Analysis of the Economic Impact of US Presidential Candidates on the United States and China

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Abstract

Aiming at the impact of the 2020 U.S. election results on the economies of China and the United States, this paper uses ridge regression and other theories or methods to construct a comprehensive benefit evaluation model, and comprehensively uses MATLAB and SPSS software programming to solve it. It is concluded that the election results will affect the economic development of China and the United States from the aspects of tax, social welfare, import and export volume, etc, Finally, some reasonable suggestions are given.

Keywords

U.S. Election; Ridge Regression; Comprehensive Benefit Evaluation Model; MATLAB.

1. Background Knowledge

1.1. Background

1.1.1. Background Introduction

2020 is the year of the US presidential election. Republican candidate Donald Trump and Democratic candidate Joe Biden run for president. The candidates of the two parties have different political positions and administrative plans in finance and trade, economic and financial governance, and various other fields. Different candidates will be elected to lead the United States and even the world's economic and financial development towards a different direction, which for China, it will have a huge impact, opportunities and challenges, need to take advantage of.

1.1.2. Research Significance

First of all, candidates of the two parties are in finance and trade, economic and financial governance, and other different key development areas (such as new crown pneumonia combat measures, infrastructure, taxation, environmental protection, medical insurance, employment, trade, immigration, education, etc.) There are different political positions and administrative plans.

Second, the election of different candidates will shape different global economic and financial development strategies and have a greater impact on the US economy and the global economy (including the Chinese economy). Therefore, different policies will have an impact on the American economy and the Chinese economy.

1.2. Relevant Data

①2005-2019 China National Statistical Yearbook (see annex 1);
②FRED economic database related data(see annex 2).

2. Summary of Research Status

Literature [1] believes that in the 2020 US election year, the Middle East faces a three-dimensional vacuum of power, thought, and resources at the same time, which is both a challenge and an opportunity. Regardless of whether the Middle East is in great chaos, great change or great development, the future will enter an era of turbulence and extraordinary. On August 13, 2020, Trump announced a "major historical breakthrough": Israel and the UAE reached an agreement on the normalization of bilateral relations under the mediation of the United States. The achievements of Middle East diplomacy have been used by Trump as a list of political achievements and expanded support. Electoral selling points.

Literature [2] found that the U.S. election may change the development trend of energy technology in the future, and has an important impact on the development of the global energy industry. Strengthening trend.

Literature [3] found that the price of gold has rebounded to around US$1,900 per ounce recently. International financial institutions have a big disagreement on whether the gold price can reach a new high in the fourth quarter of this year. The focus of the entire market is still the US general election, and the fourth quarter Whether the price of gold can reach a new high, reaching US$2100 per ounce, or even US$2250 per ounce, depends on the outcome of the US election.

Based on the above research, the article finds that the US election will have a great impact on the economic and financial development of the United States and the world. The results of the election of representatives of different parties will determine the future development of the United States. Therefore, a quantitative analysis of different candidates The election of a candidate has far-reaching implications for the economic impact of the United States and China [4] .

3. Establishment and Solving of the Model

3.1. Analysis and Solution

3.1.1. Analysis of Problems

We establish a mathematical model and use relevant data to quantitatively analyze the possible impact of different candidates on the U.S. economy. First, we look at the data to find out the key development areas and relevant data that have an impact on the U.S. economy; Secondly, determine the respective political preferences of trump and Biden; Multicollinearity analysis was performed after standardization; Finally, it analyzes the possible impact of different candidates on the U.S. economy, and uses the same method to analyze the possible impact of different candidates on China's economy.

3.1.2. Solve the Problem

(1) Model preparation

1) Model principle:

Ridge regression is a biased estimation regression method dedicated to collinearity data analysis. In essence, it is an improved least squares estimation method. By abandoning the unbiasedness of least squares method, at the cost of loss of partial information and reduced accuracy Obtaining regression coefficients is more practical and reliable, and the fitting of ill-conditioned data is stronger than the least square method.

