Analysis of economic recovery forecasts in the post-COVID-19 era - China as an example

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Article

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Analysis of economic recovery forecasts in the post-COVID-19 era - China as an example

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Abstract: Since the outbreak of the new crown epidemic, it has dealt a severe blow to economies around the world. How to quickly recover the traumatized economies in the post-epidemic era is now an important task. This paper constructs a prediction model based on the data of five major epidemics similar to the current one that occurred in history. Based on the prediction model built, we make a comprehensive forecast and individual economic indicators forecast for China's economy after the current epidemic, and the forecast results show that the overall economy of the country name and import and export can basically recover to the pre-epidemic level in about one year, and the recovery time for tourism and air transportation is longer and requires a slow recovery. This result is also very much in line with China's reality. China has already gained some experience in this kind of economic recovery, and a summary of these experiences will provide inspiration to other economies**.**

Keywords: Post-COVID-19 era; China's economic forecast; Economic recovery; Fuzzy mathematics

I. Introduction

The new crown epidemic broke out in China in 2019, and after a relentless fight against the epidemic, the epidemic was effectively controlled within China at the end of March 2020, but it is still spreading very seriously in other countries and regions of the world, and as of April 2022, 95 million people have been infected worldwide, 6 million people have died due to the epidemic, and the epidemic is continuing to spread. As you can imagine, China's economy has been hit very hard by this epidemic, and according to China's economic report for the first quarter of 2020, China's GDP growth rate for the first quarter of 2020 was -6.8%, and consumption, investment, and exports, which have the name of the economic troika, all fell very sharply, which is an unprecedented contraction of the Chinese economy. In the aftermath of the epidemic, economic recovery has become a top priority for all countries. China has recovered its economy to pre-epidemic levels after

just one year. In this paper, we hope to construct a comprehensive economic forecasting model to forecast China's overall economy and important economic indicators, and to give an analysis of China's economic recovery, the results of which are very much in line with the actual situation of China's economic recovery. This forecasting model can be put into practice in other economies to better analyze the economic recovery and give impetus to other economies to recover their economies. At the same time, a more detailed analysis of China's practices and experiences in economic recovery will also bring methods to other countries.

II. Domestic and international research

Throughout the world's history, there have been various disasters of various sizes, from natural disasters to viral epidemics, and each disaster is bound to slow down the growth of the economy or cause a major impact on the economy in severe cases. The economic recovery after a disaster is over is naturally valued by all countries, and the study of post-disaster economic recovery has great significance. The study of economic recovery has received a lot of contributions from domestic and foreign scholars.

In terms of domestic research, Jinlei He (2004)[1] et al. established a mathematical model of SARS using economic forecasting methods, and processed the data longitudinally and horizontally using the 0.618 method, time series exponential smoothing technique, and the Wendt method, respectively, to derive China's economic recovery after SARS under the analysis of the forecasting model; Yuying Jin (2006)[2] et al. addressed the financial crisis in Southeast Asia that caused a huge impact on the world economy The study of the world economic recovery after the crisis is the starting point; Tang Yandong and Wu Jidong (2011, 2013, 2014)[3][4][5] et al. conducted a study on the theory of post-disaster economic recovery from a macro perspective and analyzed the overall economic recovery after the Tangshan earthquake and Wenchuan earthquake; Korean Moon (2012)[6] et al. used fuzzy mathematical methods to construct an economic forecasting model to study the economic recovery after the 2011 (2020)[7] et al. constructed a model from the consumer confidence index (CCCI) as a starting point to analyze the prior prognostic effect of CCCI on many aspects of macroeconomics.

