The Research of Digital Currency

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Abstract: We use K-mean clustering analysis to process the GDP data of 189 countries with the software SPSS. Based on the principle of Minimum Variance and the method of exponentially weighted, we successfully select three countries as the representatives of 189 countries. To figure out the most contributing indicator, we successfully achieved the dimensionality reduction of data by using the principal component analysis with the software PYTHON. We use Multiple Linear Regression to determine the parameters of our equation. And the equations of the three representative countries are obtained through the analysis results of EVIEWS. Then we use analytic hierarchy process (AHP) to find one suitable formulas for a particular country. We also performed the Sensitivity Analysis on the test results. Our second model can monitor tendency of GDP, making sure that it develops healthily and sustainably. How it was created and the way it works are as follows. We design a model using time series analysis with R. When leaders input the data of their country in recent years, the model will give them two sequence diagrams, and we have designed a set of inspection process to help them finding their current situation and making decisions. We randomly tested our model using real economic data from Canada, and the error analysis of the model suggest that the model has a high reliability. In addition to the two models above, we created an interesting model based on the theory of Population Competition. This model show the competition between the digital currency economy and the traditional currency economy in a vivid way. Besides the models above, we also did some theoretical analysis. And we design an Online Questionnaire and hand it out online in order to make our analysis more practical.

1. Introduction

The vigorous rise of digital currency has attracted much public attention as well as scholarly interest, coming with a heated debate over its pros and cons. On the one hand, some people believe the digital currency should be encouraged, as it owns many merits that do not exist in traditional currency. First, the digital currency greatly improve speed of an exchange. Second, digital currency has no national boundaries. For example, it can remove the barriers to capital circulation. Third, compared with traditional currency, the digital currency is more transparent, traditional currencies are prone to corruption, while digital currencies are not, which can improve the efficiency of capital flow. On the other, the digital currency also has disadvantages that shouldn't be overlooked. For one thing, some people doubts it security. For another, there are systemic risks arising from the failure of a single issuer. One issuer's mismanagement failure may leads to a loss of confidence in the market as a whole, in some way, other issuers may also face the trust dilemma as well. Admittedly, the digital currency is a mixed blessing, and we should consider its advantages and disadvantages carefully. Overall, problem concerning digital currency is really complex, it really hard to decide whether to promote or to forbid, or taking a neutral attitude.

2. Glossary

Bitcoin is a decentralized digital currency based on an open-source, peer to peer internet protocol. Population competition model can describe the process of two populations competing with each other and analyze the conditions that produce various outcomes. Analytical hierarchy process (AHP) is a decision making method which decomposes the elements related to decision into the levels of

goal, criterion and plan and so on. The k-means algorithm is a hard clustering algorithm, and it is a representative of the prototype-based clustering method of objective functions. The difference operation has a strong ability to extract deterministic information, and many non-stationary sequences will show the property of stationary sequences after the difference. The basic purpose of factor analysis is to describe the relationship between many indicators or factors with a few factors.