2) Data preprocessing

In view of previous related research, and consulting related data of US GDP Y (100 million US dollars), 10 key indicators affecting US GDP were selected, including government education expenditure X1 (100 million US dollars), and current federal government tax revenue $X2$ (100 million U.S. dollars), interest rate $X3$ (%), export $X4$ (billion U.S. dollars), import $X5$ (100

million U.S. dollars), 5-year breakeven inflation rate $X6$ (%), unemployment rate $X7$ (%), social security $X8$ (100 million U.S. dollars)), per capita health expenditure $X9$ (USD), manufacturing ratio $X10$ (based on 2012).

Selects China CDP in 2005-2019 "China National Statistical Yearbook" Z (US dollar), China's import volume to the United States $M1$ (US dollar), China's export volume to the United States $M2$ (US dollar), public budget expenditure $M3$ (100 million yuan), social fixed assets investment $M4$ (100 million yuan), money supply $M5$ (100 million yuan), national financial education fund $M6$ (10000 yuan), the contribution rate of the primary industry to GDP is $M7$ (%), the contribution rate of the secondary industry to GDP is $M8$ (%),the contribution rate of the tertiary industry in GDP is $M9$ (%),Completion of industrial pollution control investment is $M10$ (10000 yuan). The data were standardized and studied.

As each index data may have the influence of magnitude and dimension, in order to facilitate analysis, the data needs to be standardized. The processing formula is:

$$X_i^* = \frac{X_i - E(X_i)}{\sqrt{D(X_i)}} \quad i = 1, 2, \cdots\cdots, p$$

Where X_i^* is the normalized index, $E(X_i)$ is the mean index, $D(X_i)$ is the variance indicator. Import the processed data into the SPSS software for relevant analysis.

First, establish the scatter plot matrix of each indicator, and the results are shown in the Figure 1.
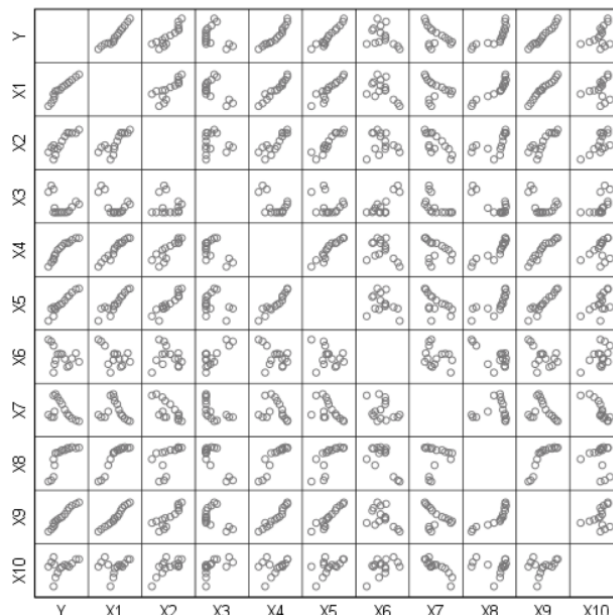

Figure 1. Scatter matrix

Through Figure 1, the article found that there is a correlation between the various indicators. In order to reduce the error caused by multicollinearity and better screen the indicators, the article chose to establish a ridge regression model for research and analysis [10].

(2) Model establishment

Suppose the error equation of an adjustment problem has the following form: $V = AX - L$

In the formula, L is the n-dimensional observation vector, A is the n*t-order coefficient matrix, X is the t-dimensional parameter vector, and V is the n-dimensional error vector; let P be the weight matrix of the observation vector.

$$\hat{X}(k) = (A^T PA + kI)^{-1} A^T PL$$

The ridge regression estimate called X. I is the identity matrix, 0≤k≤∞. When k=0, the above formula becomes:

$$\hat{X} = (A^T PA)^{-1} A^T PL$$

This formula shows: Ls estimate is the ridge estimate when k=0.

