

Research on the factors affecting the development of green finance in China

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Abstract. With the increasing attention of the state to the development of green finance year by year, China's green economy framework has gradually shown a certain scale. In order to better understand the factors affecting the development of green finance in China, this paper uses the factor analysis method to reduce the dimension of the factors affecting the development of green finance from 2010 to 2020, and extracts two main factors affecting the development of Green Finance: economic development factor and environmental protection factor. The empirical results are as follows: the weight of economic development factors is larger, and the weight of environmental factors is smaller.

Keywords: Green Finance, Influencing factors, Factor analysis.

1. Foreword

With the development of green finance in China, it has been gradually raised to the national strategic position. Green finance is to use the financing function, resource allocation function and risk management function of finance to regulate the economy, reflect the economy, promote environmental improvement and use resources efficiently. Green finance can encourage more social capital to invest in the social field. At the same time, green finance can also encourage and promote more social capital to withdraw from industries with high pollution and energy consumption. It is an important path to realize the development of green economy. At present, based on the perspective of exploring the influencing factors of green finance, this paper collects the data of nine influencing factors affecting the development of green finance in the decade from 2010 to 2020, analyzes whether there is an internal relationship between each influencing factor, and calculates the development score of green finance every year from 2010 to 2020, so as to provide a theoretical basis for the follow-up development of green finance in China.

2. Literature review

In the 21st century, China is in a critical transition period. During this period, domestic scholars have made a lot of research results on green finance. Zeng Xuewen et al. (2014) took the five indicators of green credit, green securities, green insurance, green investment and carbon finance as evaluation indicators, and weighted them through a combination of subjective and objective weighting methods. Finally, they concluded that the secondary indicator green credit has the highest weight, accounting for 40%. Referring to three existing representative viewpoints, Li Xiaoxi et al. (2015) summarized that green finance is financial activities such as credit, insurance, securities and industrial funds for the purpose of promoting the coordinated development of economy, resources and environment, and combined green ecology with finance from an environmental perspective to transform the financial structure. Liu Yanmei (2021) proposed that the influencing factors of green finance mainly include five aspects: financial development level, education level, residents' income level, urban environmental protection investment and energy consumption per unit GDP, and further empirically analyzed the panel data by using multiple regression model. Sun Qiufeng et al. (2022) analyzed the current practice of green finance in China under the background of "double carbon", and proposed that the green financial market uses five green financial instruments to raise sufficient funds for low-carbon emission reduction projects.

3. Empirical analysis

3.1 Index selection

Table 1. Index selection

| Variable symbol | Variable meaning |
|-----------------|---|
| X1 | Financial related ratio |
| X2 | Per capita carbon dioxide emissions |
| X3 | Number of people in Higher Education |
| X4 | National fiscal expenditure on environmental protection |
| X5 | Investment in industrial pollution control completed |
| X6 | Urbanization rate |
| X7 | Per capita forest area |
| X8 | National political education funds |
| X9 | Per capita disposable income |

The development of green finance is affected by a series of factors. Referring to the previous research results, this paper uses the index data from 2010 to 2020 as the initial sample, and selects nine influencing factors with strong correlation with green finance, namely, the financial correlation ratio (x1), that is, the ratio of the value of all financial assets to the total amount of economic activities, per capita carbon dioxide emissions (x2), the number of Higher Education (x3) National financial expenditure on environmental protection (x4), investment in industrial pollution control (x5), urban rate (x6), per capita forest area (X7), international financial education funds (x8) and per capita disposable income (x9), with a total sample size of 90. The original data of the above indicators are from China Statistical Yearbook, China Financial Yearbook and China Environmental Statistical Yearbook.

3.2 Correlation test

This article uses SPSS_23 for factor analysis, we must first test the correlation of the sample data. KMO test statistics show whether the partial correlation between variables is strong enough. Bartlett spherical test is used to judge whether the correlation matrix is an identity matrix. It can be seen from the above table that the p value (significance) is 0.000 according to Bartlett's spherical test, that is, there is a strong correlation between specific variables. At the same time, the KMO test statistic value is 0.686, indicating that the coincidence degree between various variables is acceptable. Through KMO and Bartlett test, we can know that the sample data can be reduced by factor analysis, and then draw a conclusion.

