

## Comprehensive quantitative Analysis of Chinese and American economy based on improved Analytic hierarchy process

Kailong Zhao<sup>1,a</sup>, Yang Xu<sup>2</sup>, Yanning Bi<sup>1</sup>, Zixuan Gao<sup>1</sup>, Haochen Fu<sup>1</sup>, Jialin Miao<sup>1</sup>

<sup>1</sup>School of Mechanical and Automotive Engineering, Qingdao University of Technology, Qingdao, Shandong, 266520, China

<sup>2</sup>School of Management Engineering, Qingdao University of Technology, Qingdao, Shandong, 266520, China

<sup>a</sup>3417617790@qq.com

**Keywords:** Analytic Hierarchy Process, Coefficient of Variation, Time Series, Political Analysis Model, Rational Analysis Model

**Abstract:** People often play a decisive and heterogeneous role in matters, such as small matters, and even more so in a country's economy. The different political and economic propositions adopted by different leaders will have an impact on a country and the international structure. Through the analysis and research of the US general election, the use of analytic hierarchy process, Critic assignment method and coefficient of variation to analyze the impact of different American candidates on the domestic and Chinese economic fields, so as to make it more clear that the superstructure will affect the lower economy. In this paper, the economic situation of the United States is studied according to the analytic hierarchy process. Six selected areas of the US economy were studied after collecting and analyzing data related to Biden and the Trump administration. On the basis of collecting data, the evaluator assignment method is used to determine the sub-standard level of each field, that is, the index. Finally, the correlation coefficients of each index are compared by using the coefficient of variation, and the impact of their respective governance concepts on the American economy is quantitatively explained.

### 1. Introduction

The US election is a matter of concern to the whole world, and 2020 will be the year of the US election. This election is a competition between Republican candidate Donald Trump and Democratic candidate Joe Biden. Moisturizing things silently, the cultures inherited by different parties have different influences on the political positions, economic and cultural thoughts of the two candidates, etc. Therefore, the election of different candidates will rebuild the US strategic model and global economic finance. The development pattern will not only have a major impact on the economic situation of China and the United States, but also have a major impact on the global economy. Therefore, paying attention to the changes in the US political situation in time and understanding its latest policies play an important role in formulating countries' political and economic strategies for the United States and the world.

Based on the above-mentioned background, first of all, we choose to use Analytic hierarchy process to analyze various standards in the field of American economy. Mainly from the United States financial market, people's livelihood, employment, COVID-19 epidemic situation and other six aspects of analysis and research. Through the evaluator assignment method, the sub-criteria layer in each criterion layer, that is, the indicators in different areas of the American economy, are selected for data processing and analysis. Using the coefficient of variation to calculate the index weight coefficients of six areas, comparing the index weight coefficients of Biden and Trump in different areas, and comparing and analyzing their policies in these areas, we can more intuitively get the different results of different candidates' impact on the US economy.

## 2. Model preparation

### 2.1 Select research related fields

In order to reflect more comprehensively, the different policies and political opinions adopted by different candidates have different effects on the US economy. Six areas of the US economy, including the US financial market, people's livelihood, employment, and the new crown epidemic, are selected for analysis and research. Through the collection, processing and analysis of relevant data, we found that candidates from different ruling parties have different emphasis on various parts of the economic field, and the overall impact of the US economic trend has produced a certain degree of heterogeneity. The principle used in the selection of the field is: the selected field can more intuitively and clearly reflect the impact of different leadership propositions on a country's economy. Therefore, we mainly select six of the US financial market, people's livelihood, employment, and the new crown epidemic. In-depth analysis and research in each field.

### 2.2 Data collection and chart analysis

According to the selected fields, data collection and analysis are carried out, and data information in six areas of the U.S. financial market, employment, people's livelihood, and the new crown epidemic can be obtained by consulting the data. When collecting information, it involves a relatively short time for President Biden. The economic data of his political period has not yet been released. Taking into account the political relationship between the parties, the political and economic claims between the same parties are homogenous. Therefore, the current US President Biden's data mainly refers to the data during President Obama's tenure. After collecting and integrating relevant data, SPSS is used for processing to obtain the corresponding data statistical graph and correlation coefficient analysis graph.

## 3. Model establishment and solution

### 3.1 Structure diagram of analytic AHP

We first establish an analytic hierarchy process model with the U.S. economy at the highest level, the six basic elements as the middle level, and Trump and Biden's ruling choices as the lowest level.

