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Research on the Relationship between Corporate Carbon Disclosure Quality and Corporate Value in the New Economic Context-Anhui Province

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Abstract

General Secretary Xi Jinping pointed out in the report of the 20th Party Congress that: in the context of the new economy, the first task is to be based on reality, and adhere to the "first to establish and then to break", and the corporate carbon disclosure can guide the flow of funds in the capital market and pooling, easier to obtain investor preferences, reduce the cost of corporate finance, ease the corporate capital constraints, and enhance the value of enterprises. enterprise value, and promote the development of China's low-carbon economy. From the perspective of carbon disclosure, taking Anhui Province as the research case, we constructed a carbon disclosure evaluation system for carbon disclosure of listed companies, examined the intrinsic relationship between carbon disclosure and enterprise value of heavy polluting industries and non-heavy polluting industries, and used multiple linear regression model and robustness test to fit the level of coordinated development of the two, and the results of the research found that there is a negative correlation between carbon disclosure and enterprise value of heavy polluting industries, while there is a negative correlation between carbon disclosure and enterprise value of heavy polluting industries and enterprise value of heavy polluting industries. enterprise value are negatively correlated with each other, while non-heavily polluted industries are positively correlated. The study aims to reveal the relationship between carbon disclosure quality and enterprise value in the context of the new economy, to guide enterprises to disclose carbon information regularly and independently and to improve the authenticity of carbon disclosure, to comply with the development trend of the new economy, and to increase enterprise value.

Keywords

Carbon Disclosure; Firm Value; Multiple Linear Regression; Robustness Test.

1. Introduction

General Secretary Xi Jinping put forward the strategic goal of "actively and steadily promoting carbon peaking and carbon neutrality" in the report of the Twentieth National Congress. In the new economic context of internal and external economic cycles and low-carbon development, carbon disclosure is becoming a global trend. Carbon information disclosure is to visualise and make transparent the emission of carbon dioxide and other greenhouse gases, emission reduction measures and implementation of enterprises, which will also consume the resources of enterprises and make the earnings lagging behind, but it will have a positive driving effect on the value of enterprises in terms of investor decision-making and the efficiency of resource

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allocation in the market [1][2] , which can alleviate the negative impact of carbon emissions on the value of enterprises.

Internationally, Western countries have enacted mandatory carbon disclosure laws and voluntary carbon disclosure, and the Carbon Disclosure Project, an international co-operation project, has become the main form of carbon trading information disclosure and reporting, providing relatively complete carbon information system for the benefit of enterprises. Carbon information system for the benefit of enterprises. However, domestic enterprises have a relatively shallow awareness of the importance of carbon information disclosure, and the structure is scattered under the regulatory environment without mandatory requirements of relevant laws, regulations and systems, and enterprises have little initiative and willingness to disclose, and lack of motivation to disclose; in particular, most of the enterprises lack perfect carbon emission management system, and only express "formalism" when choosing to disclose information, and the content of information disclosure is mostly "formalism", and the information disclosure content is mostly "formalism". In particular, most enterprises lack a perfect carbon emission management system, and when they choose to disclose information, they only express "formalism", most of the information disclosure contents are general qualitative descriptions, and the quantitative indexes such as carbon information audit and forensics are seriously missing, and there are also false underreporting, and they have not made the behaviours and measures that are actually conducive to the goal of "double carbon"[3] . At the same time, the situation is also influenced by a combination of other unavoidable factors[4] :

(1)In the field of carbon information disclosure, a variety of disclosure standards coexist and there is a lack of recognised quantitative standards. Different organisations and enterprises define diverse disclosure contents, such as the impact of greenhouse gases, resulting in a lack of comparability of carbon information.

(2)Carbon information disclosure lacks relevance. The impact of carbon information on different enterprises varies according to the risks of climate change, etc.; the auditing and authentication of the carbon information trading process is simple and not rigorous, and its credibility is doubtful; carbon disclosure does not effectively enhance the ability of enterprises to manage carbon; the demand and supply sides of carbon information do not form a favourable interactive relationship, and the communication is poor.

