The Impact on Chinese Energy Enterprises in the Context of Carbon Neutrality: Based on the ESG and Carbon Disclosure Index

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Abstract—This article collected 2020 data from wind and Cninfo, used them as samples, and used a multiple regression model to explore the impact of carbon neutrality on Chinese energy companies. The final result found that carbon information disclosure is positively correlated with corporate value, ESG, and corporate, concluding that value is negatively correlated. At the same time, this article also finds a strong correlation between better financial performance and better climate change disclosure and performance. However, the data used in this article is during the COVID-19 period, so the conclusion may be different from other periods. It is recommended that future studies select data that is not during the COVID-19 period for research to avoid the impact of COVID-19 on the problems we are studying.

Keywords- carbon neutrality; corporate value; ESG; carbon disclosure;

1 INTRODUCTION

1.1 Research Background and Motivation

Carbon neutrality refers to the total amount of greenhouse gas emissions directly or indirectly produced by enterprises within a certain period. Enterprises can offset their carbon dioxide emissions to achieve "zero emissions" of carbon dioxide through afforestation, energy conservation, and emission reduction. Climate change is the most critical issue facing humanity [1]. In December 2015, nearly 200 parties to the United Nations Framework Convention on Climate Change (UNFCCC) reached the Paris Agreement at the Paris Climate Change Conference. The Agreement sets out arrangements for post-2020 global action on climate change to achieve net-zero greenhouse gas emissions, or carbon neutrality, by the second half of this century. To

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combat climate warming and reduce carbon emissions, the Chinese government proposed at the 75th Session of the United Nations General Assembly in 2020. "China will increase its nationally determined contributions, adopt more forceful policies and measures, and strive to peak its CARBON dioxide emissions by 2030 and achieve carbon neutrality by 2060[2]." In March 2021, the 2021 Government work report of The State Council pointed out that the work of carbon peaking and carbon neutrality should be done well. The action plan of carbon emission peaking before 2030 should be formulated. The industrial structure and energy structure should be optimized. However, in 2019, China consumed a total of 4.86 billion tons of coal equivalent, most of which came from coal (57 percent), followed by oil and natural gas at 19 percent and 8 percent, respectively. It shows that China is still in the stage of accelerated industrialization, with a large proportion of manufacturing industry and a large amount of fossil energy consumption, making the transition of energy consumption difficult. Traditional energy lags far behind enterprise development strategy and is not on the right, "orbit with energy trend." Most traditional Chinese energy companies only pursue good financial data, ignoring the development goal of "low-carbon green." More partial enterprises cause resource waste, excessive carbon does not implement the corresponding economic benefits simultaneously.

In the context of promoting energy conservation and emission reduction globally and proposing a clear development path in China, Compared with European and American countries, China's low-carbon green awareness is still relatively weak. As the world's largest emitter, China's emissions increased by 3.1% in 2019 [3]. There is a dire need to implement green practices and eco-friendly policies on a national scale [4]. Among 407 companies that have signed the UN "1.5°C Business Goal Commitment", only 8 Chinese companies, such as JD Logistics, 37 Mutual Entertainment, and Hon Hai Precision, account for less than 2%, ranking 16th in the world together with Chile. At present, only Three technology companies -- Qinhuai Data, Tencent, and Ant -- have made it clear that they are carbon neutral. In the context of China's medium-high economic growth, the commitment to "carbon neutrality" is bound to put higher requirements on the development strategies of Chinese energy enterprises at different stages of development and accelerate China's energy transformation and the wide application of green production technologies. To achieve the goal of "carbon neutrality" and "carbon peak" and guarantee the enterprise benefit, different types of energy enterprises should adopt different development strategies at different stages to achieve a win-win situation of "environment" and "benefit". Chinese energy companies how to safeguard their own steady and rapid development, achieve good results data and economic efficiency at the same time, adopt the strategy of the development of environment friendly and reduce carbon emissions is the leading research direction of the current stage. Different types and stages of energy companies can take cash assets management strategy as the core and control the corresponding enterprise development model and strategy. We will promote the rapid growth of corporate earnings and meet national and international energy conservation and emission reduction targets. Therefore, it is of great practical significance and far-reaching international impact to explore the analysis of cash asset management strategies in different enterprises under carbon neutrality stages.

