining the predicted results with the actual results after the implementation of the policy, it is found that: in 2006, the GDP after the implementation of the policy is compared with the predicted results without the implementation of the assumed policy, and in the annual prediction, the gap between the predicted results and the actual results is reduced. This proves that the effect of the policy will be reduced in the long run. In the process of extrapolation according to the trend, it is found that the degree of coincidence in the third power is the highest, but in fact, GDP does not always decrease with time, which reflects that the long-term effect of an economic policy will decrease.

The economic policy in Northeast China should be adjusted with time and in combination with the actual situation, because now is the most important time for economic reform. Once the development opportunity is missed, the economy will decline. We will further straighten out the relationship between the government and the market, clarify the responsibilities of the government, and accelerate the transformation of government functions [7]. Give full play to the ability of economic self recovery and reduce the intervention behavior. Reduce support for zombie enterprises and high energy consumption enterprises. One belt, one road, is open to expand and expand the market. Connect to the Internet to reduce overcapacity.

Therefore, the short-term impact of policy release on urban economic vitality is significant. The government should adjust and control in time according to the market situation, change the corresponding policies in time, enhance the economic vitality of the city and enhance the regional competitiveness.

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