As the disclosure standards for carbon information, environmental information and sustainable development information have been introduced by domestic and foreign regulatory authorities and various organisations, their connotations have been precisely unified. Under the government's strengthening of carbon information disclosure standards and system construction, and strengthening of the audit and forensic function of carbon information disclosure, domestic enterprises, in order to avoid redundancy and clutter of information and to achieve the goal of increasing the validity and comparability of information, based on China's national conditions, have absorbed and learnt from the experience of the frameworks of typical representatives of foreign countries to build the framework of carbon information disclosure and evaluation system, and at the same time, improve the quality of data and the initiative to achieve the standardisation and systematisation of carbon information disclosure. The standardisation and institutionalisation of carbon information disclosure.

The rest of the paper is arranged as follows: in the section of research methodology and data sources, the scoring system of carbon disclosure is sorted out, the scoring results of 173 listed companies in Anhui Province are calculated, the research hypotheses are put forward and the regression model is constructed; in the section of empirical analysis of carbon disclosure and enterprise value, the descriptive statistics, correlation and regression analyses are conducted on the variables of the research; the results of the empirical analyses are presented and explained with statistical significance and economic significance; finally, the section of conclusion and discussion summarizes the whole paper and explains the significance of this

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paper. The results of the empirical analysis are presented and explained in terms of statistical significance and economic significance; finally, the Conclusion and Discussion section summarizes the whole paper and explains the significance of this paper.

2. Research Methodology and Data Sources

2.1. Research Methodology

Firstly, the entropy weight method is used to construct a comprehensive evaluation system of carbon information disclosure in Anhui Province, and the carbon information related indexes disclosed by 173 sample enterprises in Anhui Province are classified and scored, and secondly, according to the actual situation of the sample enterprises, the TOBIN'Q value is used to measure the enterprise value, and the impact of the two of them is analyzed in a quantitative manner.

Subsequently, 173 enterprises were classified into heavy pollution industries and non-heavy pollution industries, and the mean square, F-value, and significance level of carbon disclosure and enterprise value were calculated for each type of enterprise, so as to comprehensively analyse the coordinated relationship between the quality of carbon disclosure and enterprise value, as well as the factors influencing it.

Finally, the models are again tested for robustness by replacing the classified similar firm variables.

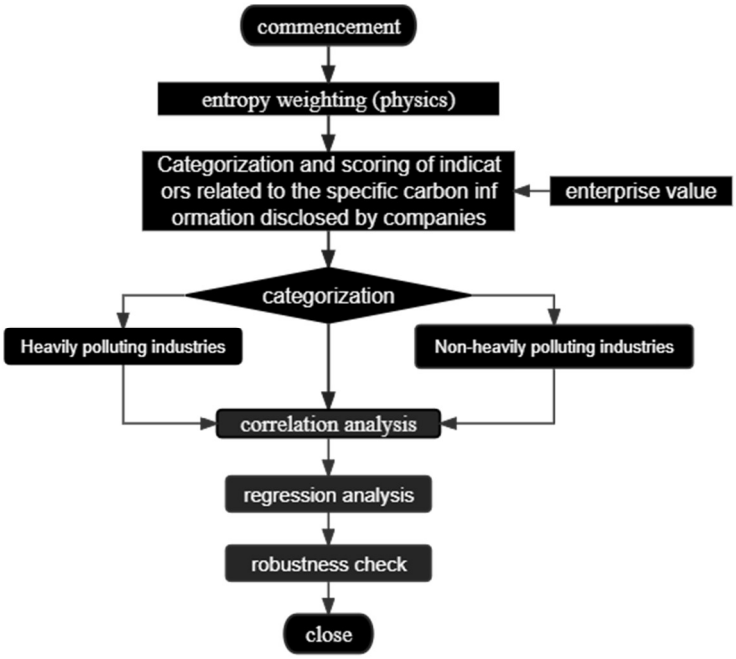

Figure 1. Flow chart of Research Research methodology2.2 Data sources and variable descriptions

Listed companies represent the level of economic development of a region[5] , as of September 2023, there are 173 listed companies in Anhui. According to the national standard of the People's Republic of China Ministry of Civil Affairs of the People's Republic of China Classification of Industries of the National Economy, released in 2017, the enterprises in Anhui Province are subdivided.

