Analysis of the influence of different candidates on American economy based on mathematical modeling

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Abstract: As a superpower, the United States is in the leading position in the world in terms of military strength and social and economic development strength. American elections are held every four years, and 2020 is the year of the US presidential election. Republican candidate Donald Trump and Democratic rival Joe Biden are running for president. The purpose of this article is to study the impact of different candidates on the U.S. economy and the global economy through mathematical modeling. The focus of this study is to find and process data. In order to understand the objective impact of different candidates on the U.S. economy, after consulting a large number of data, we divided the US economic indicators into three levels: economic influencing factors, financial influencing factors and trade influencing factors, Under the three major influencing factors, six influencing branch indexes are determined. After classifying the data, we package different index data into the same table page, we put the data into Mpai (data processing platform), use XGBoost machine learning processing method to get the data we need, and clear the outliers, the method of outlier detection is 3Sigma outlier recognition. Finally, the data are fitted after regression analysis. After the fitting is successful, we can get the impact of different candidates on the U.S. economy according to the model analysis.

1. Model Assumptions

(1) The overall situation of the macro financial market is generally stable, and there is no significant macroeconomic adjustment of economic policies and industry crisis.

(2) In the short term, there will be no major changes in the overall political form and the election model in the United States, and the presidential election will be conducted normally in the original expected form.

2. Establishment and Solution of the Model

The two candidates, Trump and Biden, represent the political will of the two parties of the Republic and the Democratic Party respectively, and there is a wide gap in their political views, the political positions and policy views of both parties can be regarded as less changed for a long time. Under the U.S. elector system, we cannot simply determine the impact of its policies on the U.S. economy through the speeches of candidates from both parties. In order to understand the objective impact of different candidates on the U.S. economy, after consulting a large number of data, we have classified the U.S. economic indicators into 3 levels: economic impact factors, financial impact factors and trade impact factors, 6 branch indexes were determined under the 3 major influence winning and losing situations, the relationship is as follows:

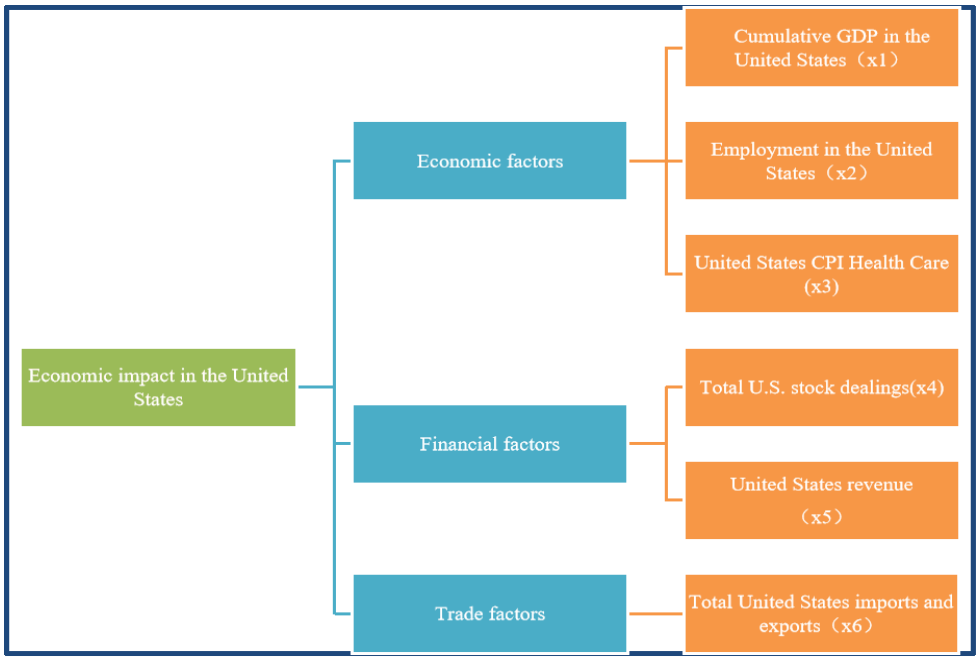

Fig 1: Model establishment flow chart

We set out the following indicators X1: GDP accumulated value, X2: number of employees, X3: CPI healthcare, X4: total stock transactions, X5: revenue, X6: total imports and exports. X1, X2, X3 reflect the economic factor level of the United States, X4, X5 reflect the financial level of the United States, in which we define Hang Seng Index as Y (dependent variable).