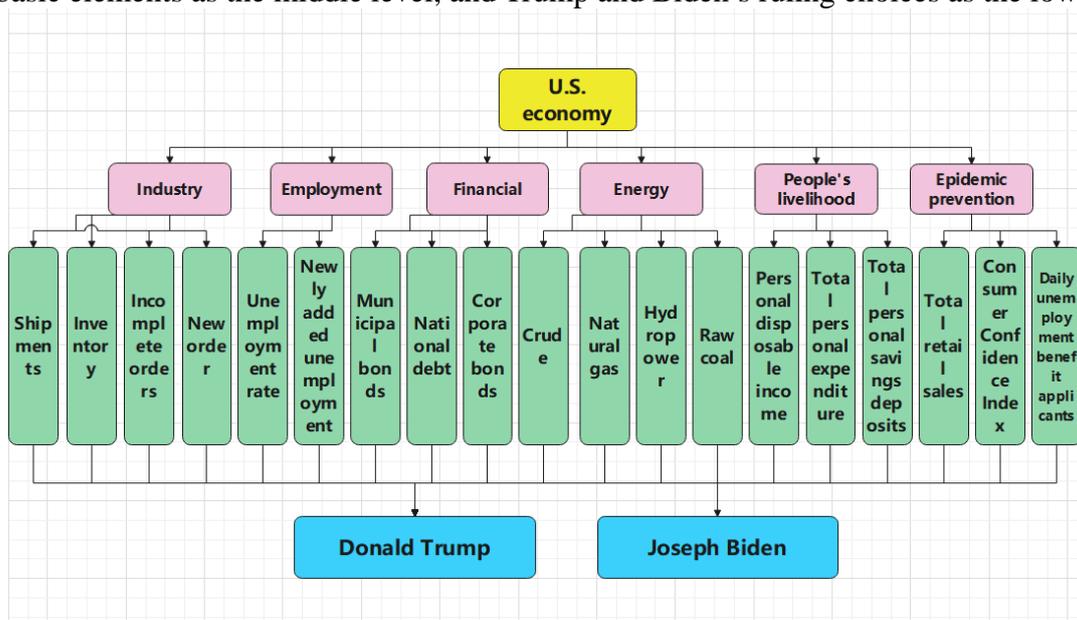


Figure 1 Structure diagram of analytic AHP

### 3.2 AHP comparison matrix

By consulting the data, we can sort out the different political propositions of the American

candidates Biden and Trump in six areas of the American economy, including financial markets, people's livelihood, industry, employment, and the new crown epidemic, as shown in Table 1 below:

Table 1 Biden's and Trump's political views in six major economic areas

	<b>Donald Trump</b>	<b>Joseph robinette biden</b>
<b>Industry</b>	Encourage U.S. companies to reduce overseas production and revitalize U.S. domestic manufacturing.	Revitalize the U.S. manufacturing industry, oppose the trade war with China, and support the North American Free Trade Agreement.
<b>Employment</b>	Tax cuts encourage companies to keep jobs in the U.S.	Expand infrastructure investment and increase employment.
<b>Financial</b>	Advocating a free market, deregulation, tax cuts and promotion of manufacturing.	Pay attention to regulation and control of the market, raise the minimum hourly wage, and increase taxation for high-income groups.
<b>Energy</b>	It plans to achieve energy independence by expanding the production and export of fossil energy represented by coal, oil and natural gas.	To ensure that the United States achieves a 100% clean energy economy and achieves net zero carbon emissions by 2050.
<b>People's livelihood</b>	Encourage states to restart the economy as soon as possible.	Be cautious about restarting the economy.
<b>Epidemic prevention</b>	Take the economy first and promote the resumption of work; give priority to speeding up the progress of new crown treatment methods and vaccines.	Shelling Trump is not good for responding to the epidemic. Promote free testing, establish a nationwide contact history tracking plan, and make masks mandatory.

Through the analysis of the problem, we can see that our final research is the US economic field, using the analytic hierarchy process to select the US economy as the target layer, and the US economy as a whole system. Different U.S. leaders Biden and Trump have adopted different policies for the six areas of the economy, which will ultimately affect the U.S. economy. According to the various policy propositions of Trump and Biden in the chart, we can compare the importance of each element of the sub-criteria layer with respect to a criterion in the criterion layer, that is, construct a contrast matrix. Here, we are studying the impact of various factors on the US economy, that is, how important it is to the US economy. Therefore, the definition of the scale of the judgment matrix is given, as shown in Table 2 below.

Table 2 Matrix scale definition judgment table

<b>Scaling</b>	<b>Meaning</b>
<b>1</b>	Equal importance
<b>3</b>	The former is slightly more important
<b>5</b>	The former is obviously more important
<b>7</b>	The former is more important
<b>9</b>	The former is extremely important
<b>2,4,6,8</b>	The median value of the above adjacent judgment

The process and results of the judgment matrix, importance calculation and consistency test are shown in Table 3.