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Table 1. Sample Industry Distribution

Industry Type	sample size	Proportion of total sample (%)
Heavily polluting industries		
Pharmaceutical manufacturing	10	5.78
Textile, clothing and apparel industry	5	2.89
Ferrous metal smelting and rolling	1	0.58
Coal mining and washing	4	2.31
Manufacture of chemical materials and products	18	10.40
Alcohol, beverages and refined tea manufacturing	4	2.31
Non-ferrous metal smelting and rolling	9	5.20
Electricity, heat production and supply	1	0.58
Gas production and supply industry	1	0.58
Building decoration, renovation and other construction	8	4.62
Non-heavily polluting industries		
Loading, unloading, handling and storage	2	1.16
Monetary and financial services	5	2.89
Furniture manufacturing	1	0.58
food processing industry	2	1.16
News and publishing	1	0.58
Radio, television, film and sound production industries	2	1.16
Other financial services	3	1.73
Public facilities management industry	13	7.51
Repair of household products	2	1.16
Agriculture, forestry, animal husbandry and fisheries	4	2.31
Wholesale and retail trade	2	1.16
Electrical machinery and equipment manufacturing	9	5.20
automobile manufacturing	13	7.51
Computer, communications and other electronic equipment manufacturing	28	16.18
Specialized equipment manufacturing	1	0.58
Road transport industry	1	0.58
real estate industry	1	0.58
Civil engineering construction	2	1.16
Manufacture of railway, ship, aerospace and other transport equipment	20	11.56

The level of carbon disclosure is expressed by CDI[6] , and the higher the score, the higher the level of carbon disclosure the enterprise. This paper draws on the evaluation framework of the global influential CDI project[7] and combines the characteristics of carbon information disclosure of listed companies in our province, starting from the three features of completeness, reliability and readability, of which completeness is subdivided into the four aspects of planning, management, accounting and reporting.

The scoring system has three primary indicators and 18 secondary indicators to evaluate the level of carbon information disclosure. For indicators that are both qualitative and quantifiable,

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they are scored as 0, 1 and 2 according to the criteria of "no disclosure, qualitative disclosure and quantitative disclosure"; for other indicators that are difficult to quantify, they are scored as 0, 1 and 2 according to the criteria of "no disclosure, simple disclosure and detailed disclosure"; for indicators with only two results, they are scored as 0, 1 and 2 according to the criteria of whether they exist or not. For other indicators that are difficult to quantify, each is scored as 0, 1, 2 according to the criteria of "no disclosure, simple disclosure, detailed disclosure"; for indicators with only two results, each is scored as 0, 1 according to the criterion of existence or non-existence, and the scores of each part are summed together to get the level of carbon disclosure of the enterprise, with the score ranging from 0 to 33.

With reference to this scoring system, the company websites and independent reports (e.g. monthly, quarterly, annual, environmental reports, etc.) of 173 listed companies in the province were reviewed and collected, and finally the results of the scoring of the carbon disclosure of the companies were summarized to arrive at the value of the CDI of the 173 companies[8].