Whether $\hat{X}$ is a good estimate of X depends on how close it is to X. Mean square error (denoted as MSE)

$$MSE(\hat{X}) = E(//\hat{X} - -\hat{X}//^2) = E\left[(\hat{X} - X)T(\hat{X} - X)\right]$$

σ^2 represents unit weight variance, tr represents trace.

Because of $N = A^T PA > 0$, its characteristic roots are all positive, set to $\lambda_1 \geq \lambda_2 \geq \cdots \lambda_n > 0$, notice that the characteristic root of $N^{-\lambda}$ is:

$$\frac{1}{\lambda_1}, \frac{1}{\lambda_2}, \cdots, \frac{1}{\lambda_t}, tr(N^{-1}) = \sum_{i=1}^{t} \frac{1}{\lambda_i}$$

Then

$$MSE(\hat{X}) = \sigma^2 \sum_{i-1}^{t} \frac{1}{\lambda_i}$$

$$Var(//\hat{X} - X //^2) = 2\sigma^4 \sum_{i=1}^{t} \frac{1}{\lambda_i^2}$$

(3) Model solution

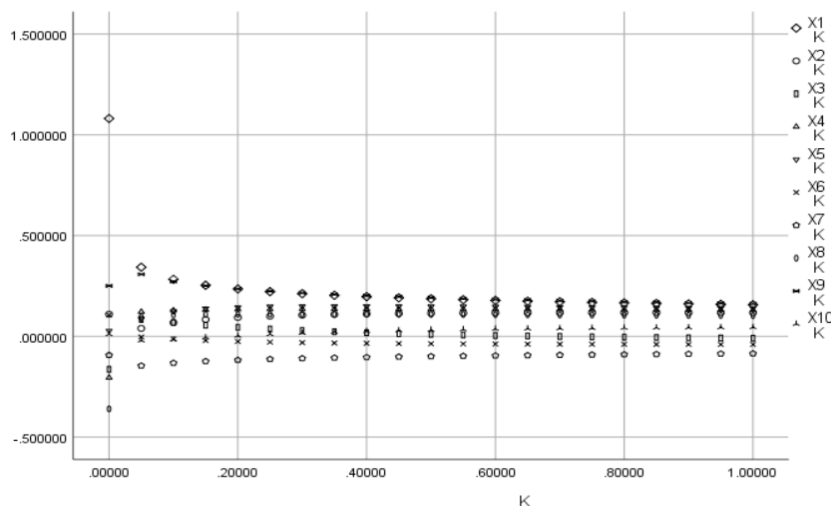The data in the table are analyzed by SPSS software, and the ridge trace Figure 2 is obtain.

Figure 2. Initial ridge map

You can clearly see the change trend of each indicator from the table. The *X1* indicator quickly tends to 0 when the *K* value changes, so the indicator is discarded and the adverse effect of the indicator on the result is excluded [11]; the data in the ridge trace graph is at 0.1 It tends to be stable from 0.3 to 0.3, so we set the ridge parameter between [0.1, 0.3], the step size is changed to 0.02, and the ridge regression method is used again to get Figure 3.
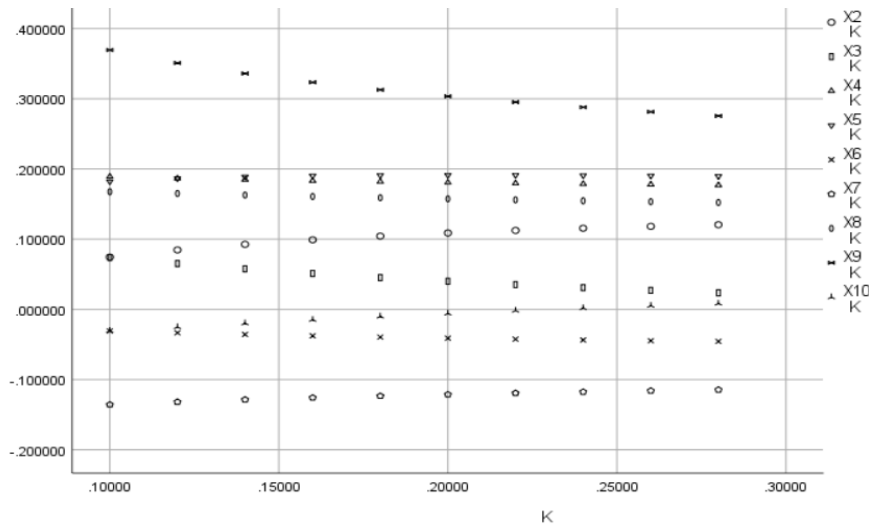

