

Comprehensive Evaluation of Jianyang City's Economic High-Quality Development Level Based on Entropy Method

Xiong Zhang¹ Jinyang Liu^{1,2,*} Qiuzhu Chen¹

¹*School of Statistics, Chengdu University of Information Technology, Chengdu 610103, Sichuan, China*

²*School of Mathematics, Harbin Institute of Technology, Harbin 150001, Heilongjiang, China*

**Corresponding author. Email: lista@cuit.edu.cn*

ABSTRACT

Based on the connotation and goals of high-quality development, a comprehensive evaluation index system, including 19 indicators, is constructed. After processing the data and calculating the index weights, the broad index and sub-indices of the high-quality economic development of Jianyang City are obtained. Research shows that the overall quality of Jianyang's economic growth is at an acceptable level, but the internal economic development is not balanced. The green ecological index and the people's livelihood sharing index are significantly higher than the benefits efficiency index, structural optimization index and kinetic energy conversion index.

Keywords: *Entropy method, High-quality economic development, Comprehensive Evaluation*

1. INTRODUCTION

At present, China's economy has entered a stage of shifting from a location of rapid growth to a place of high-quality development and is in a critical period of transforming development mode, optimizing economic structure, and changing growth momentum. Jianyang City should actively adapt to the new normal of China's economic development and actively explore practical ways of high-quality economic development. For this reason, this article makes a comprehensive evaluation of the high-quality economic development level of Jianyang City [1].

2. MEANING AND CONNOTATION

High-quality economic development is a comprehensive concept. It is necessary to start from the new development concept and clarify the connotation of high-quality economic growth based on a deep understanding of the fundamentals of the new development concept. Specifically, high-quality economic development includes seven aspects.

Content: One is the increase in total factor productivity. The second is the transformation and upgrading of the industrial structure—the ability to supply products and services. The third is the improvement of technology and innovation capabilities. The fourth is to coordinate the development of relations between all parties and strive to achieve coordinated development. The fifth is to achieve sustainable green growth: sixth, a higher-level opening-up pattern. Seventh is the concept of people-centred economic development [2].

3. REALITY BASIS

3.1. Scale Basis

After a long period of high-speed growth, the scale of the economy has continued to expand, and it has the scale to shift to high-quality development. In 2019, Jianyang City achieved a regional GDP of 50.405 billion yuan, 1.46 times that of 2013, and an added value of 26.363 billion yuan in the service industry, which was 3.23 times that of 2013. The GDP growth rate has gradually changed from 10.6% in 2013 and 9.9% in 2014 to 8.5% in 2019.

3.2. Structural Basis

The industrial structure is slowly optimized. In ten years, the design of the three industries has been adjusted from 20.7:54.2:25.1 in 2010 to 15.0:32.7:52.3 in 2019. The development of modern agriculture, strategic emerging industries and modern service industries within the sector has accelerated, traditional initiatives with outdated production capacity, high energy consumption and increased emissions have been transformed, and structural adjustments have achieved initial results.

3.3. Demand Basis

In 2019, the per capita disposable income of urban and rural residents was 1.52 times and 1.99 times that of 2013 respectively; in terms of expenditure, in 2019, the per

capita living consumption expenditure of urban residents was 1.33 times that of 2013, and the per capita cash expenditure of rural residents was 2013. 1.70 times. It can be seen that with the development of the economy, residents have increased their consumption demands. In contrast, their incomes rise, and they already have strong consumption power in the pursuit of a high-quality standard of living.

according to the guiding ideology of the new development concept, following the principles of scientificity, systematization, operability, independence and typicality, the establishment of efficiency, structural optimization, There are five modules including kinetic energy conversion, green ecology, and people's livelihood sharing, with a total of 19 evaluation indicators, as shown in Table 1 [3].

4. COMPREHENSIVE EVALUATION

4.1. Index Selection

Based on an accurate understanding of the connotation and requirements of high-quality economic development,

Table 1 Comprehensive evaluation index system and weight

Evaluation module	Evaluation index	unit	Weights
Benefit efficiency	GDP growth rate	%	0.0422
	GDP per capita	元	0.0441
	The industrial value-added growth rate	%	0.0242
	Service industry value-added growth rate	%	0.0547
Structure optimization	The added value of the service industry as a proportion of GDP	%	0.0483
	Tax as a proportion of general public budget revenue	%	0.0379
	Urbanization rate	%	0.0341
	Income ratio of urban and rural residents	-	0.0810
Kinetic energy conversion	Actual use of foreign capital	10,000 \$	0.0267
	Self-exported foreign exchange earning	10,000 \$	0.0285
	Total foreign trade import and export	10,000 \$	0.1230
Green ecology	COD emission reduction	Ton	0.0368
	Ammonia nitrogen reduction	Ton	0.0309
	Number of days that the air environment quality meets the standard in a year	%	0.2051
	Energy consumption per unit of GDP	10,000 tons of standard coal	0.0386
Livelihood sharing	Per capita disposable income of urban residents	RMB	0.0410
	Net income of rural residents	RMB	0.0371
	Number of health technicians	Number of people	0.0351
	Number of beds in medical institutions	number of beds beds	0.0307

4.2. Method Selection

Based on the comparative analysis of various evaluation methods, combined with the actual situation of Jianyang City, it was decided to adopt the entropy method to determine the specific index weights (see Table 1). Entropy method is a method to assess the significance of each index based on the influence of the relative degree of change on the whole. It has strong objectivity, will not be subjectively affected by the researcher, is easy to operate, and is a decision-making method that combines qualitative and quantitative [4].