1.2 Literature Review

As for the cash asset management of enterprises in different stages, many pieces of literature have proved that reasonable allocation of cash can help enterprises develop. Some enterprises only pay attention to short-term corporate profits without considering long-term sustainable

economic development [5]. In terms of China's overall financial environment, as monetary policy is pushed to its limits, what is missing is a way to increase long-term investment and infrastructure financing, particularly for energy projects in the green sector [6]. Companies are not interested in green energy projects because of the low returns and associated risks [7]. A fertile area of empirical research addresses the determination of corporate cash holdings and finds that firms specify cash targets partially for circumventing the brunt of future financing constraints [8]. The relationship between cash holding and financing is studied. Cash (liquidity) management is at the heart of a firm's financial management. It is a silver lining between bankruptcy and the success story of a company [9]. It is pointed out that cash flow management plays a decisive role in whether the company can continue to operate. Cash management necessitates speeding cash inflows while slowing down cash outflows, but it may not be considered in isolation [10]. We will also conduct more in-depth research on how to carry out proper cash management in this paper.

1.3 Research Contents and Framework

Based on this, under the background of the development of carbon-neutral China energy development strategy of enterprise financial data and theoretical and empirical analysis, at the same time, choose different stages of enterprise development can be life cycle theory (or a five-year plan key enterprises) of financial data (mainly the cash flow statement, income statement) and the phase development strategy, to contrast with each other and use the method of linear regression analysis, To explore the development of the relationship between each variable, the analogy, in comparison with the traditional energy enterprises in China's current development strategy in different stages of the targeted business strategy optimization Suggestions are arranged as following the framework of this article, the first part is the introduction, the second part is the theory and empirical analysis, the third part is based on the results of theoretical and empirical analysis and discussion, The fourth part is conclusion.

2 METHODOLOGY

To explore our research questions, according to Wang Zhongbing, Jin Xiaochao (2013), the carbon information disclosure index (CDI) is taken as the explanatory variable to study the impact of carbon information disclosure index on enterprise value and the carbon information disclosure index is taken as the index system of carbon information disclosure quality [11]. This paper also draws on Zhang Qiaoliang, Song Wenbo, Tan Jing (2013) to study the impact of carbon emissions on enterprise value. The price of carbon emissions in the capital market will directly affect the capital cost of enterprises and indirectly affect the cash flow of enterprises [12]. To facilitate calculation, this paper uses the ESG investment index to measure the carbon emissions of enterprises. Based on this, this paper puts forward the following hypothesis: the carbon information disclosure quality of China's listed energy enterprises is positively correlated with enterprise value. In contrast, carbon emission is negatively correlated with enterprise value.

2.1 Sample selection and data sources

At present, there is no index directly corresponding to the concept of carbon neutrality and carbon emissions in the market. Listed energy companies involved in environmental protection business will disclose more information. The index's component stocks include listed companies in environmental protection business such as sewage treatment, solid waste treatment, air treatment, and energy conservation and regeneration. Relatively speaking, this index is the one closest to the concept of carbon neutrality. We selected the component stocks of THE CSI Environmental Governance Index released in 2021 to study the correlation between their carbon emissions, carbon information disclosure, and enterprise value in 2020. Of the 50 selected enterprises, 45 published carbon information to varying degrees, 7 non-energy enterprises were excluded, and 8 companies lacking ESG data were excluded too. In this way, a total of 30 samples from 30 enterprises were taken as research objects. The carbon information disclosure index data are sorted and calculated manually according to the annual report, and other data come from the WIND database, Cninfo, and ESG Rating Center.

2.2 Construction of Carbon Disclosure Index and ESG index

2.2.1 Carbon Disclosure Index

Based on the existing research, Carbon Disclosure projects (CDP), and the Carbon Disclosure status of listed companies in China, the Carbon Disclosure Index is shown in Table 1.

Table 1 Carbon Disclosure Index

Index	Contents
carbon emission reduction target	Emissions and treatment methods, emission reduction plans, and emission reduction strategies
carbon emission reduction management	Environmental protection, energy conservation, and emission reduction management system
carbon emission reduction calculation	Saving tons of energy
capital investment	Project investment, energy conservation, and emission reduction subsidies

If one of the above information is included in the current annual report of an enterprise, it will get 1, and if all four are included, it will get 4 points. Then it will score on a scale of 1 to 4 according to the content, quantity, and quality of disclosure. The average of the two scores is the final index of corporate carbon information disclosure.