3. Decision-Making Model

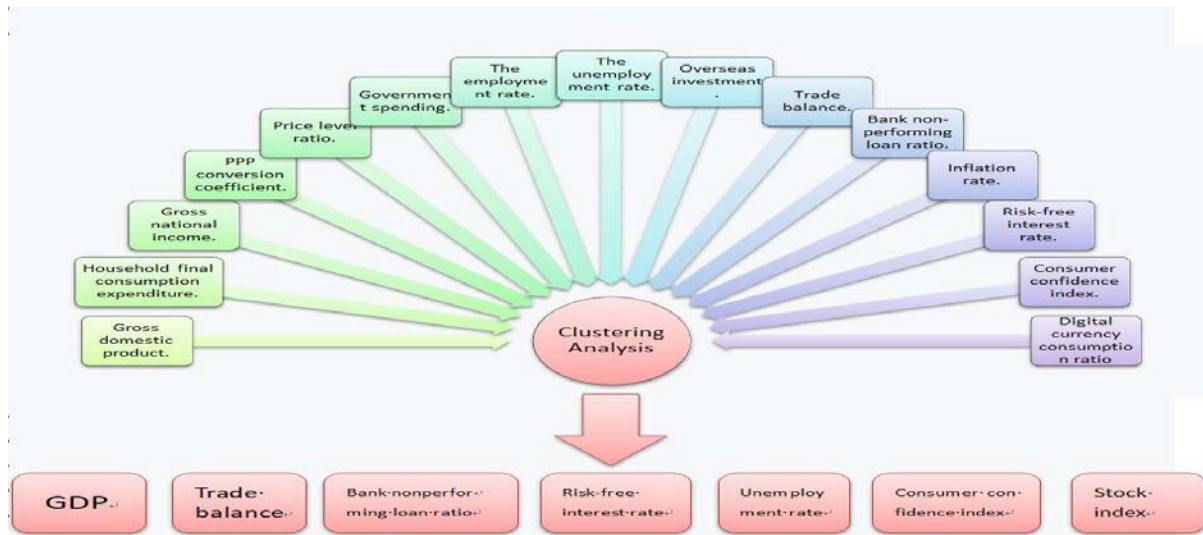### 3.1. The step of Decision-Making Model

First, we downloaded the GDP data of 189 countries (more than 80% of the world's countries). They are the lighted parts in the world map. Second, by using the Clustering Analysis function of software SPSS, the countries with similar economic conditions are divided into a group (we set it as 3 groups), and the tree chart and icicle chart are made (only the tree chart is shown here).After that, a representative country will be selected out. Third, there are only two areas in the Euro-American group (including the Euro Zone and the United States), so we boldly use one as the representative, i.e., select the United States as the research object of this group. Similarly, China in the Far East group (including China and Japan) is taken to represent this group.

When it comes to the third group, things become more complex. This group contains more than 180 countries. So it is unreliable to pick a country at random as the representative of all 185 members so we followed the principle of Minimum Variance to solve this problem. The smaller the variance is, to some extent, the lower the data fluctuation degree is and the more representative it is.

What's more, considering the different influence of time interval, we introduced a series of weight. As we all know, during the process of economic development, greater weight has to be assigned to the variance from the recent data than to the variance from relatively remote data. Assuming that the weight decreases exponentially with the increase of time interval. The weighted average is the sum of the variance values, but each weighted by a certain exponential-form coefficient. The basic idea of this method can be summarized as the exponential weighted average of variance.

Forth, The next step is to download the specific economic data of the U.S., China and Nigeria, including almost all kinds of economic indicators(such as unemployment rate, bank account opening rate,ect).After more than 60 data points were downloaded, we had to figure out which ones were truly important to our research. Next we use PYTHON to help us with Principal Component Analyze. Next, we focus on these seven data indicators of each country, which are: GDP, Trade balance Bank non-performing loan ratio, Risk-free interest rate, The unemployment ratio, Consumer confidence index and Stock index. Based on the data collected, different models of countries were set up respectively by using linear, multilinear and nonlinear regression with software EVIEWS. In the process, we also encountered some difficulties. For example, results show that the t-test statistics of parameters are not significant while the goodness of fit of equations is up to 99%.We regard this Model as the initial Model of the decision-making Model. Any country using this model can put their own economic data into this equation.

3.2. Error Analysis of Decision-making Model

This article essay mainly compares the data predicted by the decision-making model with the data predicted by the general time series model, and determines whether the established model is reasonable according to the comparison results. In order to obtain the real GDP data forecast ,we have better guiding significance of the results.We model the annual GDP of China, the United States and Nigeria respectively with the general ARIMA time series model by using PYTHON software. Therefore, ARIMA model should be established. Next then, we adding the predicted GDP data curve obtained from the decision-making model in the comparison diagram include the original curve and the ARIMA model curve making by PYTHON. Compared with the curves ,It's clear that the error of the decision-making model is smaller.