Suppose that X_{ij} is ($i = 1, 2, \dots, n, j = 1, 2, \dots, m$) as the data value of the j index in the i year.

The first step, There are dimensions between indicators, and direct measurement and evaluation will lead to errors in the results. Therefore, before data analysis, the original

data should be standardized
$$x'_{ij} = \frac{x_j - x_{min}}{x_{max} - x_{min}}$$

order for the data processing to be meaningful, the influence of 0 must be eliminated. Thus, the dimensionless data needs to be translated as a whole, that is, $x'_{ij} = x'_{ij} + \partial$, but in order not to destroy the internal

laws of the original data, the maximum Keep the original data, the value of $\hat{\partial}$ must be as small as possible, this article takes $\hat{\partial} = 0.0001$.

The second step, Calculate the proportion of the index value of the i year under the j index $p_{ij} = \frac{x'_{ij}}{\sum_{i=1}^n x'_{ij}}$.

The third step, Calculate the entropy of the index j . $e_j = -k \sum_{i=1}^n p_{ij} \ln(p_{ij})$, $k = \frac{1}{\ln n}$. The information

utility of index j will directly affect the size of the weight. For a particular index, the more significant the difference of X_{ij} , the smaller the entropy value e_{ij} , and the greater the effect of the index on the evaluation object, the greater the weight of the index Big, $d_j = 1 - e_j$.

The last step, Determine the weight of the index j , $w_j = \frac{d_j}{\sum_{i=1}^n d_j}$.

Since the units and magnitudes of the selected indicators are not entirely consistent, if a simple summary is made, the summary results will not only have fuzzy meanings in

the calculation, but even meaningless results will appear. Therefore, our measurement of indicators is divided into three steps:

The first step is to standardize the data to remove the influence of dimensions. The specific processing formula is as follows:

Standardized value = (numerical value-minimum value) / (maximum value-minimum value)

In the second step, according to the entropy method, assign corresponding weights to each measurement index and the five categories of indicators, and calculate the values of various sub-indices. The specific calculation formula is as follows:

Weighted value = weight \times normalized value

The third step is to add up the five secondary indicators to form a high-quality economic development index. The three-level indicators are weighted and added together to obtain the benefits efficiency index, structural optimization index, kinetic energy conversion index, green ecology index and people's livelihood sharing index.

5. CONCLUSION

Based on the above method, the standardized data is calculated to obtain the comprehensive index and sub-indices of Jianyang City's high-quality economic development from 2013 to 2018, as shown in the figure.

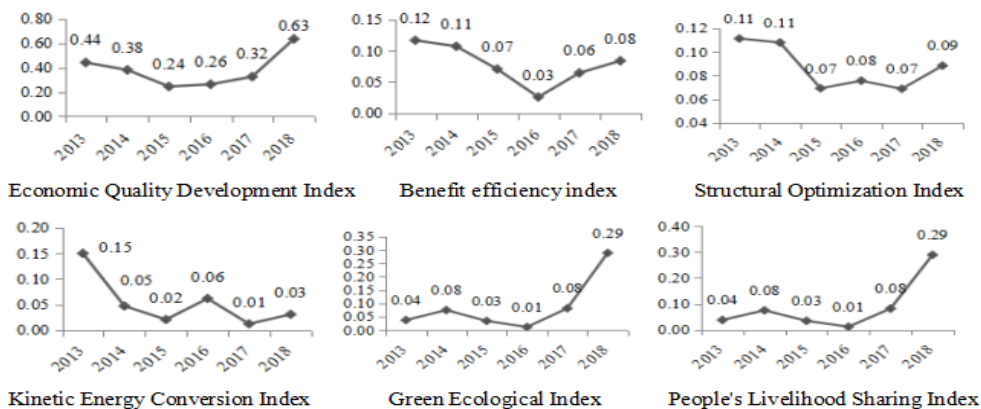


Figure 1 The high-quality economic development index and sub-indices from 2013 to 2018

On the whole, the high-quality economic development index has steadily increased and reached 0.63 in 2019. This is due to Jianyang City's strategic plan, advancing with the times from the path selection, and resolutely overcoming the narrow geographical and static view. The concept of population, backward hierarchy, static location, a basic conservative concept, and scientific, leading, and future planning guide the magnificent blueprint for the development of county economy. Through reforms to strengthen development momentum and innovation to increase development vitality, Jianyang can see the opportunity of the "millennium change". It is driving the transformation and upgrading of the county economy with

the comprehensive deepening of reform and innovation, opening a new era for Jianyang to become bigger and stronger. To achieve a new chapter of high-quality economic and social development [5].