In foreign studies, Webb (2002)[8] et al. used questionnaires to allow people to subjectively compare changes in the number of customers and profitability after the disaster to predict business recovery in a county in Florida after the earthquake; Ewing (2003)[9] et al. studied the growth of

employment in Texas after the tornado as a way to observe changes in industries, and found that manufacturing, services, and Lam (2009)[10] et al. investigated the recovery of industries in New Orleans after Hurricane Katrina, with science and technology industries recovering earlier and wholesale and retail industries recovering later; Xiao (2011)[11] used the Marx index to study the impact of flooding on employment and agriculture by finding a city very similar to the affected city as a control group. Hochrainer (2014)[12] used the ARIMA model to predict the trajectory of GDP growth five years after the absence of disasters after collecting data from 225 disasters in the world; Usadhi (2019)[13] et al. analyzed the role of government and social resources in post-disaster recovery and found that government and Sylvain (2020)[14] et al. summarize the economic recovery problems caused by financial crisis in the past 20 years worldwide and conclude that only half of the countries in the sample are in line with the V-U-L type economic recovery graph. type economic recovery graphs. Keogh-Brown (2008)[15] analyzed GDP, imports and exports, tourism, retail sales, etc. for countries in the SARS epidemic and finally found that the impact of SARS was only for a few months.

Many scholars at home and abroad have studied post-disaster economic recovery. In this paper, based on the study of numerous literatures, five historical epidemic events with similar impact to the current epidemic were selected, and the data related to these five epidemics were used to predict the combined economic as well as individual economic variables of the current epidemic. Since each epidemic differs from this one to a different extent, there is no clear criterion to classify the differences between epidemics, so the concept of fuzzy mathematics is chosen to represent the problem of weight coefficients between the selected five epidemics and the current new crown epidemic using Euclidean proximity. The most innovative point of this paper is to build a prediction model for the degree of economic recovery of the current epidemic by using historical similar epidemic data predicting the future direction of economic indicators to predict the recovery direction.

III. Model building

(i) Calculation of the integrated economic recovery degree and the recovery degree model of individual economic indicators

1、Model introduction

In this paper, the factors affecting the level of economic recovery are divided into impact and performance factors, where the impact factor is mainly used to determine the magnitude of the

closeness of the control epidemic to the target epidemic, i.e., the degree of similarity between the selected five epidemic events and the current new crown epidemic. The performance factor, on the other hand, is used to determine the degree of economic recovery of the control epidemic. The impact factors mainly include the basic situation information of the country and the information of the severity of the epidemic. The basic situation information of the country includes the land area, population and GDP, and the information of the severity of the epidemic includes the scope of the epidemic, the number of deaths and the duration of the epidemic. Performance factors This paper identifies eight major economic indicators including CPI, residents' final consumption, government final consumption, money supply, employment, fiscal revenue, import volume and export volume.

Since it is impossible to accurately describe the similarity between the five outbreaks that occurred in history and the current New Crown outbreak, the concept of closeness in fuzzy mathematics is chosen in this paper to represent the similar distance between the control outbreak and the target outbreak, and then the exponential smoothing method of time series[16] is used to construct weight factors to approximate the economic recovery after the 2019 New Crown outbreak that occurred in China.

2. Prediction model of economic recovery from the new crown epidemic in China

For the economic prediction of the new crown epidemic in China, this paper selects m influential factors that have a significant effect on the economic recovery. Using these m factors as criteria, n epidemics in history that are more similar to the current New Crown epidemic are selected as controls for prediction analysis. For the selection of control epidemic weights, this paper chooses the concept of fuzzy set of fuzzy mathematics as the expression thatx_{ij} denotes the value of the affiliation function of the jth characteristic influence factor of the ith epidemic, where$x_{ij} \in [0,1]$[17] . The influence of the nth reference epidemic can be expressed as the following characteristic fuzzy matrix.

$$\begin{pmatrix} x_{11} & \cdots & x_{1m} \\ \vdots & \ddots & \vdots \\ x_{n1} & \cdots & x_{nm} \end{pmatrix} = (X_1, X_2, \cdots, X_n), x_{ij} \in [0,1]$$

