Research on Econometric Risk Assessment Method Based on Grey Clustering

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Abstract. Economy is a powerful driving force for the progress and development of human society. The close relationship between consumption and economic development has been widely concerned by scholars in various fields. Today, we focus on high-quality economic development, and exploring the impact of energy consumption on economic development has more rich meanings. This paper uses the risk assessment model to divide the economic development into three aspects: the stable growth of GDP, the optimization of industrial structure, and the narrowing of regional gap. Through the analysis of the relationship between the three dimensions of econometrics, the impact of energy consumption on economic development is specifically analyzed.

Keywords: Econometrics · Consumption · Industrial structure optimization · Risk evaluation

1 Introduction

Since the new century, China's economy has been growing at a high speed. At the same time, it is increasingly important to explore a correct direction of economic development. Reviewing the history of human economic development, it can be found that the reasonable course of national economic development should be a process from quantitative change to qualitative change. If the economic development mode is still conservative and does not seek to change from "quantitative" and "rapid" growth to "qualitative" steady improvement, then the healthy and sustainable development of the economy will undoubtedly be difficult to achieve. Therefore, high-quality economic development is the objective law that the national economic development must follow, and it is also the only way for China to realize the modernization process [1, 2]. In recent years, China's economic aggregate has continued to rise, with considerable incremental scale. The industrial structure has been further optimized, the regional gap has been narrowing, and economic development has shown the characteristics of higher quality and greater resilience. After the 18th National Congress, China's economic construction has maintained a healthy development trend; Since the 13th Five Year Plan, the demand for high-quality economic development has become more urgent [3, 4]; It can be seen that China is seeking to change from "quantity" growth of economy to "quality". At

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the same time, China's energy industry has also changed, and the mode of energy production and consumption is gradually changing. Oil, coal and other traditional fossil energy industries bid farewell to the rough development, and introduced high-tech products to gradually transform into an intensive and efficient model [5, 6]; After long-term construction and rapid development of China's power system, the total installed capacity of power sources has ranked first in the world, the power supply capacity has been continuously enhanced, and the scale of the power grid has grown steadily; Driven by the national energy policy, natural gas and renewable energy have developed rapidly, the installed capacity has continued to expand, and the utilization level has continued to improve. The accelerated implementation of electric energy substitution and clean substitution and the strategic choice of China's energy revolution have made profound changes in the way of energy production and consumption in China. The transformation of energy consumption to the consumption of clean energy such as natural gas, wind power and hydropower has become a general trend [7, 8].

Looking at the changes and development of social economy and energy industry, it can be found that energy is an important material basis for economic development and social progress, and the relationship between energy and economic development is very close. On the one hand, energy consumption can promote rapid economic development by providing necessary fuels and raw materials for daily life and production activities in economic development. Almost all life and production activities of human society are inseparable from energy consumption, for example, the most basic "clothing, food, housing and transportation" in daily life are indirectly or directly dependent on energy consumption. First of all, the production, processing and transportation of "clothes" need energy. Part of the clothing raw materials are chemical fiber fabrics, which are mainly from petroleum. Secondly, "food" also needs energy consumption. Food can be eaten by people through steaming, boiling, frying and other cooking methods, which consume energy such as electricity and natural gas. "Living" is also inseparable from energy consumption. All kinds of household appliances in the residence need daily electricity, and a large amount of energy is also needed when building the house. Finally, "travel" is more dependent on energy consumption, whether it is public transport such as buses, subways, planes, high-speed trains, or private cars, all need oil or electricity consumption. On the other hand, energy consumption drives the development of upstream and downstream industries and other important industries. To promote social and economic development. For example, energy exploitation, processing, by-product production, transportation, sales and other links may involve different industries, and energy consumption will drive the development of such industries. And many important industries of national economic development also depend on energy consumption: regional economic development cannot be separated from traffic construction, and a large amount of energy is consumed in the process of building railways and highways; The petrochemical industry, one of China's pillar industries, is based on energy consumption; The logistics industry can be said to be the artery of national economic development, which has a strong pull on various industries of the national economy and radiation, and the main packaging, transportation and storage in the logistics industry are also inseparable from energy consumption. However, at the same time, the intensification of energy consumption under the rapid economic growth has led to the gradual reduction of some non renewable energy. In order to limit the consumption of non renewable energy, the cost of fossil energy exploitation has gradually increased. At the same time, the environmental pollution in the process of energy consumption has also restricted the consumption of traditional energy. Factories need to pay more manpower and capital to solve the problem of pollutant emissions, further increasing the cost of energy consumption Due to various restrictions in the process of processing and consumption, economic development has to slow down. Therefore, energy will also hinder economic development. It can be seen that energy consumption reflects the level of economic development of the whole society, and energy consumption has an impact on or promotes or restricts economic development. Therefore, in order to adapt to national development, conform to the trend of the times, and achieve high-quality and sustainable economic development, we must study the dynamic relationship between energy consumption and economic development, and explore the impact of energy consumption on high-quality economic development [9].