Table 3 Judgment matrix and importance calculation

A	B1	B2	B3	B4	B5	B6	$W_i$	$W_i^0$	$\lambda_{mi}$
B1	1	2	5	1/2	3	3	1.89	0.28	6.201
B2	1/2	1	3	1/3	1	2	1.00	0.14	6.195
B3	1/5	1/3	1	1/3	1/2	1/2	0.42	0.06	6.182
B4	2	3	3	1	2	2	2.04	0.29	6.480
B5	1/3	1	2	1/2	1	1	0.83	0.12	6.096
B6	1/3	1/2	2	1/2	1	1	0.74	0.11	6.162

The resulting judgment matrix R is as follows:

$$R = \begin{bmatrix} 1 & 2 & 5 & 1/2 & 3 & 3 \\ 1/2 & 1 & 3 & 1/3 & 1 & 2 \\ 1/5 & 1/3 & 1 & 1/3 & 1/2 & 1/2 \\ 2 & 3 & 3 & 1 & 2 & 2 \\ 1/3 & 1 & 2 & 1/2 & 1 & 1 \\ 1/3 & 1/2 & 2 & 1/2 & 1 & 1 \end{bmatrix}$$

$$W_i = (\prod_{j=1}^n a_{ij})^{\frac{1}{n}} \quad (1)$$

$$W_i^0 = \frac{W_i}{\sum_i W_i} \quad (2)$$

$$\lambda_{mi} = \frac{\sum_{i=1}^n a_{ij} w_j}{W_i} \quad (3)$$

$$\lambda_{max} = 1/6(6.201 + 6.195 + 6.182 + 6.480 + 6.096 + 6.162) = 6.219 \quad (4)$$

$$C.L. = \frac{\lambda_{max} - n}{n-1} = 0.0438 \quad (5)$$

$$R.L. = 1.26 \quad (6)$$

$$C.R. = \frac{C.L.}{R.L.} < 0.1 \quad (7)$$

According to the calculation,  $C.R.=0.0348<0.1$ , so it can be judged to pass the consistency test.

#### 4. Model results

We multiply the correlation coefficients of each indicator in the six fields calculated in the analytic hierarchy process with the  $W_i^0$  in the contrast matrix respectively to obtain the weights of  $C_1, C_2, \dots, C_{19}$  indicators of the C-level total ranking. Then, by multiplying the coefficients of Biden and Trump in the 19 indicators by the corresponding weights of the 19 indicators, add them to obtain the weight values of Biden and Trump in the economic field, and normalize them. Afterwards, Biden is 0.51 and Trump is 0.49. Because  $0.51>0.49$ , we can see from the data that Biden's election has a slightly greater impact on the US economy than Trump.

#### 5. Conclusion

Through the analysis and processing of data and information about Biden and Trump on 19 indicators in six major economic sectors, we found that in the industrial sector, energy sector, and the prevention and control of the new crown epidemic, the economy brought about by Biden's political propositions The effect is stronger than that of Trump. According to Biden's speeches in recent elections, it is not difficult to see that Biden has a supportive attitude towards the development of industry and energy, showing the proposition of revitalizing the US manufacturing industry, and In terms of epidemic prevention and control, Biden stated that measures to prevent and control the epidemic should be increased, which may have a certain inhibitory effect on economic development in the short term, but the future economic development trend will still show

a positive direction. In terms of financial markets, employment, and people's livelihood, Trump's political propositions have brought better economic effects than Biden. Trump will continue to extend his tax reduction and exemption policies to allow residents and businesses to obtain more benefits. In the financial market, the stimulus policies introduced and the results achieved will be lower than expected. At the same time, tax reduction and exemption policies will be implemented. Investors will have less pressure on taxation, investors' risk appetite will rise, and financial markets will appear more prosperous. status. The election of different candidates will have an impact on the U.S. economy, and the different impacts can be reflected mainly through indicators in different fields.

## References

- [1] Chen Jiajun, Li Dongchen. Is it possible for Biden to defeat Trump? [J]. World Knowledge, 2020(14):16-19.
- [2] Zeng Jia. Trump Biden's first defense [J]. Caixin Weekly, 2020(38):9-9.
- [3] Zhang Tengjun. Biden and Sanders: Who Can Beat Trump[J]. China News Weekly, 2020, 000(009): P.60-62.
- [4] Qiu Zhenhai. The new U.S. election kicks off Trump is very unfavorable[J]. Chinese and Foreign Management, 2019, No.323(11):14-14.
- [5] Zhou Shengnan. This issue of Big Coffee Joe Biden[J]. Global People, 2020, 000(009): P.8-9.
- [6] Zhang Tengjun. "Intergenerational Divergence" in American politics[J]. Party Lessons Reference, 2020(10).
- [7] Zhou Xinyu. The "Cross Ripping" of American Party Politics and Its Future Development Trend [J]. Contemporary World, 2020(8):11-17.
- [8] Qian Kejin. A mature election will not be delayed. [J]. Watch the World, 2020, 000(008): P.92-92.Liu Weidong. An Analysis of the Voter Factor in the 2020 U.S. General Election[J]. American Studies, 2020(4).