Also, assume thatx_j^* is the value of the affiliation function of the jth characteristic influencing factor of this new crown epidemic, the characteristic fuzzy vector of this epidemic isX^* : The

$$X^* = (x_1^*, x_2^*, \cdots, x_m^*), x_j^* \in [0,1]$$

For the selection of the closeness between each epidemic, the European closeness is chosen in this paper and calculated as follows:

$$\beta_i = 1 - \frac{1}{\sqrt{n}}[\sum_{j=1}^{m}(x_{ij} - x_j^*)^2]^{\frac{1}{2}}, i = 1,2,\cdots,n \qquad (1)$$

whereβ_i denotes the closeness of the ith control outbreak to the target outbreak, thex_{ij} andx_j^* denote the affiliation function values of the control epidemic and the factors influencing the characteristics of the current epidemic, respectively. Next, to facilitate the calculation, we sort the closeness of the n control epidemics in ascending order, i.e.$(\beta_1, \beta_2, \cdots, \beta_n) \rightarrow (\beta_1^*, \beta_2^*, \cdots, \beta_n^*)$, and subsequently use exponential smoothing to forecast the post-epidemic economic recovery in China by constructing an exponential smoothing recursion as follows.

$$S^* = \beta_n^* s_n + (1 - \beta_n^*)s_n^*$$
$$= \beta_n^* s_n + (1 - \beta_n^*)[(\beta_{n-1}^* s_{n-1} + (1 - \beta_{n-1}^*)s_{n-1}^*)]$$
$$= \cdots$$
$$= \beta_n^* s_n + (1 - \beta_n^*)\beta_{n-1}^* s_{n-1} + \ldots + (1 - \beta_n^*)(1 - \beta_{n-1}^*) \cdots (1 - \beta_2^*)\beta_1^* s_1 \qquad (2)$$

whichS^* denotes the predicted economic integrated recovery for the current Chinese epidemic, ands_i denotes the integrated economic recovery for the one-year period of the i-th epidemic, ands_i^* denotes the predicted integrated economic recovery for the one-year period of the ith outbreak, satisfying$s_j^* = \beta_{j-1}^* s_{j-1} + (1 - \beta_{j-1}^*)s_{j-1}^*(j = 1,2,\cdots,n)$ and take$\beta_i(i = 1,2,\cdots,n)$ as the smoothing coefficient of the index of the ith control epidemic. And the average of the economic integrated recovery of the n control epidemics is chosen as the initial condition in the recursive exponential smoothing equation, i.e.$s_1^* = \frac{\sum_{i=1}^{n}\beta_i s_i}{\sum_{i=1}^{n}\beta_i}$.

Next, since the comprehensive economic recovery needs to be assessed through a combination of multiple economic indicators, the principal component analysis in multivariate statistics[18] is utilized and constructed as follows.

(1) Construct the original matrix

In this paper, n epidemics similar to the current epidemic were taken as statistical samples and sorted in ascending order according to the magnitude of the closeness obtained earlier, while p indicators were selected as performance factors in the semi-annual economic recovery examination to obtain the following raw data information matrix.

$$\begin{pmatrix} t_{11} & \cdots & t_{1p} \\ \vdots & \ddots & \vdots \\ t_{n1} & \cdots & t_{np} \end{pmatrix} = (T_1, T_2, \cdots, T_p)$$

wheret_{ij} denotes the size of the jth performance factor indicator for the ith outbreak, $T_i = (t_{1i}, t_{2i}, \ldots, t_{ni})^T, i = 1,2, \cdots, p$

(2) Calculate the covariance matrix and find the eigenvalues of the covariance and the corresponding eigenvectors

The covariance matrix of the control epidemic is first calculated as$\sum = (s_{ij})_{p\times p}$, i.e.$s_{ij} = \frac{1}{n-1}\sum_{k=1}^{n}(t_{ki} - \overline{t_i})(t_{kj} - \overline{t_j}), i, j = 1,2, \cdots, p$;

Next, find the eigenvalues of the covariance matrix$\lambda_1 \geq \lambda_2 \geq \cdots \geq \lambda_p \geq 0$ and the corresponding orthogonalized unit eigenvectors:$a_i = (a_{1i}, a_{2i}, \cdots, a_{ni})^T, i = 1,2, \cdots, p$.