2.2.2 ESG index

ESG rating is a rating method that takes environment, society, and corporate governance as the main factors to evaluate the investment. Its advantage is that it can contribute to the success of the investment and play a positive role in social progress. Generally speaking, the more comprehensive carbon emissions an enterprise emits, the lower its ESG rating. In this paper, CUFE and SynTao green finance indexes are selected as ESG indexes. The company's rating is divid-

ed into nine grades: A+, A, A-, B+, B, B-, C+, C, and C-. corresponding to nine points to one point respectively.

2.3 Variables

2.3.1 Dependent and Independent variables.

To study the impacts of CDP and carbon emissions on enterprise value, in this paper, we take the dependent variable Tobin 'q value, which is used to measure whether an asset's market value is overvalued or undervalued, as the alternative variable of enterprise value, this data comes from the company's annual report in the year when it was listed. Independent variables are the carbon information disclosure index (CDI) and carbon emissions. The data of carbon emissions comes from the company's annual report in 2020.

2.3.2 Control variables.

The data of Control variables comes from the Wind database. Control variables and their definition are shown in Table 2.

Table 2 Control Variables

Variable	Variable definitions
Size	Company size; The natural logarithm of total assets at the end of the year
ROE	The level of return on shareholders' equity measures how efficiently a company uses its own capital. The higher the index value, the higher the return brought by the investment.
GROW	The growth of the enterprise; The growth rate of operating income
Cash	Before the maturity of short-term debts, the enterprise's current assets can be turned into cash for repayment of liabilities. The ratio of current assets to current liabilities
State	The nature of the firm, 1 for state-owned enterprises, otherwise 0

2.4 Descriptive Statistics

The descriptive statistical results are shown in Table 3.

Table 3 Descriptive statistics

Variable	*N*	*Mean*	*Min*	*Max*	*Std.*
Tobin's Q	30	2.08	0.64	6.2	1.365
CDI	30	2.6	1.8	3.8	0.527
ESG	30	5.67	3	9	2.15
Size	30	14.78	13.75	16.77	0.757
ROE	30	0.032	-0.027	0.1724	0.0437
Grow	30	0.188	-0.215	1.55	0.353
Cash	30	1.067	0.34	2.78	0.51
State	30	0.6	0	1	0.49

According to the descriptive statistical results in Table 3, these results present some information. The average value of Tobin's Q is about 2, which seems to explain this problem, and this means that the market value of most firms is greater than the replacement cost. The average CDI index is 2.6, indicating that the carbon information disclosed by listed companies is sufficient. The average number of ROE is only 0.032, which shows that these listing companies are hard to get enough return by investment. Moreover, some companies' investments brought negative growth to their earnings. The growth of the enterprise is relatively good. Although the minimum ratio of Grow is a negative number of -0.215, the average of Grow is 0.188. Business revenues are growing at a rate of 18.8 percent. There are 18 state-owned enterprises and 12 non-state-owned enterprises listed in annual reports in 2020. The number of state-owned companies listed is about twice non-state-owned companies. This shows that state-owned enterprises are more likely to attain more project investment to improve CDI or ESG than other non-owned enterprises.

3 EMPIRICAL RESULTS AND DISCUSSION

3.1Multivariate Model

The model has been created:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 Size + \beta_4 ROE + \beta_5 Grow + \beta_6 Cash + \beta_7 State + \varepsilon \quad (1)$$

Y: Enterprise value. Enterprise value is measured by the Tobin q value, which is difficult to calculate through financial data, the price-to-market rate is taken as a dependent variable

X_1: Carbon information disclosure index

X_2: ESG index

3.2Model parameter estimation and test results

To better study the problem we raised, we performed model parameter estimation, shown in the following Table 4.

Table 4. Parameter estimation

Variable	*coefficient*	*standard error*	*T statistic*	P-Value
β_0	4.424	5.548	10.575	0.000
CDI	1.25	0.395	3.167	0.005
ESG	-0.185	0.092	-2.018	0.05
Size	-0.335	0.324	-2.3	0.05
ROE	11.19	4.995	2.24	0.05
Grow	0.057	0.006	1.034	0.375
Cash	-0.078	0.429	-0.181	0.858
State	0.035	0.412	0.086	0.932
R^2: 0.638	F value: 6.649		N :30	

The adjusted R^2 value of the model is 0.638, indicating that the independent variable explains 63.8% of the variance of Tobin 'q, which is acceptable to the model. In addition, the tolerance of all variables is greater than 0.1, and VIF is less than 10, indicating that there is no multicollinearity problem among variables.