2 Overall Analysis Process of the Model

2.1 Introduction to the Model

The coefficient of variation method is an objective weighting method to obtain the value of coefficient of variation on the basis of calculating the standard deviation of data. The specific calculation steps are as follows:

Step 1: Build a risk evaluation index matrix, so that M represents the object to be studied and N represents the index content to be evaluated. Then the matrix feature is P = (x_{ij}) M × N ((i = 1, 2,…, j = 1, 2,…, M)).

Step 2: Calculate the characteristic value of specific indicators, mainly calculating the standard deviation of each indicator. The calculation formula is as follows:

$$\sigma_k = \sqrt{\frac{\sum (x_k - \bar{x}_k)}{n-1}} \tag{1}$$

In the formula, σ_k is the standard deviation of the k-th index and the $\bar{x}_k$ average of the k-th index.

Step 3: Calculate the value of coefficient of variation of specific indicators. Using the results of standard deviation calculation, calculate the value of coefficient of variation of each index. The calculation formula is as follows:

$$V_k = \frac{\sigma_k}{\bar{x}_k}(k = 1, 2, \ldots, n) \tag{2}$$

Step 4: Calculate the weight of each index, and normalize the value of coefficient of variation according to the calculation result of coefficient of variation. The formula for calculating the weight of the k-th index is shown in (3):

$$W_k = \frac{V_k}{\sum_{k=1}^{n} V} \tag{3}$$

In the formula, Wk is the weight of the k-th index and Vk is the coefficient of variation of the k-th index.

Use formula (4) to calculate the whitening weight function which belongs to the grey category.

$$\begin{cases} 0 & x \notin [\lambda_{k-1}, \quad \lambda_{k+1}] \\ \frac{x-\lambda_{k-1}}{\lambda_k-\lambda_{k-1}}, & x \in [\lambda_{k-1}, \quad \lambda_k] \\ \frac{\lambda_{k+1}-x}{\lambda_{k+1}-\lambda_k}, & x \in [\lambda_k, \quad \lambda_{k+1}] \end{cases} \tag{4}$$

Calculate the comprehensive clustering coefficient of ash.

$$\sigma_i^k = \sum_{j=1}^{m} f_j^k (x_{ij}) \cdot w_j, (i = 1, 2, \cdots, n; k = 1, 2, \cdots, s) \tag{5}$$

2.2 Model Derivation

The general form of the triangle whitening weight function of the center point of the upper and lower limit measures in clustering is shown in Fig. 1.

For an actual value x of index j, the whitening weight function belonging to the grey category is calculated by using Formula (6) to Formula (8) respectively.

$$f_j^1 = \begin{cases} 0, & x \notin [\lambda_0, \lambda_2] \\ 1, & x \in [\lambda_0, \quad \lambda_1] \\ \frac{\lambda_2-x}{\lambda_2-\lambda_1}, & x \in [\lambda_1, \lambda_2] \end{cases} \tag{6}$$

$$f_j^k = \begin{cases} 0, & x \notin [\lambda_{k-1}, \lambda_{k+1}] \\ \frac{x-\lambda_{k-1}}{\lambda_k-\lambda_{k-1}}, & x \in [\lambda_{k-1}, \lambda_k] \\ \frac{\lambda_{k+1}-x}{\lambda_{k+1}-\lambda_k}, & x \in [\lambda_k, \lambda_{k+1}] \end{cases} \quad k = 2, 3, \cdots, s-1. \tag{7}$$

$$f_j^s(x) = \begin{cases} 0, & x \notin [\lambda_{s-1}, \lambda_{s+1}] \\ \frac{x-\lambda_{s-1}}{\lambda_s-\lambda_{s-1}}, & x \in [\lambda_{s-1}, \lambda_s] \\ 1, & x \in [\lambda_s, \lambda_{s+1}] \end{cases} \quad s \geq 2 \tag{8}$$

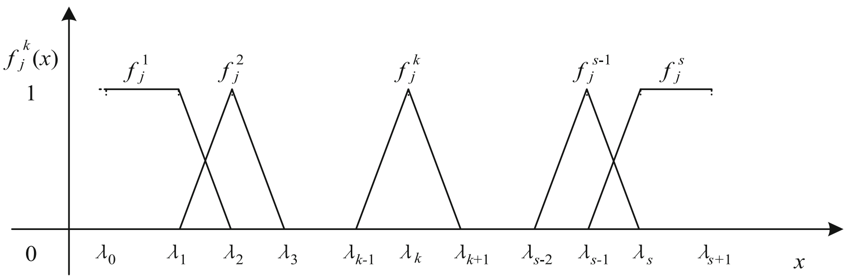

Fig. 1. Rendering

3 Demonstration

Through the analysis of evaluation results, it can be found that the econometric risk analysis method based on gray clustering has certain advantages, and the evaluation satisfaction is more than 70%. At the same time, the clustering effect achieved by using the gray clustering evaluation model is shown in Fig. 2.