(3) Calculate the standardized principal component scores

First, this paper standardizes the raw data, i.e.

$$t_{ij}^* = \frac{t_{ij} - \overline{t_j}}{s_j} (i = 1,2, \cdots, n; j = 1,2, \cdots, p) \qquad (3)$$

wheret_{ij}^* denotes the jth performance factor of the ith control epidemic after dimensional standardization treatment, while the standardized matrix is denoted as$T^* = (T_1^*, T_2^*, \cdots, T_P^*)$ The matrix is denoted as$\overline{t_j}$ denotes the sample mean of the jth performance factor of the n control epidemics, i.e.$\overline{t_j} = \frac{1}{n}\sum_{i=1}^{n} t_{ij}$ The sample standard deviation of the jth performance factor in the n control epidemics, i.e.$s_j = \sqrt{\frac{1}{n-1}\sum_{i=1}^{n}(t_{ij} - \overline{t_j})^2}$.

Second, based on the orthogonalized unit eigenvectors obtained in the second stepa_i and the normalization matrixT^* , the m principal component scores of the integrated economic recovery of these n control epidemics can be calculated, i.e., using the variance contribution ratio$a_i = \frac{\lambda_i}{\sum_{k=1}^{p}\lambda_k}$ to explain the magnitude of information reflected by the principal components, and m is determined by the cumulative contribution rate G(m) =$\sum_{i=1}^{m} a_i$ reached 90% or more as the principle. The calculation equation is as follows.

$$F_i = a_{1i}T_1^* + a_{2i}T_2^* + \cdots + a_{pi}T_p^*, i = 1,2, \cdots, m$$

(4) Determination of the integrated economic recovery of the control epidemic

In this paper, the variance contribution ratio was used as the weight to calculate the principal component$F_1, F_2, \cdots, F_m$ of the weighted average as the integrated economic recovery of the control epidemic, which is calculated as follows.

$$S = \begin{bmatrix} s_1 \\ s_2 \\ \cdots \\ s_n \end{bmatrix} = (F_1, F_2, \cdots, F_n) \begin{bmatrix} a_1^* \\ a_2^* \\ \cdots \\ a_n^* \end{bmatrix} \qquad (4)$$

where S denotes the control epidemic integrated economic recovery vector satisfying$S = (s_1, s_2, \cdots, s_n)^T$, a_i^* denotes the weighted adjusted orthogonal unit eigenvector satisfying$a_i^* = \frac{a_i}{\sum_{k=1}^{m} a_k}, i = 1,2, \cdots, m$.

IV. Calculate the degree of comprehensive economic recovery and the degree of recovery of individual economic indicators

(1) Calculation of control epidemic proximity

In this paper, five epidemics that are more similar to the current New Crown epidemic were selected as control epidemics, in which the West African Ebola epidemic was counted only in three countries with more serious epidemics, Guinea, Sierra Leone, and Liberia. Among these epidemic events, the SARS epidemic in China, the influenza epidemic in the United States, and the Middle East Respiratory Syndrome in Saudi Arabia are all respiratory infectious viral diseases, similar to the transmission of the viruses in this New Crown epidemic, and the Ebola virus in Brazil and the Zika virus, although not respiratory infectious viral diseases, can be compared with this New Crown epidemic in terms of the scope and intensity of their epidemic impact at that time. See Table 1 for details.

Table 1 Sample of control epidemics

Country	Epidemic situation	Time
China	SARS Epidemic (SARS)	2003
United State	Influenza epidemic (H1N1)	2009
Saudi Arabia	Middle East Respiratory Syndrome (MERS)	2012
West Africa	Ebola virus (EBOLA)	2014

Brazil	Zika viru (ZIKA)	2016

Source: World Health Organization.

