Evaluation and Application of Enterprise Carbon Credit Rating Based on Energy Data

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Abstract. The construction of key indicators for carbon credit evaluation not only affects the implementation of financial institutions' support for the dual carbon goals, but also has a significant impact on the construction of China's carbon market, the achievement of the dual carbon goals, and the green development of the economy and society. This article is based on enterprise energy data and designs key indicators for enterprise carbon credit evaluation through data such as production energy efficiency, carbon emissions, and carbon efficiency levels, to more accurately reflect the true credit status of the enterprise. By constructing a more comprehensive carbon credit evaluation method and system, enterprise carbon credit evaluation can accurately reflect the changes in credit status of various enterprises in the process of achieving carbon neutrality goals and carbon market construction. It provides scientific and feasible credit evaluation tools for financial institutions, investment institutions, local governments, etc., and helps China achieve the "dual carbon" goals and promote green economic and social development.

Keywords: carbon credit, dual carbon, evaluation indicators, energy data, finance

1 Introduction

According to calculations, the investment scale required for China to achieve carbon peak and carbon neutrality is 150 trillion to 300 trillion yuan, equivalent to an annual investment of 3.75 trillion to 7.5 trillion yuan. The achievement of carbon peak and carbon neutrality goals requires strong support from the financial system. How to effectively identify qualified credit entities and reduce credit risks while providing financial support for the real economy to cope with climate change has become an urgent problem that banks and other financial institutions need to solve. At the same time, local governments also need appropriate evaluation tools to screen investment targets with medium to long-term competitiveness, and promote the green transformation of enterprises in their jurisdiction[1].

In the process of deepening the national carbon market, various industries will assume different obligations, and the survival and development environment of enterprises is undergoing long-term and significant changes, which has had a profound impact on their credit. At the same time, the sources and impacts of credit risks for Chinese enterprises in the context of the carbon market are also undergoing profound changes. The level of carbon emissions and the progressiveness of carbon reduction technology will directly affect the risk and value of enterprises, and the value of stock assets will also face revaluation. Therefore, exploring the experience and lessons of foreign carbon market construction, deeply revealing

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the systematic impact of carbon neutrality goals on enterprises, screening substantive factors, and constructing a carbon credit evaluation system are of profound significance. Not only is it related to whether financial institutions can support the dual carbon goals, but it will also have a significant impact on the construction of China's carbon market, the achievement of the dual carbon goals, and the green development of the economy and society.

By constructing a more comprehensive carbon credit evaluation method and system, enterprise carbon credit evaluation can accurately reflect the changes in credit status of various enterprises in the process of achieving carbon neutrality goals and carbon market construction. It provides scientific and feasible credit evaluation tools for financial institutions, investment institutions, local governments, etc., and helps China achieve the "dual carbon" goals and promote green economic and social development[2].

However, the current practice of enterprise carbon credit evaluation systems is mostly based on traditional credit evaluation systems, which cannot effectively play the guiding role of green finance. Therefore, this article is based on enterprise energy data, and designs an enterprise carbon credit evaluation system based on energy data through data such as production energy efficiency, carbon emissions, and carbon efficiency levels. This system more accurately reflects the true credit status of enterprises and supports the carbon management needs of multiple entities such as energy management platforms, enterprises, parks, and governments.

2 Summary of carbon credit evaluation system research

In the general credit evaluation system, credit or credit is a reflection of solvency. The carbon credit of enterprises refers to the embodiment of the willingness and ability of enterprises to fulfill their commitments under the strategic background of coping with climate change and carbon neutrality. Carbon credit evaluation (national group standard "enterprise carbon credit evaluation specification" (T / CECA-G 0189-2022)) refers to the scientific method and standardized procedures, the corresponding to climate change and carbon neutral target influence enterprise credit risk factors analysis, comprehensive evaluation of enterprise commitment to perform will and ability, and professional symbols indicate different credit rating[3]. The change of enterprise carbon credit comes from two aspects, one is the credit change driven by the change of external environment; the other is the credit change driven by the change of the enterprise's internal resource ability of credit. The change of the external environment and the internal resource ability of the enterprise may have the credit enhancement and reduction effect on the enterprise's carbon credit of enterprises.

