

Research on the Quality Evaluation Index System of China's Economic Growth Under the New Normal

Ling Wei

School of Economics, Anhui University of Finance & Economics, Bengbu, 233030, China

Abstract: According to the requirements of economic development under the new normal, and combined with existing literature at home and abroad, a comprehensive evaluation index system for the quality of economic growth is constructed. The principal component analysis method is used to carry out weight analysis on the basic indicators and secondary indicators in the comprehensive evaluation indicator system, and the evaluation value of the quality of economic growth is measured. Analyze the problems in the process of high-quality economic growth in China according to the results of the comprehensive evaluation index system. The four aspects of optimizing the industrial structure, strengthening economic development in rural areas, deepening supply-side structural reforms, and improving independent innovation capabilities for China's economic growth Provide suggestions.

Keywords: New normal; Quality of economic growth; Principal component analysis; Comprehensive evaluation

1. Introduction

Under the new normal, China has entered a stage of transition in the rate of economic growth. China's economic development no longer focuses only on the speed of growth, but more on the quality of growth. Achieving the sustainability of economic development, changing the mode of China's economic growth, adjusting the economic structure, and improving the quality of China's economic growth have become the goals of China's economic development under the new normal.

Foreign scholars started to study the quality of economic growth earlier. Most scholars define the concept of the quality of economic growth from a broad perspective. Kamayev believes that the quality of economic growth should be considered from three aspects: product quality, means of production, and consumer effects of consumer goods [1], Thomas advocates that the quality of economic growth includes human development, income growth, distribution of opportunities, governance institutions, and governance Environmental sustainability and other aspects [2], Dornbusch and Fisher understood the quality of economic growth as the accumulation of factors of production and the improvement of factor productivity [3], while Barrow from the perspectives of politics, religion, society, etc. To understand the quality of economic growth, including economic development status, education level, income distribution, religious belief, health level, political system, etc [4].

In recent years, domestic scholars' research on the connotation of the quality of economic growth has also achieved further results. In the narrow sense, the quality of economic growth is considered from the perspective of the efficiency of economic growth. It is believed that the quality of economic growth is total factor productivity. The quality of economic growth in a narrow sense has certain limitations and one-sidedness, and it is difficult to meet the current research requirements of the quality of economic growth in China. Therefore, most scholars study the quality of economic growth in a broad sense. Total factor productivity is a study of the economic growth efficiency of capital, labor, and means of production under the constraints of resource structure and income distribution structure. The quality of economic growth in a broad sense cannot be judged by a single measure. Generally, the quality of economic growth is evaluated from multiple aspects. With Hong Guang, study the quality of economic growth from the efficiency, stability, and effectiveness of economic growth; Ma Yiqun and Shi Ana study the quality of economic growth from the three aspects of economic growth methods, processes, and results [5], Consumption, service and product quality, input-output efficiency, living environment conditions and economic operation efficiency are studied in five aspects. The scholars represented by Ren Baoping have conducted a systematic research on the connotation of the quality of economic growth, mainly studying the quality of economic growth from the perspectives of economic growth efficiency, economic

growth structure, economic growth stability, social welfare distribution, and scientific and technological innovation capabilities [6].

Studies by many scholars at home and abroad have shown that the quality of economic growth in a narrow sense has certain limitations. Total factor productivity cannot comprehensively and effectively measure the quality of economic growth, and narrow economic growth is no longer suitable as a measure of the quality of China's economic growth. Many domestic scholars have begun to use multiple measurement indicators to establish an index system to evaluate the quality of economic growth. Under the new normal, China's economic development needs to change its approach, reduce the growth rate, and optimize the economic structure. However, the comprehensive evaluation index system constructed by most scholars did not anticipate the change in the goals of China's economic development under the new normal.

Therefore, this article constructs a comprehensive evaluation index system based on the characteristics of the new normal and the goals of economic development under the new normal. The principal component analysis method is used to analyze the different measurement indexes in the comprehensive evaluation index system and determine their weights. The weights are analyzed to provide effective suggestions to promote the realization of China's high-quality economic growth target.

2. Constructing a Quality Index System for Economic Growth

When evaluating the quality of economic growth, a single index method or a comprehensive index method is generally used. This article studies the quality of economic growth in a broad sense. When constructing a comprehensive evaluation index system, the basic indicators are selected from multiple dimensions. It is suitable to use the comprehensive index method to first summarize and summarize the basic indicators, and then determine the quality of economic growth.