After classifying the data, we package different indicator data into the same table page (convenient for data processing), Data range: January 2,008 -2,020 October. It should be noted that since Biden has not yet become president, we will use the data from when Biden was vice president under Obama (Obama and Biden are both democratic parties, and the governing philosophy is basically the same). The data interval is recorded every month, resulting in 155 sets of data, with Trump taking office at the beginning of 2,016 as the data conversion point to separate the two parties.

We substitute data into Mpai (data processing platform) We use XGBoost machine learning method to get the data we need and clear the abnormal value. The abnormal value inspection method is 3sigma abnormal value identification.

After the data preparation is completed, we classify and screen the auxiliary processing data by similar machine learning to establish a mathematical model, The effective indicators were replaced by machine learning model XGBoost regression for training. The number of decision trees was adjusted to 100, Taking the above processed quantitative data as the main reference index, it was substituted into the Mpai software for training.

Process the data successfully, Then it is substituted into the linear regression analysis to obtain the following data:

Linear regression

Results of linear regression analysis **n=58**

	Coefficient of non standardization		Standardization coefficient	t	p	VIF	R^2	Adjust r	F
	B	Standard error	**Beta**						
Constant	-7872.961	14677.907	-	-0.536	0.594	-			
Cumulative GDP	0.000	0.002	0.012	0.067	0.947	2.285			
US government revenue	0.009	0.006	0.234	1.532	0.132	1.577			
US employment Quarterly	0.024	0.017	0.199	1.374	0.175	1.413	0.229	0.155	F=3.089 P=0.016*
CPI healthcare in the United States	42.532	30.607	0.261	1.390	0.171	2.372			
Total imports and exports	0.073	0.033	0.153	2.175	0.034*	inf			
Total imports and exports	0.073	0.033	0.153	2.175	0.034*	inf			

Dependent variable Hang Seng Index

Fig 2: Linear regression analysis chart

The standard form of linear programming:

$$Max(Min)\ z=c_1x_1+c_2x_2+\ldots+c_nx_n$$

$$s.t.\begin{cases} a_{11}x_1+a_{12}x_2+\ldots+a_{1n}x_n \geq (=\leq)\ b_1 \\ a_{21}x_1+a_{22}x_2+\ldots+a_{2n}x_n \geq (=\leq)\ b_2 \\ \ldots\ldots \\ a_{m1}x_1+a_{m2}x_2+\ldots+a_{mn}x_n \geq (=\leq)\ b_m \end{cases}$$

The above table shows the analysis results of this model, It includes the standardization coefficient, t value and Vif value of the model, which is used to test the model and analyze the formula of the model. According to the results of F test, the significance P value is 0.016, which is significant at the level, has rejected the original assumption that the regression coefficient is 0. At the same time, the goodness of fit of the model is 0.229, and the model performance is poor, so the model basically meets the needs. For the collinearity of variables, Vif is less than 10, so there is no multicollinearity problem in the model, and the model is well constructed.

The formula of the model is as follows:

y=-7872.961+0.000*GDP: Cumulative value + 0.009 * US government revenue + 0.024 * US employment + 42.532 * US CPI healthcare + 0.073 * total imports and exports + 0.073 * total stock transactions.

