

The Impact of COVID-19 on China's Economy and Residents' Consumption Levels

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Abstract

Review Article

As one of the first countries to break out of the new crown pneumonia epidemic, although China has succeeded in controlling the epidemic with a national effort, the impact of the epidemic on China's economy and residents' consumption levels cannot be ignored. This article uses a gray model to study the impact of the new crown epidemic on China's economy and residents' consumption level in 2020. The results show that the new crown pneumonia has brought varying degrees of impact on China's economy and residents' consumption level, exposing some areas of economic and social development. Existing shortcomings. Moreover, the impact of the new crown epidemic on the consumption level of Chinese residents is four percentage points greater than that of the Chinese economy. China should pay more attention to social development.

Keywords: COVID-19 Economy and Residents.

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INTRODUCTION

The new crown pneumonia epidemic that has occurred since the beginning of 2020 has had a huge impact on the Chinese economy and the world economy, and has profoundly changed the macro background of China's economic development. The epidemic has disrupted the normal order of production and life in the country, and has dealt a severe blow to both the supply side and the demand side of the economic system. Data from the National Bureau of Statistics show that China's gross domestic product (GDP) fell by 6.8% in the first quarter of 2020, and the growth rates of the three major industries have all experienced a significant decline [1]. According to the economic situation at that time, formulating economic goals is not only an expectation of future economic development, but also can influence the path and results of economic development by restricting the behavior of government officials and forcing various resources [2, 3]. Hu Angang *et al.* took the "five-year plan" goal as an example and found that the economic goals formulated by China have obvious strategic planning characteristics, which not only promoted economic development, but also significantly reduced economic fluctuations [4]. Therefore, understanding the impact of

the new crown pneumonia on China's economy and residents' consumption levels will not only help formulate economic goals, but also clarify the direction for economic improvement in the future.

Grey system theory takes "small samples" and "poor information" uncertain systems with "part of the information already known and part of the unknown" as the main points of inquiry [5, 6]. Compared with other methods of solving uncertain problems such as probability statistics and fuzzy mathematics, it is a new historical leap. As the most widely used part of the gray system theory, the gray prediction theory is used to predict the future behavior trend of the system by mining the internal evolution law of the system [7, 8]. GM (1, 1) model is one of the important contents of gray system theory; it is the core of gray prediction model and the foundation of many gray prediction models. Due to the fact that there are a large number of small samples and poor information uncertainty systems, the GM (1, 1) model has a wide range of applications in many fields [9, 10], and it is also one of the excellent models for predicting the consumption level and GDP of Chinese resident's one.

REDICTIVE MODEL CONSTRUCTION

Suppose the original sequence $X^{(0)} = (x^{(0)}(1), x^{(0)}(2), \dots, x^{(0)}(n))$,

Where $x^{(0)}(i) > 0, k = 1, 2, \dots, n$, the general steps of using the original sequence to establish a GM (1, 1) model are as follows:

(1) Do an accumulation of the original sequence $X^{(0)}$, get $X^{(1)} = (x^{(1)}(1), x^{(1)}(2), \dots, x^{(1)}(n))$

(2) Generate sequence $z^{(1)}(k) = \frac{1}{2}(x^{(1)}(k) + x^{(1)}(k - 1))$ as the immediate mean value of $X^{(1)}$

Get $Z^{(1)} = (z^{(1)}(2), z^{(1)}(3), \dots, z^{(1)}(n))$, where $k = 2, 3, \dots, n$. Then the original form of the GM (1,1) model is $x^{(0)}(k) + az^{(1)}(k) = b$, where a is the development coefficient and a is the ash effect. The whitening equation of

formula $x^{(0)}(k) + az^{(1)}(k) = b$ is $\frac{dx^{(1)}}{dt} + ax^{(1)} = b$

(3) Estimate the parameters of $\hat{a} = (a, b)^T$ by using the least square method, and obtain $\hat{a} = (B^T B)^{-1} B^T Y$, where

$$B = \begin{bmatrix} -z^{(1)}(2) & 1 \\ -z^{(1)}(3) & 1 \\ \dots & \dots \\ -z^{(1)}(n) & 1 \end{bmatrix}, Y = \begin{bmatrix} x^{(0)}(2) \\ x^{(0)}(3) \\ \dots \\ x^{(0)}(n) \end{bmatrix}$$

(4) The time response sequence of the GM (1,1) model $x^{(0)}(k) + az^{(1)}(k) = b$ is

$$\hat{x}^{(1)}(k + 1) = \left(x^{(0)}(1) - \frac{b}{a} \right) e^{-ak} + \frac{b}{a}, k = 1, 2, \dots, n$$

The time response function of the whitening equation $\frac{dx^{(1)}}{dt} + ax^{(1)} = b$ is $\hat{x}^{(1)}(t) = \left(x^{(1)}(1) - \frac{b}{a} \right) e^{-at} + \frac{b}{a}$

(5) Under initial conditions $\hat{x}^{(1)}(1) = x^{(1)}(1) = x^{(0)}(1)$, the original data sequence model is

$$\hat{x}^{(0)}(k) = \hat{x}^{(1)}(k) - \hat{x}^{(1)}(k - 1), k = 2, 3, \dots, n$$

MODEL RESULTS

The collected data are shown in Table 1 below. Based on the historical data of Chinese residents' consumption level and China's GDP from 2013 to 2019, the gray forecast model is used to describe the Chinese residents' consumption level and the evolution of

China's GDP, so as to obtain the first-order differential equation, and finally predict Obtained the value of household consumption and China's GDP in 2020 without the impact of the epidemic, as shown in Table 2.

Table-1: Historical data values

Years	Chinese residents' consumption level	China GDP
2013	15586	592963.2
2014	17220	643563.1
2015	18857	688858.2
2016	20801	746395.1
2017	22969	832035.9
2018	25245	919281.1
2019	27504	986515.2
2020	27438	1015986

Table-2: Predicted result value

Index	Actual value	Predictive value	Decrease value	Decrease rate
Chinese residents' consumption level	27438	30321	2883	10.51%
China GDP	1015986	1083542	67556	6.23%

CONCLUSION

There is an important perspective on the impact of the new crown epidemic on China's economy and the level of consumption of residents, that is, the time dimension. The long-term corresponds to the decrease and trend, and the short-term corresponds to the cycle and volatility. The new crown epidemic is an exogenous shock. From a short-term perspective, it has created a small economic cycle for China's economy and the level of consumption of residents, resulting in downward pressure on its economy. However, in the long run, the impact caused by the epidemic may also create opportunities for "structural" upgrades in the Chinese economy and increase the level of consumer consumption. Only in this way can we be worthy of the price paid in the process of epidemic prevention and control. Based on the mathematical model, this paper predicts China's GDP and the consumption level of Chinese residents in 2020 under the normal scenario (without the impact of the new crown pneumonia), and compares the actual situation with the actual situation to get the impact of the new crown epidemic on China's economy and residents' consumption level. The results show that: the new crown epidemic has reduced China's GDP by 6,755.6 billion yuan, a drop of 6.23%; the new crown epidemic has reduced the consumption level of Chinese residents by 288.3 billion yuan, a decrease of 10.51%; the impact of the new crown epidemic on China's consumption level is greater than that of the new crown epidemic on China Economic impact. It can be seen that the occurrence of the new crown pneumonia epidemic has not only the inherent laws of the generation and spread of the virus, but also exposed some shortcomings in the economic and social development fields. After the epidemic, if there is more investment in public health, biomedicine, smart society and other fields, China's economy is expected to gain new development opportunities and momentum, and the people's quality of life is also expected to be further improved.

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