First, the GDP curve of the United States,China and Nigeria is obtained according to the time series prediction model.In the original figure, we continue to add the prediction curve obtained by the decision-making model. As shown in the following figures.
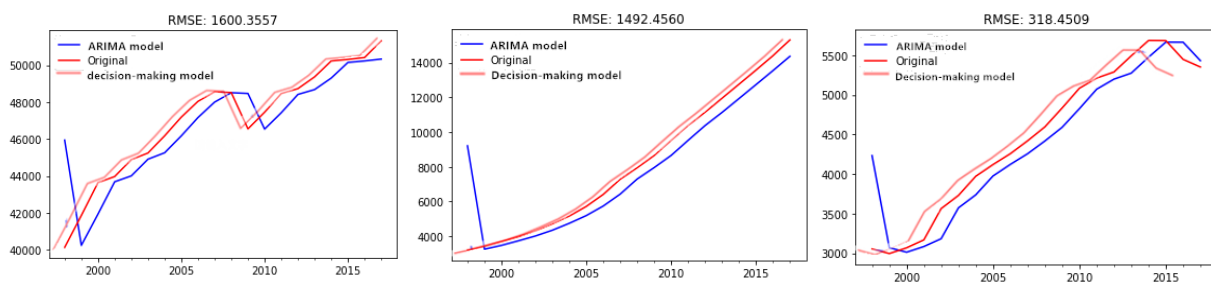
For decision-making model ,although there is a relatively large error compared with the ARIMA model in a certain part of the time, there is still a tendency of small error in most of the time.This is understandable.After experimental analysis , it is obvious that the decision-making model curve fits the original data curve better than the ARIMA model curve.Therefore, through error analysis, it shows that the decision-making model can better predict the future GDP of the country implementing digital currency, and can provide some basis for national leaders to decide whether digital currency is feasible.

For digital currency, how to conduct effective supervision is a crucial topic in its development process. With the increasing volume of transactions, digital currency transactions in the global heat is also increasing.Generally speaking, a series of regulatory mechanisms are required after the implementation of a certain policy or guideline, so as to continuously adjust them to meet our different requirements in different periods.We build the supervision model by using the time series analysis method in PYTHON. However,it may not be able to accurately grasp the change trend of the country's GDP though the timing diagram and the first-order difference diagram and judge

whether the timing diagram or the first-order difference diagram is stable. At this time, judging the stationarity only by the first-order difference graph will cause a large error.

3.3. Strength and Weakness of Decision-making Model

First, it is used widely. Cluster analysis was carried out for different countries, and different situations of different countries were considered. Second, it is convenient to use. Our models can be well applied in different country and we just need to chose a the specific conditions. Third, the model is stable. Our models are robust while the parameters changes. That is to say, a slight change of parameter will not cause a significant change of the results. Forth, the data is reliable. Our data comes from the official website such as Global economic database(CEIC),East Money Net, which is believable.

Its weakness is as follows: It is hard to judge the veracity of the data.it is difficult to verify whether the data based on previous years are consistent with the reality. It is difficult to say whether the economic environment has changed. GDP forecasts are based on GDP statistics from previous years .Economic regulation needs to be strengthened. Further research is needed on the impact of regulatory models on digital currencies. Some possible influencing factors were neglected. The economic impact of changes in other factors other than economic factors is not taken into account.

4. Conclusion

In the decision-making model, we only consider the impact of a limited number of economic factors on GDP, and assume that there are no abnormal factors. However, in the time series analysis of real GDP, abnormal factors are possible, and even these abnormal factors may have destructive effects on the national economy.U.S. economist Paul krugman has open economy policy choice problem under the proposed ternary paradox (also called trilemma) who pointed out: the independence of monetary policy, exchange rate stability, complete liquidity capital cannot be implemented at the same time, the maximum meet two targets at the same time, and give up another goal. Therefore, in order to improve the accuracy of the model, increase the freedom of error and reduce the error variance, we can optimize the model. Introducing dummy variables is a convenient way to do this. The model equation with dummy variables can be obtained by analyzing the data of categorical variables represented by dummy variables over the years together with the data used in the establishment of decision model.

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