2.1. Dimension selection of evaluation index system

When constructing a comprehensive evaluation index system for the quality of economic growth, this article will choose multiple dimensions. First, choose the dimension of external competitiveness. In the wave of economic globalization, China's economic trade with other countries is getting closer and closer. In order to achieve a trade surplus, attract and utilize foreign capital, and promote domestic economic development, China must improve its external competitiveness. Second, choose the dimension of people's living standards. The people's living standards reflect the state of China's economic development from the side. With the high-quality economic growth, the social medical security system has gradually

improved, the income distribution gap has further narrowed, the infrastructure construction in various regions has basically been implemented, and the public service system has developed in a balanced manner, thereby improving people's living standards. Third, choose the dimension of economic structure. A reasonable economic structure includes the effective use of production factors, the rational allocation of resources, and the large investment in high-tech production equipment. The rationality of the economic structure largely determines the quality of a country's economic growth. Therefore, the dimension of the comprehensive evaluation index system for the quality of economic growth should include the dimension of the economic structure. Fourth, choose the dimension of sustainable economic growth. Economic sustainable development is a country's long-term development goal. Under the new normal, while pursuing high-quality growth goals, China's economic development must also achieve the sustainability of economic growth and ensure economic growth and society, environment, and resources Harmonious Development. Fifth, choose the dimension of innovation capability. Countries with high-quality economic growth often have strong independent innovation capabilities. The improvement of innovation capabilities will help improve China's level of scientific and technological development, reduce energy consumption, and build an intelligent and green industrial chain. power. In summary, when constructing a comprehensive evaluation index system for the quality of economic growth, this article will choose five dimensions: external competitiveness, people's living standards, economic structure, economic growth sustainability, and innovation ability.

2.2. Selection of basic indicators and measurement methods

2.2.1. Selection of basic indicators

In terms of foreign competitiveness, we choose to use the three basic indicators of export trade, import and export trade, and utilization ratio of foreign investment to reflect China's external competitiveness of the economy. In the dimension of people's living standards, the level of people's living standards is reflected by the level of retail prices of social commodities, income of urban residents, income of rural residents, coverage of pension insurance and coverage of medical insurance. In the dimension of economic structure, it is reflected by five basic indicators: the investment consumption rate, the proportion of the tertiary industry, the proportion of high-tech industries, the rate of resource allocation, and the level of rural urbanization. In the dimension of the sustainability of economic growth, the indicators are selected from the perspectives of economic sustainability and resources and the environment. The economic sustainability is expressed by the economic growth sustainability and the unit ener-

gy consumption output rate; the energy consumption coefficient and the degree of sewage pollution are used. And domestic waste disposal status to represent resources and the environment. In terms of innovation capability, the three basic indicators of patent approval, R & D investment proportion, and R & D personnel investment proportion are used to express the innovation capability.

2.2.2. Measurement method description

After comparing the advantages and disadvantages of analytic hierarchy process, principal component analysis method, entropy method and fuzzy evaluation method, this paper chooses principal component analysis method to study and analyze the comprehensive evaluation index system of economic growth quality. The principal component analysis method is to transform several original variables into several new variables through linear trans-

formation. It reduces the original variables while retaining the information of the original variables to the greatest extent. For the study of the quality evaluation of economic growth, the principal component analysis method has certain advantages in determining the weight of the secondary indicators, and it can also judge the contribution of each basic indicator to the quality of economic growth. Therefore, this article uses the principal component analysis method to evaluate The quality of China's economic growth.

2.3. Construction of comprehensive evaluation index system

This paper uses the selected five dimensions as secondary indicators and combines the basic indicators selected on each dimension to build a comprehensive evaluation index system. (See Tab. 1)