Table 2. Carbon Disclosure Scoring System

Level 1 indicators	Secondary indicators		Assignment of values
completeness	plan	Energy saving and emission reduction targets, emission reduction plans	0 for no disclosure, 1 for stereotyped disclosure, 2 for quantified disclosure
		Development of an energy conservation and emission reduction management system	0 for no disclosure, 1 for stereotyped disclosure, 2 for quantified disclosure
		Low-carbon or energy-saving reductions are addressed in corporate strategies	0 for no disclosure, 1 for stereotyped disclosure, 2 for quantified disclosure
	managerial	Construction and operation of environmental protection facilities	0 for no disclosure, 1 for stereotyped disclosure, 2 for quantified disclosure
		Investment in environmentally relevant technologies	0 for no disclosure, 1 for stereotyped disclosure, 2 for quantified disclosure
		Payment of sewage charges and treatment fees	0 for no disclosure, 1 for stereotyped disclosure, 2 for quantified disclosure
		Incorporating carbon performance into pay appraisals	0 for no disclosure, 1 for stereotyped disclosure, 2 for quantified disclosure
		Environmental awareness and training	0 for no disclosure, 1 for stereotyped disclosure, 2 for quantified disclosure
	calculate	Accounting for carbon emissions	0 for no disclosure, 1 for stereotyped disclosure, 2 for quantified disclosure
		Assessing carbon performance	0 for no disclosure, 1 for stereotyped disclosure, 2 for quantified disclosure
	reporting	Timely disclosure of carbon information	0 for no disclosure, 1 for stereotyped disclosure, 2 for quantified disclosure
		Continuous disclosure of carbon information	0 for no disclosure, 1 for stereotyped disclosure, 2 for quantified disclosure
dependability	Carbon information collection process system is sound		0 for no disclosure, 1 for simple disclosure, 2 for detailed disclosure
	Passed ISO14001 environmental management system certification		No is 0, Yes is 1
	Availability of third-party forensic reports		No is 0, Yes is 1
	Honors related to the environment		No is 0, Yes is 1
readability	Graphic descriptions (use of text, data and graphs in carbon disclosure)		0 for no disclosure, 1 for simple disclosure, 2 for detailed disclosure
	Terminology (whether terminology is used in carbon disclosure and its interpretation)		0 for no disclosure, 1 for simple disclosure, 2 for detailed disclosure

The explanatory variable of this paper is enterprise value, which is measured by TOBIN'Q value[9] , which is calculated by the formula: (stock market value + net debt)/current value of tangible assets. The explanatory variable is carbon disclosure quality, which is obtained by

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constructing a carbon disclosure evaluation system for manual scoring. In addition, this paper selects industry characteristics IND, company size SIZE, profitability ROE, debt level LEV, enterprise nature STATE, development ability GROWTH, foreign listing LIST as control variables. Each factor of the control variables is selected to be represented by the corresponding indicators:

Table 3. Variable definition table

Variable type	variable name	variable symbol	Variable Definition
explanatory variable	enterprise value	TOBIN'Q	(Market value of equity + net debt)/current value of tangible assets
explanatory variable	Quality of carbon disclosure	CDI	Carbon Disclosure Quality Score
control variable	Industry Characteristics	IND	Whether it is heavily polluting (1 for heavily polluting industries, 0 otherwise)
	Company size	SIZE	Natural logarithm of total assets at the end of the year
	profitability	ROE	return on net assets
	debt level	LEV	gearing
	Nature of enterprise	STATE	Whether it is a state-owned enterprise (1 for state-owned enterprises, 0 otherwise)
	Development capacity	GROWTH	Total asset growth rate
	Overseas Listing	LIST	Whether listed abroad (yes 1, otherwise 0)

2.2. Research Hypothesis and Model Construction

When exploring the carbon disclosure of enterprises in heavy polluting industries and non-heavy polluting industries, scholars such as Chi Yuanying have mentioned in their research that although both heavy polluting industries and non-heavy polluting industries can alleviate the financing constraints of the enterprises by making carbon disclosure, but it is more significant in the non-heavy polluting industries, and at the same time, the alleviation of the financing constraints of the enterprises by the level of carbon disclosure is more significant in the non-heavy polluting industries[10] . Besides, Chen Hongmei and other scholars take listed companies in heavy pollution industry as samples and test the impact of carbon disclosure level on corporate financial performance, and conclude that carbon disclosure by enterprises can promote the improvement of corporate financial performance[11] . Zhang Qiaoliang and other scholars also pointed out that corporate carbon disclosure is positively related to corporate value, but the quality of carbon disclosure of high carbon emitting enterprises is negatively related to corporate value[12] . In view of this, this paper proposes research hypothesis 1 and research hypothesis 2.