Based on the influencing factors in the hypothetical conditions, statistical analysis was conducted for each control epidemic separately, and the data were obtained by normalizing six characteristic factors that can express the characteristics of the country, the difference between countries and the intensity of the epidemic impact at that time, namely, the area of the country, the population, the GDP, the impact of the epidemic, the number of deaths and the duration of the epidemic, as shown in Table 2.

Table 2 Table of affiliation function values for the control epidemic

Characteristic factors	Country are	Population	GDP	Impact range	Number of deaths	Duration
China (X_1)	1	0.917	0.115	0.135	0.05	0.205
United States (X_2)	0.972	0.219	1	0.2	1	0.436
Saudi Arabia (X_3)	0.234	0.021	0.052	0.121	0.032	1
West Africa (X_4)	0.662	0.158	0．001	0.047	0.8	0.256
Brazil (X_5)	0.887	0.146	0.125	0.2	0.133	0.205

Source: WIEGO statistical database, World Health Organization.

Meanwhile, using the information collected from this Chinese epidemic, the characteristic fuzzy vectors of this epidemic under six characteristic factors are obtained X^*= (1,1,0.482,1,0.328,0.103). At this point, using equation (1), the magnitude of the closeness of the five control epidemics can be derived and sorted in ascending order to obtain the following results.

$$(\beta_1, \beta_2, \cdots, \beta_n\ ) = (0.5553, 0.3544, 0.174, 0.337, 0.44246) \rightarrow$$
$$(\beta_1^*, \beta_2^*, \cdots, \beta_n^*) = (0.174, 0.337, 0.3544, 0.44246, 0.5553) \quad (5)$$

Specifically, the closeness and similarity between the 2003 SARS epidemic in China and the current New Crown epidemic is 0.56, which is also the highest among the five control epidemics. The closeness and similarity between the 2009 influenza epidemic in the United States and the current epidemic is 0.35, the closeness and similarity between the 2012 Middle East respiratory

syndrome in Saudi Arabia and the current epidemic is 0.17, and the similarity between the 2014 Ebola epidemic in West Africa and the current epidemic is 0.17. The closeness and similarity between the 2014 Ebola epidemic in West Africa and the current New Crown epidemic is 0.34, and the closeness and similarity between the 2016 Zika epidemic in Brazil and the current New Crown epidemic is 0.44. The second highest degree of similarity is between the 2016 Zika epidemic in Brazil, when the Zika virus infected 1.5 million people worldwide, and the breadth of transmission is very similar to the current epidemic. However, it is still mainly in South America, Latin America and other regions, while this new crown epidemic has a much wider transmission range. The next epidemic was the U.S. influenza epidemic, which affected the U.S. and Mexico to a greater extent and was controlled within a certain time frame, and did not have the same impact as the current epidemic. The Middle East respiratory syndrome and Ebola virus epidemics were both hardest hit in the Middle East and West Africa, and although other countries and regions of the world were infected to varying degrees, the scope of infection was not as great as the impact of the current New Crown epidemic, and the economic damage caused was not as great as that of the current epidemic, so the closeness was relatively small.

(ii) Calculation of the integrated economic recovery for the semi-annual control epidemic

Data on nine performance factor indicators for the six-month period after the five epidemics were collected through the data, and to avoid the influence of time factor and magnitude, the data were here subjected to year-on-year rate of change, as shown in Table 3.

Table 3 Table of indicators of economic recovery performance factors in the six-month period after the control epidemic

Control epidemic	CPI	Final consumption of the population	Employment	Fiscal revenue	Imports	Exports	Government final consumption	Money supply
Saudi Arabia (X_1^*)	9.9	19.58	15.44	53.82	11.35	5.15	12.97	47.05
West Africa (X_2^*)	16.46	3.1	5.49	18.71	1.82	36.54	11.11	36.69
United States (X_3^*)	1.9	0.27	3.01	0.31	4.29	8.79	2.8	8.91
Brazil (X_4^*)	7.89	-2.42	2.48	2.82	4.09	7.54	-0.18	3.43

China (X_5^*)	3.06	24.79	6.33	40.83	43.63	46.33	45.19	25.49

Source: WIEGO statistical database and BvD -EIU CountryData database.