The empirical results show that there is a significant positive correlation between the carbon information disclosure index (CDI) and Tobin 'q, while there is no significant negative correlation between ESG and enterprise value. The estimated regression coefficients of revenue growth, cash, and state were not significant, while return on equity (ROE) and Tobin 'q is significantly positive at the confidence level of 5%, indicating that enterprise value increases significantly with the growth of return on equity. The ownership nature is significantly negative, with Tobin 'q at the confidence level of 5%.

3.3Correlation analysis

There is a correlation analysis of explanatory variables separately, and the results are shown in Table 5.

Table 5. Correlation analysis

	CDI	ESG	SIZE	ROE	GROW	CASH	STATE
CDI	1.0000	0.0294	-0.2952	0.2921	0.1965	0.2474	-0.2842
ESG	0.0294	1.0000	-0.3525	-0.0701	0.1264	-0.0707	0.1266
SIZE	-0.2952	-0.3525	1.0000	0.2767	-0.2169	-0.4538	0.2506
ROE	0.2921	-0.0701	0.2767	1.0000	0.3278	-0.1692	0.0616
GROW	0.1965	0.1264	-0.2169	0.3278	1.0000	0.0250	-0.0571
CASH	0.2474	-0.0707	-0.4538	-0.1692	0.0250	1.0000	-0.4410
STATE	-0.2843	0.1266	0.2506	0.0616	-0.0571	-0.4410	1.0000

From the results in Table 5, it can be seen that CDI and enterprises size are negatively correlated. At the same time, there is a significant positive correlation between CDI and ROE, and it is significant at a significance level of 1%. Cash and enterprises growth can also increase the index of carbon disclosure, and both are significant at the 5% significance level. In addition, there is a significant negative correlation between ESG and enterprise size.

3.4 Discussion

Based on the influencing factors of the enterprise value, combined with the empirical results, in theory, enterprises can get more opportunities to reduce risks and meet external demands by implementing carbon emission reduction, thus increasing enterprise value. However, the model results show that there is no significant correlation between carbon information disclosure and the corporate value of listed companies in China. The main reason for such a result may be that Tobin 'q, as a substitute variable of enterprise value, has relatively strict market efficiency requirements, which may lead to results deviation when it is used in China. In general, enterprises should start to design carbon reduction, carbon accounting, and carbon productivity perspective of the strategic performance evaluation system, to expand enterprises in dealing with climate

change carbon management, carbon information disclosure enterprise value promotion, carbon information disclosure value investment field of strategic positioning, build carbon emission intensity enterprise micro governance mechanism and innovation of low carbon business. In contrast to existing studies, the disclosure index is also used to study the influencing factors of enterprise value. Unlike the research, this paper limits the research to Chinese energy companies, and the results show that the disclosure index is positively associated with market value. Finally, the relationship between enterprise value and the ESG investment index is taken into consideration.

4 CONCLUSION

This paper studies the influencing factors of enterprise value in the context of carbon neutrality, mainly studying the relationship between carbon information disclosure, carbon emissions, and enterprise value. The carbon information disclosure index, as the carbon information disclosure index, measures the enterprise's carbon emission target, emission reduction management, emission reduction accounting, and capital investment degree. The ESG index is used as the carbon emission index to establish a multiple regression model. The model included company size, total assets, ROE, enterprise growth, enterprise nature, and current assets as control variables. Through descriptive analysis, multiple linear regression analysis, correlation analysis, and confidence test, the conclusion that carbon information disclosure is positively correlated with enterprise value and ESG is negatively correlated with enterprise value is finally obtained. Corporate carbon emissions also influence control variables, and there is a strong correlation between better financial performance and better climate change disclosure and performance.

Realizing carbon neutrality is an inevitable requirement for China to implement the new development concept and promote high-quality development. Chinese energy enterprises need to formulate strategies according to different environmental factors to improve their corporate value based on the traditional development strategy. This work can help listed energy enterprises understand the relationship between enterprise value, carbon information disclosure, and carbon emissions, start to design the carbon accounting system in the context of carbon neutrality, build a new enterprise micro-governance mechanism and innovate a low-carbon business model. However, since China was in COVID-19 and the data in this article comes from the company's annual report in 2020, the conclusion may be different from the normal period.

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