H_1 : Negative correlation between carbon disclosure and firm value of firms in heavy polluting industries.

H_2 : Positive correlation between carbon disclosure and firm value of firms in non-polluting industries.

This paper constructs the following constructed multiple linear regression model to test the research hypotheses:

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$$TOBIN'Q_{\alpha} = \alpha_0 + \alpha_1 CDI + \sum_{i=2}^{7} \alpha_i controls + \varepsilon$$
$$= \alpha_0 + \alpha_1 CDI + \alpha_2 IND + \alpha_3 SIZE + \alpha_4 ROE + \alpha_5 LEV + \alpha_6 STATE + \alpha_7 GROWTH + \alpha_8 LIST + \varepsilon (1)$$
$$TOBIN'Q_{\beta} = \beta_0 + \beta_1 CDI + \sum_{i=2}^{7} \beta_i controls + \varepsilon$$
$$= \beta_0 + \beta_1 CDI + \beta_2 IND + \beta_3 SIZE + \beta_4 ROE + \beta_5 LEV + \beta_6 STATE + \beta_7 GROWTH + \beta_8 LIST + \varepsilon (2)$$

Model (1) and model (2) are used to test the effect of carbon disclosure on enterprise value for enterprises in heavy pollution industry and non-heavy pollution industry respectively, where α represents the coefficient of heavy pollution industry, β represents the coefficient of non-heavy pollution industry, and α_0 and β_0 represent the intercept terms of the regression equation, and if the regression coefficients of the dependent variables of model (1) and model (2), α_1 and β_1 , are significant, the relationship between TOBIN'Q and CDI can be continued to be investigated.

3. Empirical Analysis

3.1. Descriptive Statistical Analysis

Table 4 shows the descriptive statistics of the variables. The minimum value of the explanatory variable enterprise value of the sample companies is about 4.291, and the maximum value is about 1876.761, with a large difference between the maximum value and the minimum value, which indicates that there are large differences between the market value of the stock, the net debt and the current value of the tangible assets in different industries; the explanatory variable Carbon Disclosure Index (CDI) takes a range of 0 to 33, but the mean value of 173 companies is 9.08, which indicates that the current quality of corporate carbon disclosure needs to be improved, in addition, the minimum value is 0 and the maximum value is 28, and the difference between the maximum value and the minimum value is large, which indicates that the sample companies attach different importance to carbon disclosure; there are also some differences in the control variables, especially profitability and development ability, whose maximum values are 32.33% and 420.05%, respectively, while the minimum values are -154.10% The maximum value is 32.33%, 420.05%, while the minimum value is -154.10%, -22.749260%, indicating that some sample companies have negative operating profit growth rate and there is a big difference in profitability and development ability between different companies.

Table 4. Table of descriptive statistics

	sample size	minimum value	maximum values	average value	(statistics) standard deviation
TOBIN'Q	173	4.291116	1876.761436	91.680370	201.562346
CDI	173	0	28	9.08	6.388
IND	173	0	1	0.358381503	0.480917
SIZE	173	10.490406	17.009997	13.032111	1.298654
ROE	173	-154.100000	32.330000	4.070520	14.042508
LEV	173	2.870000	99.070000	41.509191	19.475204
STATE	173	0	1	0.36416185	0.482591
GROWTH	173	-22.749260	420.054772	14.765849	47.827925
LIST	173	0	1	0.213873	0.411228

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Table 5. Descriptive statistics of the sample by sector