Table 2. KMO and Bartlett test

| | | |
|-----------------------------------|------------------------|---------|
| KMO sampling suitability quantity | | 0.686 |
| Bartlett sphericity test | Approximate chi square | 155.908 |
| | freedom | 36 |
| | Significance | 0.000 |

3.3 Common factor analysis

Table 3 shows the degree represented by the common factor of whether each statistical variable can be extracted. It can be seen from the data in the above table that the common factor variance extraction proportion of finance related ratio (x1), the proportion of people in Higher Education (x3), the national financial environmental protection expenditure (x4), the investment completed in industrial pollution control (x5), the urbanization rate (x6), the national financial education expenditure (x8) and the per capita disposable income (x9) are all above 80%. Therefore, the common

factor extracted by default can well represent the above influencing factors and has strong explanatory ability. It can be seen from the above table that the information extraction proportion of per capita carbon dioxide emission and per capita forest area is 70% - 80%, so the common factor extracted by default can also better represent these two variables.

Table 3. Common factor variance

| | initial | extract |
|--|---------|---------|
| Financial related ratio(X1) | 1.000 | 0.906 |
| Per capita carbon dioxide emissions (X2) | 1.000 | 0.753 |
| Proportion of people in Higher Education (X3) | 1.000 | 0.971 |
| National fiscal expenditure on environmental protection (X4) | 1.000 | 0.929 |
| Investment in industrial pollution control completed (X5) | 1.000 | 0.820 |
| Urbanization rate (X6) | 1.000 | 0.988 |
| Per capita forest area (X7) | 1.000 | 0.721 |
| National financial education funds(X8) | 1.000 | 0.996 |
| Per capita disposable income(X9) | 1.000 | 0.988 |

Extraction method: principal component analysis

Table 4 Variance interpretation shows the variance contribution rate and cumulative contribution rate of each component. From this table, it can be seen that the cumulative variance contribution rate of the first two components has reached 89.719%. Therefore, using the first two principal components can better describe the level of green finance development. Because the variance contribution rate of other factors is too low, the influence of other factors can be ignored.

Table 4. Total variance interpretation

| component | Initial eigenvalue | | | Extract the sum of squares of loads | | | Sum of squares of rotating loads | | |
|-----------|--------------------|---------------------|--------------|-------------------------------------|---------------------|--------------|----------------------------------|---------------------|--------------|
| | total | Variance Proportion | Cumulative % | total | Variance Proportion | Cumulative % | total | Variance Proportion | Cumulative % |
| 1 | 6.550 | 72.777 | 72.777 | 6.550 | 72.777 | 72.777 | 5.972 | 66.361 | 66.361 |
| 2 | 1.525 | 16.942 | 89.719 | 1.525 | 16.942 | 89.719 | 2.102 | 23.358 | 89.719 |
| 3 | .608 | 6.755 | 96.475 | | | | | | |
| 4 | .153 | 1.695 | 98.169 | | | | | | |
| 5 | .111 | 1.238 | 99.407 | | | | | | |
| 6 | .048 | .528 | 99.935 | | | | | | |
| 7 | .004 | .043 | 99.979 | | | | | | |
| 8 | .002 | .017 | 99.996 | | | | | | |
| 9 | .000 | .004 | 100.000 | | | | | | |

Extraction method: principal component analysis.

3.4 Calculate factor score

According to the component score coefficient matrix, it can be known that each main factor is jointly expressed by various influencing factors, that is, main factor 1 economic development factor and main factor 2 environmental factor can be expressed by financial related ratio, per capita carbon dioxide emission, proportion of people in higher education, per capita disposable income, national financial environmental protection expenditure, urbanization rate, investment in industrial pollution control, per capita forest area. The nine influencing factors of national financial education funds are expressed together. Therefore, according to the above table, the score of each factor can be calculated as:

$$F1=0.131X_1+0.132X_2+0.149X_3+0.149X_4+0.145X_5+0.149X_6+0.041X_7+0.081X_8+0.149X_9 \quad (1)$$

$$F2=0.269X_1-0.054X_2-0.087X_3-0.118X_4-0.118X_5-0.133X_6+0.567X_7+0.435X_8-0.130X_9 \quad (2)$$