Table 1. Comprehensive evaluation indicators of the quality of economic growth

Secondary indicator	Basic indicator	Measurement method	Attribute
External competition ability	Export trade	Technology efficiency exports / GDP	+
	Import and export trade	Import and export trade volume / GDP	+
	Proportion of foreign investment	Actual foreign direct investment / Total social investment in the same period	+
Citizens' lives level	Social commodity retail price level	Social commodity retail price index	-
	Income of urban residents	Per capita disposable income of urban residents	+
	Income of rural residents	Per capita net income of rural residents	+
	Pension insurance coverage	Number of pensioners / total population	+
Economic structure	Medical insurance coverage	Number of health insurers / total population	+
	Investment consumption rate	Total capital formation / final consumption expenditure	+
	Tertiary industry proportion	Tertiary industry output value / GDP	+
	Proportion of high-tech industries	High-tech industry value added / industrial value added	+
	Resource allocation rate	Investment growth rate / GDP growth rate	+
Economic Growth Persistent	Rural urbanization level	Urban employment / total employment	+
	Economic growth sustainability	Ratio of economic growth in a year to the previous year	+
	Unit energy output rate	GDP / total energy consumption over a period	-
	Energy consumption coefficient	Energy consumption / Total GDP	-
	Degree of air pollution	Total industrial exhaust emissions	-
	Sewage pollution degree	Total industrial wastewater discharge	+
Innovation and technology	Domestic waste disposal status	Harmless treatment rate of domestic garbage	+
	Patent approvals	Three types of patent approvals by region in a year	+
	R & D investment proportion	R & D expenditure / total GDP over the same period	+
	R & D staff investment ratio	Number of R & D personnel / total employment	+
	Technological progress	Science and technology progress index	+
	Technological efficiency	Science and technology efficiency Index	+

3. Empirical Analysis

3.1. Data collection and processing

This article selects the national statistical data from 2009 to 2018. The research data comes from the National Bureau of Statistics to ensure the authority of the data. The index value of each basic index is calculated strictly according to the corresponding measurement method in Table 1. Exports and actual foreign direct investment are in US dollars, while GDP is in Renminbi. The unit of export data and actual foreign direct investment are con-

verted into RMB at the exchange rate of RMB to USD in each year to ensure the unity of data units.

The index values of the basic indicators in Table 1 have different effects on the quality of economic growth. Therefore, the basic indicators are divided into two categories: positive indicators and negative indicators according to different effects. The basic indicator that the index value and the quality of economic growth increase in the same direction is classified as a positive indicator, and the basic indicator that the indicator value and the quality of economic growth are inversely divided is classified as

a negative indicator. Positive indicators and inverse indicators have different trends in the quality of economic growth. Before the principal component analysis is performed, the method of taking the inverse of the inverse indicators is forward processed.

As this article constructs a comprehensive evaluation system for the quality of economic growth, there are many basic indicators selected, and there may be large gaps in the magnitude and variance of each basic indicator data, which affects the measurement of indicator weights, and all basic indicators need to be dimensionless. After comparing a variety of non-dimensional processing methods, this article chooses to use the average method to process the basic indicator data. The averaging process is the new data obtained by dividing the original data by the mean value. After processing, the average value of the data of the basic indicator is 1. The biggest advantage of the averaging method is that it does not change the variance of the index data, so the processed index will not have a large error in the weight measurement.

3.2. Weight calculation

First, this article uses SPSS 22.0 software to perform principal component analysis on the basic indicators of each dimension, and selects principal components F_i with eigenvalues greater than 1. (F_1 called the first principal component, F_2 called the second principal compo-

nent, and F_m called the mth principal component), then find the square root of the eigenvalue of the principal component F_i , and divide the square root by the coefficient of the principal component F_i in the component matrix. Get the weight Y_i of the principal component F_i , and multiply Y_i by the standardized index value X_i to obtain the index value W_i of each secondary index, that is

$W_i = \sum_{j=1}^n X_j X_i$ (n=1,2,3,4...). Then, performing a principal component analysis on the secondary index again, and selecting an appropriate principal component. When selecting the principal components, the weighted V_i of each secondary index is calculated according to the cumulative variance contribution rate, which is the same as the method for obtaining Y_i , Based on $Q_t = \sum_{i=1}^5 W_i V_i$ (Where t is time). Finding the evaluation value of the quality of economic growth.

3.3. Results analysis

Using SPSS 22.0 software to do a principal component analysis of the basic indicators and secondary indicators from 2009 to 2018, the weights of secondary indicators and the quality of economic growth in the comprehensive evaluation indicator system were obtained. As shown in Tab. 2.

Table 2. Quality evaluation of China's economic growth from 2009 to 2018

Year	External competitiveness	Ability of people's living standard	Economic structure	Sustained economic growth	Innovation ability	Economic growth quality
2009	1.47	-2.81	-2.21	-2.71	-2.78	-5.36
2010	2.43	-1.97	-1.75	-1.56	-2.15	-4.41
2011	1.85	-1.79	-1.72	-1.28	-1.49	-3.63
2012	0.87	-0.95	-1.29	-0.82	-0.42	-1.95
2013	0.37	-0.18	-0.91	0.02	0.17	-0.57
2014	-0.18	0.26	-0.23	0.43	0.39	0.46
2015	-1.06	0.76	1.08	0.90	0.97	2.13
2016	-1.77	1.21	1.94	1.23	1.25	3.30
2017	-1.83	2.28	2.25	1.70	1.52	4.29
2018	-2.15	3.19	2.84	2.09	2.55	5.73