Carbon credit evaluation and general credit rating complement each other. Both are used to evaluate the risks of enterprises, and can be used as tools to reflect the willingness and ability of enterprises to repay debts, but there are differences. Firstly, the carbon credit evaluation highlights the carbon emphasis on the influence of the neutral and the new situation on the enterprise credit, rather than covering aspects; secondly, the range of carbon credit evaluation is less than the general credit rating, and the enterprises less affected by double carbon are generally not regarded as the rating object; finally, the carbon credit evaluation reflects both carbon risk and carbon value, and the scope of application is wider than the general credit rating.

In terms of promoting the construction of the carbon credit system, On October 1,2022, The "Enterprise Carbon Credit Evaluation Standard" was officially implemented, The main participants include Shanghai Environment and Energy Exchange, Research Center for Sustainable Development of Fudan University, Global Securities Market Research Institute of Tsinghua University, etc.; On June 1,2022, The country's first carbon credit evaluation system was launched in Ningbo, The first landing achievement of carbon credit evaluation focuses on inclusive finance; In 2022, With the support of the Sustainable Development Research Center of Fudan University, Cixi Rural Commercial Bank has developed a "zero-carbon supply chain" credit evaluation system, To facilitate the low-carbon transformation of the manufacturing industry, Yixing, Changzhou, Taizhou and other places, Also actively promoting the implementation of carbon credit evaluation; In February, 2023, The carbon credit evaluation system symposium was held in the Whole United M & A Association, Discuss the carbon management system, carbon credit system and other issues, A lot of suggestions for the further development of carbon credit evaluation system, Steady progress was made in the construction of a carbon credit evaluation system.

At present, the domestic credit evaluation system is based on the experience of foreign credit system construction, and the domestic credit evaluation system has launched a carbon credit evaluation system suitable for China's actual situation, and further promoted it[4]. However, the current carbon credit system cannot solve the essential problem, that is, the problem of resource mismatch. At present, the development of carbon finance is mostly reflected in "finance + green", rather than green guidance finance, and there is a real mismatch problem in the allocation of resources such as capital and energy. For example, the energy-saving and low-carbon work of high-quality enterprises is promoted rapidly, and the sense of social responsibility is developed, but due to too many enterprises, they can not get the attention of banks, but can not be supported, but some rough enterprises get loans and develop. The current carbon credit system is mostly evaluated from the perspective of finance, but fails to substantially distinguish the nature of enterprises in various industries from the perspective of energy, so as not to realize the effective integration of green and finance.

Therefore, the paper is based on the enterprise energy data, select typical industry, build energy data driven enterprise carbon credit evaluation index system, more accurately reflect the real credit status, with the development of enterprises, let the market or the government funds can realize effective guidance of industry, promote the realization of social multiple subject carbon management demand.

3 Key indicators for carbon credit evaluation of enterprises based on energy data

3.1 Evaluation Path for the Dual Architecture of "Business Asset"

In the financial field, the evaluation of corporate credit mostly adopts a "business finance" binary structure, reflecting the willingness and ability of enterprises to repay debts from two dimensions: business risk and financial risk[5]. Analyze business risks from the progressive logic of factors such as national risk, industry risk, and enterprise competitive position; Analyze financial risks from liquidity and liabilities.

In the context of addressing climate change and achieving carbon neutrality goals, not only will the carbon emission obligations and rights of enterprises change, but the medium to long-term attractiveness of various industries will also undergo profound changes, which will change the business risks or opportunities of enterprises and affect the asset value under the existing financial framework. At the same time, as an emerging asset type, carbon assets, although not officially included in the scope of corporate financial statements in the short term, are affecting the willingness and ability of enterprises to repay debts, and their future impact will be wider and greater. Based on the above considerations, the carbon credit evaluation of enterprises will be carried out from the binary structure of "business asset".