Industry Type	sample size	minimum value	maximum values	average value	standard deviation
Heavily polluting industries					
Pharmaceutical manufacturing	10	2	13	6.40	3.748
Textile, clothing and apparel industry	5	5	19	11.40	5.857
Ferrous metal smelting and rolling	1	20	20	20.00	0
Coal mining and washing	4	15	24	18.00	4.082
Manufacture of chemical materials and products	18	2	24	11.72	6.711
Alcohol, beverages and refined tea manufacturing	4	12	17	14.50	2.082
Non-ferrous metal smelting and rolling	9	2	18	9.22	5.118
Electricity, heat production and supply	1	13	13	13.00	0
Gas production and supply industry	1	4	4	4.00	0
Building decoration, renovation and other construction	8	4	24	9.63	6.886
Non-heavily polluting industries					
Loading, unloading, handling and storage	2	3	9	6.00	4.243
Monetary and financial services	5	5	18	11.20	5.541
Furniture manufacturing	1	5	5	5.00	0
food processing industry	2	5	9	7.00	2.828
News and publishing	1	1	1	1.00	0
Radio, television, film and sound production industries	2	0	6	3	4.243
Other financial services	3	1	8	3.33	4.041
Public facilities management industry	13	1	21	9.62	6.740
Repair of household products	2	2	23	12.50	14.849
Agriculture, forestry, animal husbandry and fisheries	4	3	23	16.25	9.215
Wholesale and retail trade	2	2	12	7.00	7.071
Electrical machinery and equipment manufacturing	9	1	22	10.11	6.918
automobile manufacturing	13	2	19	7.62	5.300
Computer, communications and other electronic equipment manufacturing	28	1	19	6.93	6.055
Specialized equipment manufacturing	1	13	13	13.00	0
Road transport industry	1	5	5	5.00	0
real estate industry	1	3	3	3.00	0
Civil engineering construction	2	15	28	21.5	9.192
Manufacture of railway, ship, aerospace and other transport equipment	20	1	18	6.50	3.791

Table 5 shows the descriptive statistics of the sample of sub-industries, in which there are 61 enterprises in the heavy pollution industry and 112 enterprises in the non-heavy pollution industry, in comparison, the non-heavy pollution industry accounts for a larger proportion,

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close to twice as much as that of the heavy pollution industry, in which the heavy pollution industry of the chemical chemical raw materials and chemical products manufacturing industry, pharmaceutical manufacturing industry, non-ferrous metal smelting and rolling processing industry and the construction and decoration and other construction industries account for 73.77% of the total. Among the heavy polluting industries, chemical raw materials and chemical products manufacturing, pharmaceutical manufacturing, non-ferrous metal smelting and rolling processing industry and building decoration and other construction industry account for a larger proportion, accounting for 73.77 per cent of the total; among the non-heavily polluting industries, computer communication and other electronic equipment manufacturing, transport equipment manufacturing, public facilities management industry and automobile manufacturing industry account for a larger proportion, accounting for 66.07 per cent of the total.

3.2. Correlation Analysis

As shown in Table 6, the correlation coefficient between carbon disclosure and enterprise value of enterprises in heavy polluting industries is -0. 337 and significant at 5% level, indicating that there is a correlation between carbon disclosure quality and enterprise value in heavy polluting industries and it is negative, and Hypothesis 1 is valid; as shown in Table 7, the correlation coefficient between carbon disclosure and enterprise value of enterprises in non-heavy polluting industries is 0.391 and significant at 5% level. significant, indicating that there is a correlation between the quality of carbon disclosure and enterprise value in non-heavy pollution industry and it is positive, hypothesis 2 holds. The correlation coefficients are all less than 0.8 (common zeroth limit value), indicating that there is no multicollinearity problem between the variables[13].