Secondly, this paper used R software to conduct principal component analysis of the performance factors of the five outbreaks, as shown in Table 4.

Table 4 Table of variance contribution of principal components

Principal component	Principal component standard deviation	Variance contribution	Cumulative contribution
1	2	0.5	0.5
2	1.67	0.35	0.855
3	1.04	0.13	0.989
4	0.29	0.01	

With Table 4, it is intuitive to see that the cumulative contribution of the first three principal components exceeds 98%, which can already represent the vast majority of information. Next we use the principal component expression (4), we can find the first three principal component scores of the five control epidemics, as shown in Table 5.

Table 5 Table of principal component scores

Control epidemic	First principal component	Second principal component	Third principal component
Saudi Arabia(X_1^*)	1.17	-2.21	-1.08
West Africa (X_2^*)	1.65	-0.47	1.58
United States (X_3^*)	-0.04	1.57	-0.71
Brazil (X_4^*)	0.64	1.78	-0.16
China (X_5^*)	-3.42	-0.67	0.37

(iii) Predicting the integrated economic recovery of this epidemic

Finally, we predict the recovery of this epidemic, and first find the combined economic recovery of the five control epidemics according to equation (4), as follows.

$$S^T = (s_1, s_2, \cdots, s_5)^T = (-0.329, 0.880, 0.436, 0.922, -1.910)^T \quad (6)$$

Next, we take the previously obtained closeness magnitude equation (5) for these five control epidemics, and the now obtained integrated economic recovery equation (6), and bring them together in equation (2) to find the integrated economic recovery for this epidemic, as follows.

$$S^* = \beta_5^* s_5 + (1-\beta_5^*)\beta_4^* s_4 + \ldots + (1-\beta_5^*)(1-\beta_4^*) \cdots (1-\beta_2^*)\beta_1^* s_1 = -0.7994$$

In order to be able to describe the specific degree of recovery of this earthquake more accurately, this paper gives 7 level degree indicators of recovery with reference to the level indicators in the hierarchical analysis[19][6] . As shown in Table 6.

Table 6 Scale of comprehensive recovery degree degree

Scale	Meaning
I(-2,-1.25)	he degree of economic recovery is very problematic and the economy tends to be in a long-term depression
II[-1.25,-0.75)	The degree of economic recovery is unsatisfactory, and it may take more than one year for the economy to gradually recover
III[-0.75,-0.25)	The economy is recovering slowly, but it is expected to return to normal within a year
IV[-0.25,0.25)	The economy has largely recovered to its original level, but it needs to be supported at a later stage
V[0.25,0.75)	The economy has not only returned to normal, but is also on track for normal economic development
VI[0.75,1.25)	The economy has recovered more than expected and the economy is growing steadily after the disaster
VII[1.25,2)	The economy is growing rapidly because of the disaster

According to Table 6, it can be judged that the comprehensive impact of this new crown epidemic on the Chinese economy should be on the second scale, but the numerical results are very

close to the third scale, indicating that the degree of recovery of the Chinese economy is not too optimistic and the economy may take more than 1 year, basically around 1 year, to return to normal. This result is actually still basically in line with the reality of the Chinese economy after the end of the epidemic. As the epidemic turned better, the Party Central Committee introduced a series of measures to stimulate the economy, including handing out a large number of consumption vouchers to the public and lifting travel restrictions before the May 1 Golden Week. Local governments have also been pushing for economic recovery by introducing local stimulus packages and supporting small, medium and micro enterprises. Through the positive efforts in April and May and the so-called "retaliatory consumption" of the population in the post-epidemic era, China's economy has made a V-shaped reversal (see Figure 1). was the time when the new crown pneumonia epidemic broke out in China, and it is clear that the outbreak of the epidemic seriously affected consumption, and by February, the decline was even steeper and continued to affect the Chinese economy until March, when it started to rebound from the bottom and embarked on an upward trend, after which April and May were slowly picking up, although the rebound was not fast and was still far from the level at the end of 2019, but in the Chinese government's Under the strong stimulation and help of the Chinese government, it is believed that it should not be a big problem to recover to the level of 2019 after 1 year.