3.2 Carbon credit evaluation process

Based on the binary architecture of "business asset", the carbon credit evaluation of enterprises will be determined in four steps according to the logic of advancing layer by layer.

One is the selection of rating indicators. From the dimensions of business risk and asset risk, factors that have a significant impact on corporate credit are screened based on the four basic principles of importance, effectiveness, relevance, and comparability. The impact of these factors on corporate credit is revealed, and credit evaluation index systems for different industries are determined. Among them, the importance principle refers to fully considering the impact of addressing climate change and achieving the dual carbon goals in the process of selecting indicators, and selecting themes and indicators based on their importance and significance on corporate credit. The principle of effectiveness refers to the selection of themes and indicators that can fully, truthfully, and effectively reflect the adaptability and competitiveness of enterprises in addressing climate change and achieving carbon neutrality goals, and effectively measure the carbon risk of enterprises. The principle of relevance refers to the selection of themes and indicators that can fit the actual needs of various enterprises and are closely related to the characteristics of enterprises in various industries.

The second is the determination of indicator weights. After determining the evaluation indicators, different comprehensive evaluation methods such as Analytic Hierarchy Process, Fuzzy Evaluation, and Expert Scoring are selected based on the industry characteristics of different enterprises to evaluate the impact of carbon emissions from emission control enterprises on finance, the impact of carbon trading on costs, and the possibility of carbon compliance risks. The business operation status and financial risk situation of the enterprise are comprehensively analyzed, and the weight of each indicator is further evaluated, Determine the initial credit score of the enterprise.

The third is the adjustment of typical industry indicators. In the context of addressing climate change and achieving carbon neutrality goals, carbon has become one of the important factors affecting corporate credit. To truly, accurately, and completely reflect the carbon credit status of enterprises, it is also necessary to consider the impact of the cross combination of non carbon and carbon factors on the carbon credit of enterprises[6]. Based on this, this article proposes to select key energy impact factors, construct an enterprise comprehensive strength indicator system that affects carbon credit evaluation, and score the comprehensive strength of the evaluated enterprises. Based on this scoring result, the initial carbon credit rating result of the enterprise is verified to determine the benchmark carbon credit score of the enterprise.

The fourth is benchmark adjustment. After determining the benchmark, consider other factors such as comparable evaluation to adjust the benchmark and form the enterprise's carbon credit evaluation level. This step may raise or lower the benchmark, or have no impact. The final carbon credit rating of the enterprise will be divided into three levels and nine levels, represented by symbols such as AAA, AA, A, BBB, BB, B, CCC, CC, and C.

3.3 Selection of Key Carbon Credit Indicators Based on Energy Data

Based on the energy perspective and combined with the characteristics of the evaluation object, this article deeply analyzes the impact of addressing climate change and achieving carbon neutrality goals on enterprises. This article proposes carbon indicators with clearer energy characteristics and clear scope to measure. Under specific indicators.

Carbon emission data. Based on the national 24 industry accounting guidelines and other related data, complete the accounting of enterprise carbon emissions data for various energy sources such as electricity, water, gas, heat, coal, and new energy (photovoltaic, energy storage).

Carbon efficiency level. Based on the energy consumption data of enterprises such as electricity, coal, gas, and oil, calculate the carbon emissions data of the enterprise, and comprehensively display the carbon efficiency picture of the enterprise through the ratio of the carbon emissions per unit output value of the enterprise to the average carbon emissions per unit output value of the industry, and generate carbon efficiency labels to determine the carbon efficiency level of the enterprise.

Product carbon footprint data. Realize carbon footprint tracking throughout the entire product lifecycle, analyze product carbon footprint, and generate a product carbon footprint evaluation report. Collaborate with authoritative third-party evaluation institutions in China to complete product carbon footprint accounting[7].

The effectiveness level of carbon reduction decision-making. Based on the monitoring data of carbon emissions from various key energy consuming equipment or processes, conduct multidimensional analysis to determine the energy-saving and emission reduction effectiveness of the enterprise, and compare the industry emission reduction effectiveness in the bank database to determine the emission reduction level of the enterprise.