Figure 3. Optimized ridge trace diagram

Combined with the analysis of the above Figure, it can be seen that it is stable when K=0.15, and then according to the corresponding R square value in the SPSS output result 0.9777 is still large enough, so the ridge parameter=0.15 can be selected and then given a value, reapply SPSS software analyzes and the results are as follows:

Table 1. Question 1 coefficient table

Mult R	0.98879				
RSquare	0.97771				
Adj RSqu	0.93759				
SE	0.24981				
ANOVA table					
	df	SS	MS	F value	Sig F
Regress	9	13.688	1.521	24.36971	0.00131
Residual	5	0.312	0.62		
	B	SE(B)	Beta	B/SE(B)	
X_2	0.09605	0.06173	0.09605	2.55609	
X_3	0.05433	0.01872	0.05433	2.90237	
X_4	0.18399	0.02780	0.18399	6.61837	
X_5	0.18957	0.05484	0.18957	3.45699	
X_6	-0.03675	0.01449	-0.03675	-2.53618	
X_7	-0.12716	0.05839	-0.12716	-2.17802	
X_8	0.16176	0.29131	0.16176	5.55276	
X_9	0.32945	0.05152	0.32945	6.39456	
X_{10}	-0.01722	0.00528	-0.01722	-3.25792	
Constant	0.00000	0.06450	0.00000	0.00000	

According to the above table, the standardized ridge regression equation of Y to $X_2, X_3,...X_{10}$ is:

$$\hat{Y} = 0.09605X_2 + 0.05433X_3 + 0.18399X_4 + 0.18975X_5$$
$$-0.03675X_6 - 0.12716X_7 + 0.16176X_8 + 0.32945X_9 - 0.01722X_{10}$$

Among them, the smallest value of the independent variable statistic B/SE(B) is 2.17802, which is greater than 2, so the 9 independent variables are all significant, which can determine that the model after ridge regression is significantly effective [12].

For China, ridge regression analysis is also used. SPSS software is used to analyze the data in the table, and ridge trace Figure 4 is obtained.
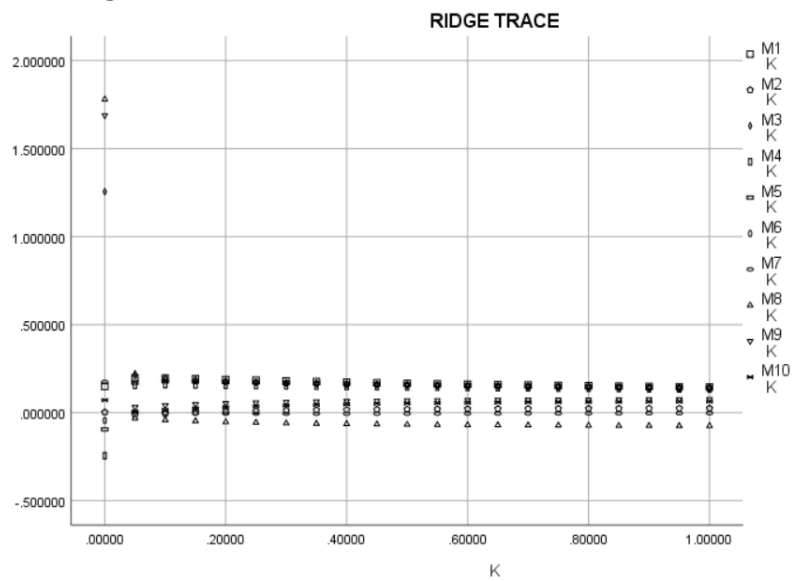

