

Evaluation of the Effectiveness of Green Finance in Promoting Low Carbon Development based on the "Double Carbon" Target

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Abstract

In order to achieve the goals of "carbon peaking" and "carbon neutrality", green finance and low-carbon economy are two important tools and approaches, so it is particularly important to evaluate the effect of green finance on low-carbon development in a scientific and objective manner. Based on the analysis of the mechanism of the impact of green finance on low-carbon development, this paper measures the level of development of low-carbon economy and the development system of green finance in this city based on the entropy value method using the carbon emission panel data of each province in China from 2017 to 2020.

Keywords

Double Carbon; Green Finance; Low Carbon Development; Evaluation Model.

1. Introduction

Low-carbon development is a model innovation based on traditional development. It is a new development model that takes environmental protection as the pillar of sustainable development under the constraints of ecological and environmental capacity and resource carrying capacity. Green finance has the functions of capital support, resource allocation and social supervision. By increasing the supply of green funds, reducing the cost of investment and financing of green projects, guiding the flow of funds and regulating the environmental behaviour of enterprises, it can promote economic growth, facilitate industrial transformation and help environmental protection, thereby realising low-carbon development.

2. Preparation

Since the reform and opening up of China, while creating a miracle of economic growth, ecological and environmental problems have also emerged. In order to ensure that the goal of carbon peaking and carbon neutrality is achieved, the 19th Party Congress and the 5th Plenary Session of the 19th Central Committee of the Communist Party of China clearly pointed out the need to accelerate the overall green transformation of economic and social development and to establish a green, low-carbon and circular development economic system[2]. Low-carbon cyclic development is a model innovation based on traditional development, a new development model built on the constraints of ecological and environmental capacity and resource carrying capacity, with environmental protection as a pillar to achieve sustainable development (2017). And the transformation of low-carbon economic development requires effective capital markets to provide financing support, and the resulting green finance is a financial innovation carried out by the financial industry to cater to the financing needs of low-carbon development and is a financing channel for the green economy[3]. However, the long-

standing dualistic economic structure of China's society has led to an uneven development of green finance between regions. Different regions differ greatly in terms of market efficiency, resource endowment and technical conditions, and there is significant regional heterogeneity in production technology. In this context, to adjust the policy formulation mode and change the policy status quo, it is necessary to scientifically sort out the mechanism of green finance-driven low-carbon development, accurately evaluate the efficiency of green finance-driven low-carbon development, and dig deeper into the root causes of the poor driving effect.

To sum up, the literature on green finance and low-carbon development mostly focuses on qualitative analysis, and there is less research on the mechanism of how green finance drives low-carbon development. In terms of empirical analysis, the existing literature does not empirically test the comprehensive effect of green finance in driving low-carbon development from the perspective of panel data space. This study will measure the level of green finance development through five dimensions: green credit, green securities, green insurance, green investment and carbon finance indicators, and the comprehensive effect of green finance driving low-carbon development through three dimensions: economic growth, industrial transformation and environmental protection.

3. Constructing Passing Network

1. Indicator construction

The research analysis is based on panel data of 30 provinces from 2017-2020. The measurement indicators are green finance divided into four dimensions: green credit (X), green securities (X), green investment (X) and green insurance (Xa)[4].

2. Model building and solving

3.1. Entropy-weight-topsis Method Evaluation Model Establishment

In this paper, green credit (X), green securities (X), green investment (X) and green insurance (Xa) are combined and each indicator is given a weight using the entropy weighting method [1] and the weight value of each indicator is calculated. The weight values of the indicators are then substituted into the topsis algorithm to calculate the relative closeness and score the overall scheme.

3.2. Introduction to the Algorithm

The entropy weighting method is an objective and comprehensive evaluation method for multiple objects and indicators. It uses information entropy to calculate the entropy weight of each indicator according to the degree of variation among the indicators, and then corrects the weight of each indicator by entropy weight, so as to arrive at a more objective indicator weight.

- ① Normalisation process: normalise the k indicators $X_1, X_2, \dots, X_k$ and use as each indicator is a positive indicator.
- ② Calculate the weight Z_{pq} of the indicator value of the pth programme under the qth indicator. i.e.
- ③ According to the definition of information entropy in information theory, the information entropy of a set of data, the information entropy value E_q of the qth indicator is calculated. i.e.
- ④ Calculate the information entropy redundancy, which is $G_p = 1 - E_q$.
- ⑤ According to the formula of information entropy, calculate the information entropy of each indicator as E_1, E_2, E_k . The weight of each indicator is calculated by the information entropy, and the weight of each indicator is calculated as.

TOPSIS is a method for multi-objective decision making, which can make full use of the information of the original index data and rank the evaluation objects by calculating the distance between the optimal and inferior solutions.

With FL_j, MY_j, JY_j and MJ_j (j=2017, 2018, 2019, 2020) representing different years respectively, and a, b, c and d denoting the weight coefficients of green credit, green securities, green investment and green insurance respectively, the entropy weighting method environmental protection evaluation model is established as $WH_j = aFL_j + bMY_j + cJY_j + dMJ_j$ (j= 2017, 2018, 2019, 2020). The weights of each indicator are then substituted into the distance formula of the topsis algorithm and the relative proximity is calculated to complete the measurement score [5].

Table 1 shows the index weights obtained after correcting the weights of each indicator by entropy weights.

Table 1. Weight coefficients of each indicator of the entropy weight method

a	b	c	d
0.1020	0.2385	0.4213	0.2382

As can be seen from the weighting coefficients of the indicators in Table 1, there is little variation in the weighting coefficients of the indicators determined using the entropy weighting method, with each indicator making a corresponding contribution in the assessment of low carbon development. Among them, green securities and green investment have higher weights, representing the role of green finance in promoting low-carbon development.

Using the topsis algorithm, the indicator types are first unified, then the indicators are standardized, the very small indicators are transformed into very large indicators, the positive and negative ideal solutions are determined, and the distance and relative proximity are calculated by substituting the indicator weights calculated by the entropy weighting method.

4. Conclusion and Recommendations

4.1. Conclusion

China is at the forefront of the rapid development of green finance in the world, but there is still much room for green finance to help achieve peak carbon neutrality. The development of green finance is not comprehensive when viewed by categories. Currently, among them, green securities and green investment have a high weighting, representing the role of green finance in promoting low-carbon development. Green credit and green insurance both have greater potential for growth.

4.2. Suggestions

We should fully understand the importance of green finance to economic and social development and economic structural transformation, and help the country achieve the double carbon target; it is suggested that, drawing on advanced experience at home and abroad, government departments should take the lead, co-ordinate and promote it at a high level. The government should provide financial subsidies; strengthen policy guidance; and broaden the field of green financial products.

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