By analyzing the data in Table 2, it can be found that in the comprehensive evaluation system for the quality of economic growth, the changes in people's living standards, economic structure, economic growth sustainability, and innovation ability are the same as those in China's economic growth quality, and foreign competition Capability has the opposite trend to the quality of China's economic growth. And by observing the weight of the quality of economic growth of the secondary indicators in 2009-2018, the contribution of the five secondary indicators to the quality of China's economic growth is not much different. From the perspective of time span, the quality of China's economic growth is constantly rising.

4. Conclusions and Recommendations

On the basis of studying a large number of existing domestic and foreign literatures, this paper explores the connotation of the quality of economic growth, and combines the requirements of China's economic growth under the new normal, to construct a comprehensive evaluation index system for the quality of economic growth. The principal component analysis method was used to analyze multiple data, and finally the evaluation value of the quality of China's economic growth was obtained. Through the comprehensive evaluation system of the quality of economic growth, it is not difficult to find that China's economic development needs to be improved in some aspects. Based on this, this article provides the following suggestions for improving the quality of China's economic growth.

4.1. Optimizing the industrial structure and enhancing the competitiveness of international trade

In the context of global economic integration, China's economic development has ushered in huge opportunities. According to authoritative data, in recent years, the scale of China's import trade and export trade have increased compared with the past. Although the trade surplus has been achieved, the import and export balance has not increased significantly. Most of the means of production in China flow to labor-intensive sectors, which makes China's industrial structure relatively low-level compared to developed countries. Industrial structure is an important factor in improving the quality of economic growth, and it is also a key indicator for measuring a country's economic development level. China must make full use of its resource advantages and system advantages to formulate industrial policies that are coordinated with market development, limit related industries' pollution indicators and energy consumption indicators; improve the quality of laborers, and vigorously support the development of the service industry; increase efforts to attract foreign investment, increase domestic production input. In this way, China's industrial structure will be optimized and international trade competitiveness will be improved.

4.2. Implementing rural revitalization strategies to reduce the gap between urban and rural areas

The large gap between urban and rural areas, the large number of unemployed people in rural areas, the low level of agricultural production technology, and the backward infrastructure in rural areas are all factors that hinder economic growth and transformation. All parts of China must implement the implementation of the rural revitalization strategy and further narrow the gap between urban and rural development. First, increase teaching equipment and teaching resources in rural areas, realize remote teaching, and improve the overall education level in rural areas; second, promote the reform of agricultural production structure, improve the level of automation in agricultural production processes, and build an intelligent agricultural product industry chain. Third, strengthen infrastructure construction in rural areas, encourage the development of rural e-commerce industries, improve the logistics system in rural areas, and build a digital village. Implement the strategy of rural revitalization, promote economic development in rural areas, reduce the gap between urban and rural areas, and improve the quality of people's living standards, thereby improving the quality of China's economic growth.

4.3. Strengthening supply-side structural reforms and adjusting economic structure

The quality of economic growth depends largely on the rationality of the economic structure. Strengthening supply-side structural reforms, optimizing the allocation

of labor, capital, land, resources and other production factors among different sectors to achieve a reasonable distribution; encouraging the development of high-tech industries through policies, formulating incentive mechanisms for high-tech industries; and improving investment utilization, Optimize the consumption structure, upgrade the industrial chain, and expand the scale of production. Thus adjusting the economic structure, increasing the vitality of economic development, and achieving sustainable development of high-quality economic growth.

4.4. Achieving the strategy of strengthening the country by talents and improving the ability of independent innovation

China is a country with a large population and a large number of laborers, but the general quality of laborers is low, coupled with weak independent innovation capabilities, irrational industrial structure, and low labor productivity. Therefore, China must vigorously promote the implementation of the strategy of strengthening the country by talents, create a good environment for talent cultivation, optimize the talent management system, improve the talent evaluation mechanism, strengthen the talent reward mechanism, and cultivate innovative talents for our country. The ability of independent innovation is an important factor in determining the quality of China's economic growth. A strong ability of independent innovation and a high level of scientific and technological development can improve production efficiency, increase the utilization rate of production materials, reduce energy consumption, reduce production costs, and change the mode of economic growth. High-quality economic growth.

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