5.1. Benefit efficiency

From 2013 to 2018, the benefits efficiency index of Jianyang City showed a trend of the first decline and then rose. The efficiency index fell from 0.12 in 2013 to 0.03 in 2016 and then rebounded rapidly. In 2018, the efficiency index reached 0.08 and maintained good upward

momentum. In recent years, Jianyang has highlighted the theme of high-quality development, completed various economic goals and tasks, economical operations have been generally stable, and quality benefits have been steadily improved. Jian Yang expressed his opinion on the regional strategic positioning of "the country's west-to-south international airport gateway, the emerging polar core of Chengdu and Chongqing, the new industrial city leading the development of the new economy, and the eastern home of Tianfu culture." According to "1581" "Overall development thinking, seizing the opportunity of eastward advancement, deepening the implementation of the "five strategies" of rejuvenating the city, building a city based on industry, Tuodong development, opening up and cooperation, reform and innovation, advancing the three significant transformations, and building the three new Jianyang, with outstanding achievements.

5.2. Structural Optimization

From 2013 to 2018, the structural optimization index of Jianyang City showed a trend of first declining, then steady and then rising. In 2018, the structural optimization index reached 0.09, which also maintained a promising upward trend. In recent years, Jianyang City has maintained the strategic determination of focusing on development and transformational development, insisting on "transformation can lead to better development", "latecomers must also start at a higher level", accelerate the transformation of economic development mode, and deepen the strategic adjustment of economic structure. Currently, the city's industrial structure, power structure, element structure, regional structure, and urban-rural structure are undergoing positive changes.

5.3. Kinetic Energy Conversion

From 2013 to 2018, Jianyang City's Kinetic Energy Conversion Index showed a downward trend in volatility. The kinetic energy conversion index dropped from 0.15 in 2013 to 0.02 in 2015, and then slightly increased to 0.06 in 2016. In 2017, it dropped to a historic low of only 0.01. The kinetic energy conversion index rebounded slightly in 2018. Since 2019, the city's strategic emerging service industry, high-tech service industry, and high-tech service industry's operating income growth rate have significantly exceeded that of all service industries above designated size. The modern service industry is booming, becoming the main driving force for the high-quality economic development of Jianyang City and the "main engine" for the conversion of new and old kinetic energy.

5.4. Green ecology

From 2013 to 2018, the Green Ecological Index of Jianyang City showed a trend of pronounced and rapid rise

after small fluctuations. From 2013 to 2017, the green ecological index fluctuated only slightly, and the overall stability was around 0.05. After 2017, the Green Ecological Index rose rapidly, reaching 0.29 in 2018.

The construction of ecological civilization is an all-round and systematic green change, which will benefit the present and the future. Especially since 2019, Jianyang City has firmly established the concept of ecological priority and green development and implemented the "three governance and one increase" decision-making deployment with an iron fist to control haze, massive water control, scientific control of congestion, and green increase in the whole region. To grow, strive to promote the city's ecological civilization construction to a new level, and make the ecological background more beautiful.

5.5. People's Livelihood Sharing

From 2013 to 2018, Jianyang Citizens' Livelihood Sharing Index maintained an almost linear upward trend. In 2013, the Jianyang Citizens' Livelihood Sharing Index was only 0.02, and by 2018 it has steadily increased to 0.14, an increase of 12%.

Jianyang City always takes the improvement of people's livelihood and welfare as the starting point, and the ultimate goal of all work insists on giving priority to people's livelihood and makes every effort to promote the construction of people's livelihood. The whole city firmly establishes a people-centred development idea. It adopts more targeted, broader coverage, more direct and more effective measures to solve education, employment, medical and health, social security, social security, and social security that are near related to the lives of ordinary people. People's livelihood issues such as stability make people's sense of gain, happiness, and security more substantial, more secure, and more sustainable.

REFERENCES

- [1] Zhenghai Yao. A review of the research status of high-quality economic development[J]. *Technology and Management*, 2020, 22(03): 81-87.
- [2] Xiaohui Wang. Research on the High-quality Development of China's Economy [D]. Jilin University, 2019.
- [3] Yanqing Zhu. Construction and Empirical Analysis of Evaluation Index System of High-quality Economic Development in Jiangxi Province [D]. Jiangxi University of Finance and Economics, 2020
- [4] Wei Pei. A comprehensive evaluation of high-quality urban development based on the entropy method[J]. *Statistics and Decision*, 2020, 36(16): 119-122.

[5] Long Xue, Guo Ge, Dong Ying. Research progress and prospects of high-quality economic development in China [J]. Journal of Zhengzhou University of Light Industry (Social Science Edition), 2020, 21(04): 76-82.