Because these two common factors reflect the overall level of the development of green finance in China from different directions, it is difficult to comprehensively analyze the development level of green finance by using a common factor alone. Therefore, considering the ratio of the variance contribution rate corresponding to each factor to the total variance contribution rate as the weight, the two factors are assigned respectively, so as to obtain the comprehensive factor score formula:

$$F_t=66.361/89.719F_1+23.358/89.719F_2=0.7396F_1+0.2603F_2 \quad (3)$$

It can be seen from the comprehensive score table that the score of green finance development has increased year by year from 2010 to 2020, from -1.34 in 2010 to 1.06, indicating that the development trend of China's green finance is good and developing. From the comprehensive factor expression, it can be seen that the weight of economic development factor is 73.96%, and the weight of environmental factor is 26.03%. It can be concluded that the comprehensive level of economic development has a greater impact on green finance, and the greater impact proportion of economic development factors may be due to the broader impact factors contained in economic development factors, including the degree of financialization, residents' income and expenditure, education level, etc., and these impact factors closely related to economic development have also played a great role in the development of green finance. Government environmental protection also has a certain impact on the development of green finance. The small proportion of environmental factors may be due to some problems in the effectiveness of the policies issued by the government on the development of green finance. In order to better develop the overall level of domestic green finance, the following suggestions are put forward.

Table 5. comprehensive score of China's green finance from 2010 to 2020

| particular year | F1 | F2 | Comprehensive score |
|-----------------|-------|-------|---------------------|
| 2010 | -1.47 | -0.95 | -1.34 |
| 2011 | -0.95 | -1.04 | -0.97 |
| 2012 | -0.68 | -1.05 | -0.78 |
| 2013 | -0.57 | -0.08 | -0.44 |
| 2014 | -0.66 | 1.79 | -0.02 |
| 2015 | -0.12 | 1.16 | 0.21 |
| 2016 | 0.04 | 1.11 | 0.32 |
| 2017 | 0.52 | 0.45 | 0.5 |
| 2018 | 0.87 | -0.15 | 0.6 |
| 2019 | 1.28 | -0.37 | 0.85 |
| 2020 | 1.74 | -0.87 | 1.06 |

4. Summary and suggestions

4.1 Maintain stable domestic economic growth

From the empirical analysis of this paper, it can be concluded that the impact of economic development factors on green finance is relatively large, that is to say, the stability of economic and financial development is indispensable to maintain the stable and healthy development of green finance. Only when there is a stable economic environment in China, the income level of residents and the degree of market financialization will be more stable, so as to promote the development of domestic green finance. At present, the development of green finance in China started late, and the categories are not complete. Moreover, the stable development of the domestic economy will promote the mature development of the domestic financial market and make the domestic financial market a solid backing for the good development of green finance.

4.2 Strengthen the training of talents with relevant backgrounds

With the country gradually putting green finance in the national strategic position, it is also very necessary for the cultivation of high-level talents with green finance related background. People in areas with better economic development have a faster acceptance of the concept and logic of green finance, and green finance can also be spread among the people in such areas. In areas with poor economic conditions, people's knowledge level is generally low and their acceptance of green finance is low, which is not conducive to the smooth spread of green finance among the people in such areas. Therefore, it is very necessary to improve the knowledge level of various regions. In addition, the rapid development of green finance needs the guidance of talents with relevant backgrounds. It is the so-called technology industry has specialization. Under the condition that more professionals are engaged in the development of green finance industry and the public's knowledge level can accept good conditions, the development of green finance in China will be more smoothly.

4.3 Strengthen investment in national governance environment

From the results of factor analysis in this paper, environmental factors account for a relatively small proportion of the development of green finance. The basic business of the financial industry mainly includes credit and savings. Therefore, the state's increased investment in the environmental protection industry will increase the liquidity of funds for environmental protection. On the one hand, special funds can be set up to support the development of clean energy projects, so as to promote technological innovation and product iteration. On the other hand, we can gradually adjust the industrial spatial layout by adjusting the direction and intensity of national investment, and provide policy support and preferential subsidies for engineering projects with sustainable development attributes, so as to promote the development of green finance.

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