Table 6. PEARSON correlation coefficients of main variables of heavy polluting industries

variant	TOBIN'Q	CDI	IND	SIZE	ROE	LEV	STATE	GROWTH	LIST
TOBIN'Q	1								
CDI	-.337**	1							
IND	-.362**	.164**	1						
SIZE	.757**	-.004	.072	1					
ROE	.103**	.202**	.057	.042	1				
LEV	.303**	-.231**	-.140**	.546**	-.237**	1			
STATE	.177**	-.004	-.012	.236**	.021	.091	1		
GROWTH	-.094	.391**	.166**	-.388**	.102**	-.346**	.024	1	
LIST	.360**	.087	-.070	.378**	.126**	.162**	.051	.000	1

Note: ** indicates significant at the 5 per cent level, respectively.

Besides, the correlation coefficient between industry characteristics and enterprise value of heavy pollution industry is -0.362, and the correlation coefficient between industry characteristics and enterprise value of non-heavy pollution industry is 0.443, which is consistent with whether it is heavy pollution or not as stipulated in this paper. However, the weak positive correlation between the enterprise characteristics of non-heavy pollution industry and carbon disclosure is inconsistent with the expectation, which may be due to the small sample size selected in this paper or the more general classification of non-heavy pollution industry, to be further tested. In addition, for both heavily polluted industries and non-heavily polluted industries, profitability is weakly positively correlated with industry characteristics and company size; debt level is significantly positively correlated with company size, and weakly negatively correlated with industry characteristics and profitability, indicating

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that the larger the company size, the higher the debt level, and the enterprises may use the funds for long-term investment to obtain higher returns; development ability is negatively correlated with company size and debt level, but the heavy pollution industry is more than the heavily polluted industry, and the development ability is negatively correlated with company size and debt level, but the heavy pollution industry is more than the heavily polluted industry. negatively correlated with both company size and debt level, but it is more significant in heavily polluted industries than in non-heavily polluted industries.

Table 7. PEARSON correlation coefficients of main variables for non-heavy polluting industries

variant	TOBIN'Q	CDI	IND	SIZE	ROE	LEV	STATE	GROWTH	LIST
TOBIN'Q	1								
CDI	.391**	1							
IND	.443**	.216**	1						
SIZE	.642**	-.196**	-.031	1					
ROE	.080	.037	.094	.166**	1				
LEV	.194**	-.158**	-.059	.568**	-.188**	1			
STATE	.224**	-.105**	-.021	.253**	-.043**	.105**	1		
GROWTH	-.039	.129**	.032	-.201**	.105**	-.190**	.047	1	
LIST	.212**	-.075	-.105**	.250**	.075	.134**	.014	.089;	1

Note: ** indicates significant at the 5 per cent level, respectively.

3.3. Test and Analysis of Regression Results of Variables

Table 8. PEARSON correlation coefficients of main variables of heavy polluting industries

source	Type III sum of squares	degrees of freedom	mean square	F	significance
revised model	1017023.240[a]	8	127127.905	12.483	.000
intercept (the point at which a line crosses the x- or y-axis)	544296.633	1	544296.633	53.446	.000
CDI	47770.433	1	47770.433	4.691	.046
Industry Characteristics IND (whether it is a heavy polluting industry)	41989.023	1	41989.023	4.123	.049
Firm size SIZE (natural logarithm of year-end total assets)	478075.494	1	478075.494	46.944	.000
Profitability ROE (Return on Equity)	225.829	1	225.829	.022	.882
Liability level LEV (gearing ratio)	4127.609	1	4127.609	.405	.527
Nature of enterprise STATE (whether it is a state-owned enterprise)	112.092	1	112.092	.011	.917
Development capacity GROWTH (total assets growth rate)	26458.903	1	26458.903	2.598	.113
Foreign listing LIST (whether or not listed abroad)	5904.689	1	5904.689	.580	.450
inaccuracies	529570.517	52	10184.048		
(grand) total	2695554.399	61			
Amended total	2146593.757	60			
a. R-square = .658 (adjusted R-square = .605)					