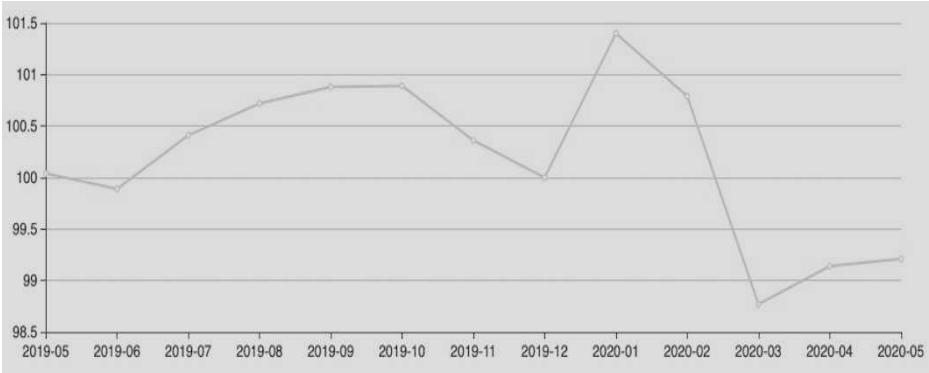

Figure 1 Consumer prices rose and fell in the chain

Source: WIEGO statistical database.

Next, this paper forecasts individual economic indicators by means of an economic forecasting model. After the forecast, the results in Table 7 are obtained, in which the final consumption of residents belongs to the fourth scale, i.e., it has recovered to the original degree, but still needs follow-up policy support and stimulation, due to various ways of stimulating consumption by the government, which has indeed driven a large amount of consumption, but there is some

overestimation here, the actual situation of residents' consumption is indeed steadily improving, but it has not reached the level of basic recovery. On the contrary, CPI belongs to the second scale, that is, the degree of recovery is not yet ideal, and it will take at least 1 year to recover, which is more compounded by the real situation. The impact of employment numbers is also quite significant, and the forecast falls within the first scale, i.e. the decline in employment numbers will be a long-term phenomenon. The current epidemic has indeed hit the job market significantly, with people in many industries losing their jobs and graduates having difficulty finding work. Fiscal revenue, money supply and exports are in the second scale, i.e., the degree of recovery is not ideal, and it will take at least one year to recover, and it is unlikely that our exports will recover in the short term due to the impact of the current international epidemic, which warns us that we should shift our economic development to domestic and not rely on exports. Imports and government final consumption forecasts belong to the third scale, that is, they are already recovering slowly, but still need at least 1 year. The results of this forecast tell us that the international epidemic continues and foreign countries receive the impact of the epidemic and also need to export a large amount of goods to reduce the loss of the epidemic, and the recovery of these two parts will reach the level of 2019 soon.

Table 7 Prediction table for individual economic performance factors

Economic scale	Recovery Scale	at which
CPI	-0.89	scale [II]
Final consumption of the population	-0.05	Fourth scale [IV]
Employment	-1.42	First scale [I]
Fiscal revenue	-1.17	Second scalar [II]
Imports	-0.63	Third scale [III]
Exports	-0.89	Second scale [II]
Government final consumption	-0.6	Third scalar [III]
Money supply	-0.94	Second scalar [II]

In general, through the model prediction results, although China has suffered a very serious economic impact in this new crown epidemic, through active state intervention and scientific and effective economic stimulus, it is believed that the economy will recover after 1 year and the long-term trend of China's economy will not change for the better.