Number of times carbon emissions exceed the standard. When the carbon emissions of a certain production line, a certain period of time, or a certain data deviates too much from the curve fitted based on historical emission data, the number of times the carbon emissions exceed the standard shall be processed.

Performance costs. Collect historical carbon emission data, real-time monitoring data of carbon prices, product market conditions, etc. of enterprises, use industrial big data analysis technology to calculate production efficiency, performance costs, etc., generate different cost performance plans, and provide credit decision-making tools.

4 Application of carbon credit evaluation system

The design of a typical industry carbon credit evaluation system can support the construction of the carbon finance functional section of the energy management platform, connect the carbon reduction system and green development system of governments at all levels, connect the ESG rating system, and improve the carbon management ability of enterprises, achieving an organic combination of green and finance, and guiding the green and low-carbon development of the industry. The project results can provide support for carbon management needs for the following entities:

Docking the carbon reduction system and green development system of governments at all levels provides an important starting point for the government's carbon reduction and green development work. The carbon credit evaluation results can provide important indicators for government certification of energy-saving and carbon reduction enterprises, green enterprises, and low-carbon demonstration parks, and add sub items for enterprises bidding for government procurement.

Connect with the ESG rating system and enrich and improve ESG ratings. The current ESG rating lacks evaluation content for carbon factors that affect the credit status of enterprises. The carbon credit evaluation results can be used as an important rating indicator in ESG and improve the ESG rating system. An excellent carbon credit rating can help improve an enterprise's ESG rating.

Connect with energy management platforms, green credit, green bonds, trusts, insurance and other green financial businesses[8]. The carbon credit evaluation results can serve as a basis for banks to issue green credit, financial institutions to issue green bonds, and apply for central bank carbon emission reduction support tools, guiding resources to flow to enterprises with high emission reduction potential.

Guide enterprises to carry out carbon management work and improve their carbon management level. Carbon credit evaluation plays a guiding role in enterprises' carbon management work. Enterprises can actively establish a green and low-carbon certification system, develop or use emission reduction and carbon reduction technologies, establish emission reduction and carbon reduction systems, and actively carry out carbon asset management and other carbon management work to improve their carbon credit level. In this process, enterprises can achieve an improvement in carbon management level, and the carbon credit level can achieve carbon governance and carbon reduction with trust.

5 Conclusions

Carbon finance is an important means to achieve the dual carbon goals. The stable development of the national carbon market, the comprehensive promotion of climate investment and financing pilot projects, the continuous increase of green credit and green direct financing projects, and the continuous introduction of green bond rating standards have effectively promoted the rapid development of the carbon finance market.

Currently, based on the experience of foreign credit system construction, the domestic credit evaluation system has launched a carbon credit evaluation system that is suitable for China's

actual situation and has been deeply promoted. However, the current carbon credit system cannot solve the fundamental problem of resource mismatch. The current development of carbon finance is mostly reflected in "finance+green", rather than green guided finance. There are practical mismatches in the allocation of resources such as funds and energy. For example, the energy-saving and low-carbon work of high-quality enterprises is advancing rapidly, with a sense of social responsibility. However, due to the excessive number of enterprises, they have not received attention and support from banks, but some rough enterprises have received loans and developed. The current carbon credit system is often evaluated from a financial perspective, failing to distinguish the nature of enterprises in various industries from an energy perspective, and cannot achieve effective integration of green and finance.

Therefore, this article is based on enterprise energy data and constructs an energy data-driven carbon credit evaluation index system for enterprises, which more accurately reflects the true credit status of enterprises. Carbon financial products are used to leverage the development of enterprises, enabling market or government funds to effectively guide the industry and promote the realization of carbon management needs of diverse social entities.

The design of a typical industry carbon credit evaluation system can support the construction of the carbon finance functional section of the energy management platform, connect the carbon reduction system and green development system of governments at all levels, connect the ESG rating system, and improve the carbon management ability of enterprises, achieving an organic combination of green and finance, and guiding the green and low-carbon development of the industry.

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