Figure 4. Initial ridge trace map

Observe the change trend of various indicators from the table, in which M8 and M9 indicators quickly tend to 0 when k changes, so abandon these indicators and eliminate the adverse impact of these indicators on the results; The data in the Figure tends to be stable between 0 and 0.05, so we take the ridge parameter between [0, 0.05], change the step size to 0.01, and operate with the ridge regression method to obtain Figure 5.
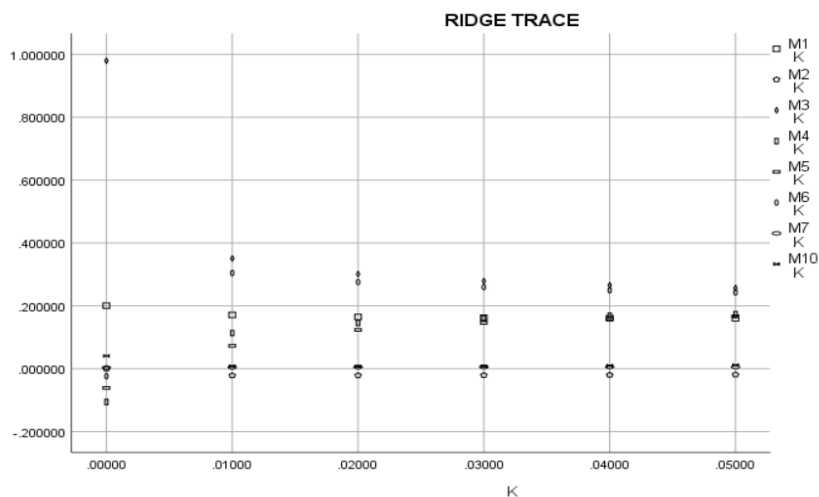

Figure 5. Optimized ridge trace map

From the analysis of the above Figure, we can see that when k =0.01, the R-square value in the output result of *SPSS* is 0.9777, which is still large enough. Therefore, we can select ridge parameter = 0.15, then give the value, and then use SPSS software to analyze again. The results are as follows:

Table 2. Coefficient table of problem two

Mult R	0.99916				
RSquare	0.99833				
Adj RSqu	0.99610				
SE	0.06243				
ANOVA table					
	df	SS	MS	F value	Sig F
Regress	8	13.977	1.747	448.2946436	0.0000001
Residual	6	0.023	0.04		
	B	SE(B)	Beta	B/SE(B)	
M_1	0.17082	0.03991	0.17082	4.27912	
M_2	-0.02156	0.01040	-0.02156	-2.07366	
M_3	0.35047	0.04592	0.35047	7.63256	
M_4	0.11338	0.05434	0.11338	2.08648	
M_5	0.07256	0.03290	0.07256	2.20564	
M_6	0.30448	0.05109	0.30448	5.95973	
M_7	0.00440	0.00196	0.00440	2.24931	
M_{10}	0.00770	0.00232	0.00770	3.31651	
Constant	0.00000	0.06450	0.00000	0.00000	

According to the above table, the standardized ridge regression equation of *Z* for *M1, M2, M3, M4, M5, M6, M7* and *M10* is:

$$Z = 0.17082M_1 - 0.02156M_2 + 0.35047M_3 + 0.11338M_4 +$$
$$0.07256M_5 + 0.30448M_6 + 0.00440M_7 + 0.00770M_{10}$$

Among them, the minimum value of independent variable statistic B / SE(B) is 2.07366, which is greater than 2. Therefore, all eight independent variables are significant. Therefore, it can be judged that the modified model of ridge regression is significantly effective.