After the establishment of the regression model, our fitting results are as follows:

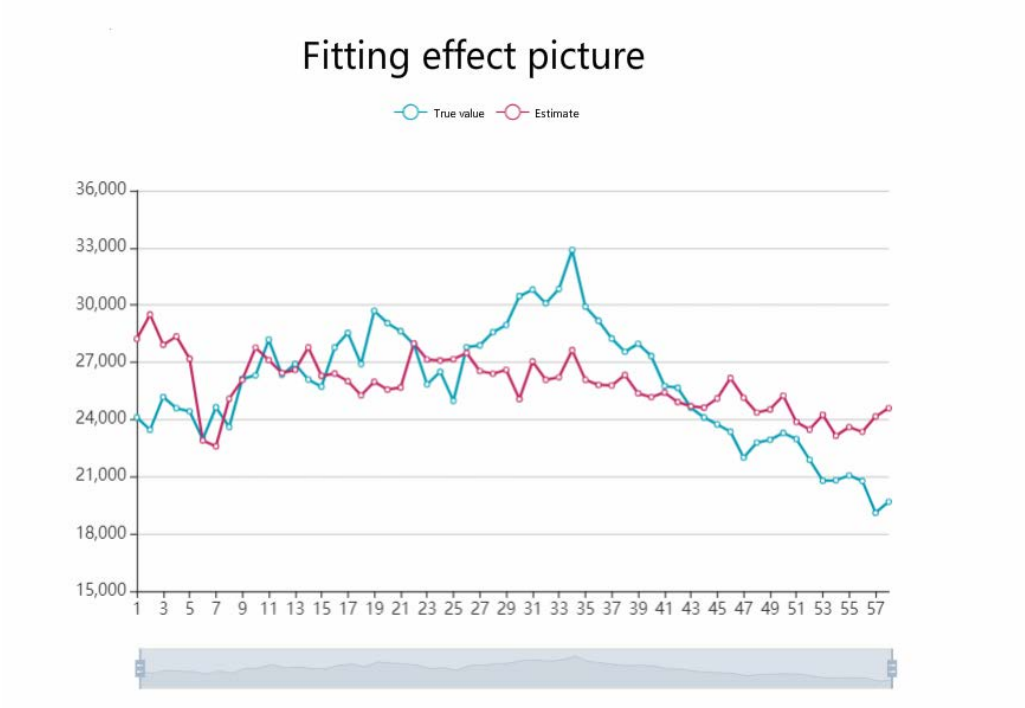

Fig 3: Fitting effect picture

It can be seen that the model is highly fitted, so linear regression can be used to analyze the data. The prediction results are as follows:

Variable	Coefficient
Constant	-7872.961
Cumulative GDP	0.000
US government revenue	0.009
US employment	0.024
CPI healthcare in the United States	42.532
Total imports and exports of the United States	0.073
Total imports and exports of the United States	0.073

Fig 4: Analysis chart of linear regression data

Conclusion: It can be seen that after Biden came to power, the U.S. economy has not changed significantly in the short term. However, from a long-term perspective, Biden's policy mainly focuses on tax reform, which will stimulate the consumption of American residents. The tax reform will release about 300 billion dollars of personal consumption expenditure and stimulate the desire of American people to consume. It is predicted that the annual additional investment in fixed assets of the United States will increase by about 210 billion US dollars in the next five years. It accelerated the return of overseas profits and increased foreign exchange income. It is estimated that the tax reform will lead to a return of at least $820 billion. From the negative impact of tax reform in the United States, in order to maintain the balance of fiscal revenue and expenditure, fiscal expenditure must be reduced because of the decrease of tax revenue. The premise of tax reduction driving economic growth is insufficient demand, economic downturn and high

unemployment rate.

If Trump continues to be president, the foreign trade policy is still "American priority", which has a certain market in the United States. Such policies and measures as tough attitude towards Russia, readjustment of economic and trade relations with trade partners, tax reduction, trade protection, industrial relocation, increase of military expenditure and infrastructure investment will basically keep the economic form of the United States unchanged.

3. Model Evaluation

Advantages and Weaknesses of the Model Evaluation:

(1) The first problem is to use Mpai to use XGBoost machine learning to process economic data. The model algorithm is novel and calculation is convenient. Based on the XGBoost model, the consideration is relatively comprehensive, and the simulation results are relatively reasonable.

(2) After dealing with outliers, XGBoost has many complex factors, which cannot be fully considered, resulting in some inconsistencies with the reality.

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