V. Research conclusions and countermeasure suggestions

(I) Conclusions

1. Although the impact of the epidemic on China's economy is significant, China's overall economic situation will recover to the pre-epidemic level in about one year

The outbreak of the New Crown epidemic in China starting in January 2020 put a pause button on the Chinese economy, which was in a high growth rate, and the impact on the Chinese economy was huge. 2020 is also the year when China will be fully prosperous, and such an unexpected epidemic is very serious for China. It is very meaningful to build an economic forecasting model to determine the recovery of China from this epidemic by finding data from five epidemics with comparable impact to this epidemic. Ultimately, the model analysis yields that China's comprehensive economy will slowly recover in about 1 year, which confirms that the long-term trend of China's economic upturn will not change and that our government is capable of raising China's battered economy to pre-epidemic levels in a short period of time.

2, the epidemic has a certain impact on China's international trade, but the opportunities outweigh the drawbacks

Although the epidemic in China was controlled at the end of March 2020, but then the epidemic began to spread to the whole world, countries have taken measures such as sealing cities and countries to control the epidemic, which caused a certain impact on China's international trade, but from the analysis of the data, the impact of import and export is not very serious, and the current export value of China is steadily increasing, and the import value is not increasing at present, although it is affected by the foreign epidemic Once the foreign epidemic is under control, the import volume is bound to increase significantly. Therefore, the impact of the new crown epidemic on imports and exports is not particularly large, but after the epidemic is controlled in China, China exports a large number of epidemic prevention materials, respirators and other equipment, such an initiative can not only enhance our economy, but also enhance the international image of China's courage in the international community, which can occupy a favorable position for China in the

international trade in the future, the impact of the epidemic on imports and exports outweighs the disadvantages.

3. The epidemic has had a huge impact on China's service industry, with the air transport and tourism industries requiring a long recovery cycle

The impact of the epidemic on China's service industry is particularly great, including the catering industry, movie industry, entertainment industry, air transportation industry and tourism industry. On the other hand, the epidemic has caused panic in people's minds, and even though the epidemic is under control, the inertia of this panic will lead to people not daring to take public transportation to travel and tourism. The recovery period for the air transport and tourism industries will also be long.

(II) Suggestions for countermeasures

1. The economic recovery in the post-epidemic era requires overall control at the national level and concerted efforts at all levels of government and the public.

The epidemic has been effectively controlled in China, and with it comes the question of how to quickly recover the economy, which has been hit by the epidemic but is resilient. In order for China's economy to recover quickly to the pre-epidemic level, it is inevitable for the central government to grasp the overall direction from the national level, and for each local government department to develop policies and recovery methods according to the actual situation and characteristics of their respective regions, in addition to the vigorous promotion of the people's consumer confidence, which is the fundamental driving force for China's economic recovery.

2, active stabilization of the epidemic at the same time to develop jobs, stabilize people's livelihood and ensure employment

Although the epidemic is basically under control in China, the pressure of internal prevention and rebound and external importation is still not small. Only when the job market is stable can people's livelihoods be stabilized, and only then will people have a sense of gain and increased income. Only when the job market is stable can the people's livelihood be stabilized, the people will have a sense of gain, their income will increase, and the development of China's economy will be boosted.

3, rebound service industry is the top priority in the post-epidemic era, boosting consumer confidence is the key

The impact of the epidemic on the service industry in China is the most serious. The losses in the catering, transportation and tourism industries are very heavy, and many enterprises have closed down or withdrawn from the market as a result. After the end of the epidemic, the rapid recovery of the service industry is the top priority of China's economic recovery, and in the recovery of the service industry, our government has taken a variety of means to support the development of enterprises, including tax exemptions and loans. In addition to the positive drive of the government at all levels, the recovery of consumer confidence is the key. Due to the impact of the epidemic, consumers will also have palpitations about the consumption of restaurants, air transportation and tourism, so it is the key to economic recovery to make consumers feel at ease and improve consumer confidence.

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