Based on the three indicator characteristics obtained from the grey clustering risk analysis, the basic data obtained from the analysis and evaluation are shown in Figs. 3, 4 and 5.

Through in-depth analysis, we can find that the probability statistics method is often used to conduct quantitative analysis of risks in risk evaluation. After the risk manager has mastered a large amount of data on the past risk losses of the enterprise, he can measure the concentration trend of risk losses through the average, median, mode, etc. The average is the most commonly used method. In addition to measuring the concentration trend of losses, it is also necessary to describe the dispersion degree of losses around the central value when evaluating economic risks. We can determine the distribution of the entire variable by one or two parameters. Since the value of risk loss is determined

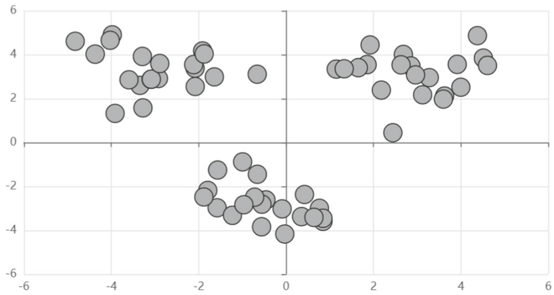

Fig. 2. Clustering effect diagram

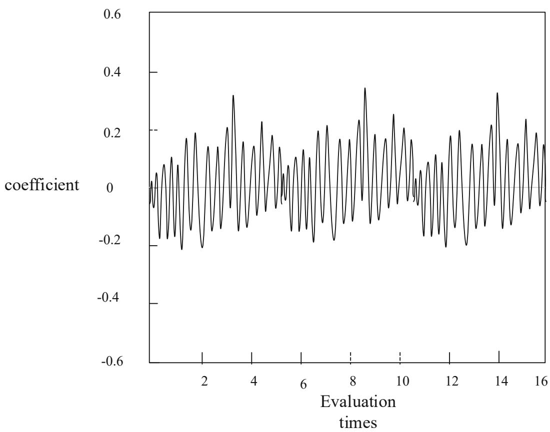

Fig. 3. Analysis of Evaluation Effect

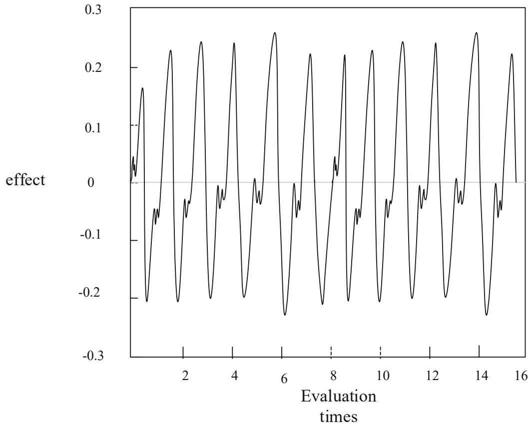

Fig. 4. Evaluate trend effect

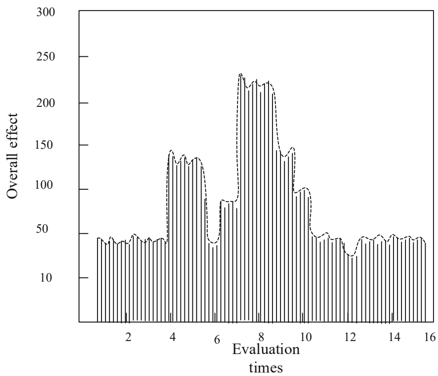

Fig. 5. Overall effect

by the distribution of this value and is dominated by the corresponding probability, the probability distribution can be used to predict the possible future occurrence of the risk loss under study. So according to the above evaluation results, the risk evaluation model based on gray clustering has a good evaluation effect and has certain practical significance.

4 Conclusion

The high-quality development of econometrics is closely related to the stability of society. Studying the relationship between economy and development and clarifying the impact and direction of econometrics on development will help to take reasonable policy measures to promote economic transformation and promote high-quality economic development from multiple perspectives. The risk rating model based on grey clustering proposed in this study can improve the risk research and judgment of econometrics.

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