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In this paper, the regression results of the two models are analyzed and their results are shown in Tables 8 and 9. The R2 before and after adjustment of model (1) are 0. 658 and 0. 605, respectively, and the R2 before and after adjustment of model (2) are 0. 483 and 0. 442, respectively, which is a better fit. The regression results of model (1) show that the sig value of carbon disclosure index is 0. 046, which is significant at 5% level, indicating that the improvement of the quality of carbon disclosure in heavy pollution industry reduces the enterprise value, and supports the research hypothesis 1. The regression results of model (2) show that the sig value of carbon disclosure index is 0. 042, which is significant at 5% level, indicating that the improvement of the quality of carbon disclosure in non-pollution industry can improve the enterprise value, and supports the research hypothesis 1. As shown in the table, the enterprise value of heavy pollution industry is significant with industry characteristics and company size, indicating that its enterprise value is closely related to the two, and the larger the two, the higher the enterprise value; the enterprise value of non-heavy pollution industry companies is significant with company size and debt level, indicating that there may be a part of the listed companies with high financial risk.

Table 9. PEARSON correlation coefficients of key variables for non-heavy polluting sectors

source	Type III sum of squares	degrees of freedom	mean square	F	significance
revised model	2624002.449a	8	328000.306	12.006	.000
intercept (the point at which a line crosses the x- or y-axis)	1729177.248	1	1729177.248	63.294	.000
CDI	150318.829	1	150318.829	5.502	.042
Industry Characteristics IND (whether it is a heavy polluting industry)	99.361	1	99.361	.004	.952
Firm size SIZE (natural logarithm of year-end total assets)	1833698.864	1	1833698.864	67.119	.000
Profitability ROE (Return on Equity)	61178.082	1	61178.082	2.239	.138
Liability level LEV (gearing ratio)	277065.501	1	277065.501	10.142	.002
Nature of the enterprise STATE (whether it is a state-owned enterprise)	4956.748	1	4956.748	.181	.671
Development capacity GROWTH (total assets growth rate)	36343.195	1	36343.195	1.330	.251
Foreign listing LIST (whether or not listed abroad)	8917.454	1	8917.454	.326	.569
inaccuracies	2963955.928	103	27319.960		
(grand) total	6056742.011	112			
Amended total	5437958.377	111			
a. R-square = .483 (adjusted R-square = .442)					

3.4. Robustness Tests

In this paper, from the perspective of variable substitution method, the data of some unlisted heavy pollution industries and non-heavy pollution industries in Anhui Province are selected to be substituted into the model (1) and model (2) respectively, and it is found that the results are the same as the original results after substituting the firms other than these 173 firms, then the previous results are robust.

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4. Conclusion and Discussion

In recent years, the Chinese government has actively responded to the global climate change challenge by formulating and implementing a series of carbon peaking and carbon neutral policies to promote green and low carbon development[14] . This paper explores the relationship between carbon disclosure and enterprise value in Anhui Province from the perspectives of heavy polluting industries and non-heavy polluting industries, and the study shows that there is a significant relationship and negative correlation between carbon information and enterprise value in heavy polluting industries, and that there is a significant relationship and positive correlation between carbon disclosure and enterprise value in non-heavy polluting industries. The insights are as follows: (1) As the environmental problems brought by rapid economic development become more and more serious, more and more listed companies begin to pay attention to the carbon peak and carbon neutrality of enterprises. In this context, the number of enterprises actively disclosing carbon information is still relatively small, and the heavy pollution industry has an impact on the assessment of enterprise value due to more carbon emissions, so the current high-quality disclosure of carbon information for heavy pollution industry can bring strategic competitive advantage. (2) The results of carbon disclosure in non-polluting industries on the assessment of enterprise value are consistent with the actual results, but Anhui Province should strengthen the supervision and introduce specific policies to regulate carbon disclosure of enterprises, and ultimately realize the high-quality development of green and low-carbon.

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