4. Conclusion

After obtaining the ridge regression equation, based on the relevant policies and the speeches of the representatives of the two parties in the U.S. general election, collect relevant data and draw a Sankey map:

It can be clearly seen from Figure 6 that Biden pays more attention to the social welfare indicator than Trump. A quantitative analysis of this field shows that it is reflected in the *X8* indicator of the ridge regression equation, with a coefficient of 0.16176. The impact of the US GDP is positive; for the import and export indicators *X4* and *X5*, the coefficients in the ridge regression system are 0.18399 and 0.18975, both of which are positive, which have a positive effect on the growth of US GDP. Den's economic globalization policy is consistent, indicating that it is possible to increase imports and exports to drive US economic growth; Biden pays more attention to the development of US manufacturing in the indicator of

manufacturing industry's share of $X10$, which can be seen from the ridge regression equation. The coefficient of is -0.01722, which has a negative relationship with U.S. GDP [13]; in terms of tax policy, Biden prefers to increase taxes, while Trump prefers to reduce taxes. The index in the ridge regression model corresponding to tax is $X2$, which the corresponding coefficient is 0.09605, which is a positive relationship, which means that within a certain range, the increase in taxation can stimulate the growth of the US economy.
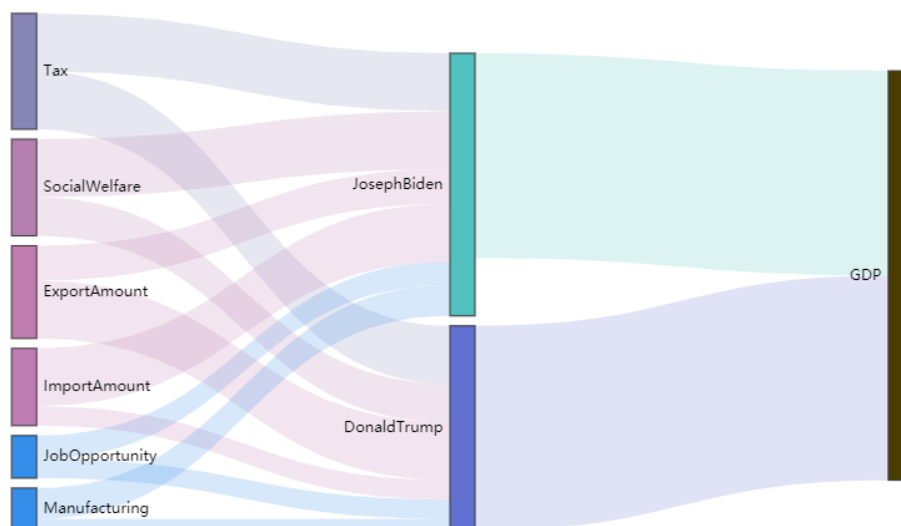

Figure 6. Policy bias Sankey diagram

Combined with the actual policies of the United States. Since China is still in the early stage of economic development, the cost of labor is relatively low. In order to attract investment, many preferential policies have been implemented to attract a large number of American enterprises to settle in China. Therefore, the investment in China's social fixed assets will have a greater impact on China's GDP. During Trump's term of office, he carried out anti globalization economic policies, which inhibited China's economic growth; while Biden advocated supporting American manufacturing and attracting the return of manufacturing industry through tax policies. If Biden encouraged enterprises to enter China more, it would have a positive impact on China's GDP. At the same time, the implementation of anti globalization, a closed economy, has limited the cultural and technological exchanges between China and the United States, so it has a greater negative impact on China's education. In contrast, Biden's policy has increased the number of imports and exports, and has become more open, which also promotes cultural and scientific exchanges. Presumably, the implementation of this policy will also have a positive impact on China's education and then it will promote China's GDP growth. Both presidents' policies have an impact on China's public budget spending. If Biden's appointment can increase the degree of opening to the outside world more, China's GDP will also be promoted.

5. Improvement of Model

The comprehensive benefit evaluation model based on ridge regression can be used to evaluate the impact of different economic indicators on national comprehensive development. For example, the model can be used to study the consumption tendency of Chinese consumers.

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