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ASSESSING THE EFFECT OF CARBON CREDIT REVENUE DISCLOSURE ON FIRM'S PROFITABILITY

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ABSTRACT

This study explores the existing practices of firms listed on the National Stock Exchange (NSE) Nifty in India concerning responsible carbon accounting and reporting. To assess the importance and transparency of the revealed financial statements' current accounting practices, it aims to provide a basic comprehension of them. We looked at the financial data to learn more about the firms' carbon disclosure and reporting practices. Many of the companies that are listed on the NSE Nifty have shown that they are genuinely concerned about the environment and that they are willing to take voluntary steps to mitigate the negative effects of carbon emissions. The objective of the study was to know the significance of Carbon Disclosure and the impact of carbon credit revenue on firms' profitability. To achieve the desired objective 126 NSE listed companies were identified out of which 106 companies were taken for the purpose of study the data has been collected from companies' financial statements for the period of 2012-2018. On the other hand, our results provide light on the relationship between overall revenue and carbon credit income. The regression model demonstrates strong explanatory power (R-squared = 0.709) and a strong correlation (R = 0.842) between the variables. Moreover, the ANOVA test validates the model's considerable significance in explaining the variance in total revenue. This suggests that carbon credit income has a influence on the company's total revenue and financial performance.

KEYWORDS: *Carbon Disclosure, Carbon Credit Income, Carbon Accounting, Profitability, Financial Performance*

INTRODUCTION

The proliferation of global carbon markets has introduced a myriad of challenges for companies, and among these challenges, accounting disclosure remains one of the least comprehended. Presently, numerous developed nations have implemented various carbon-related requirements. This includes Carbon Emission Reduction (CER) (P. Kumar & Firoz, 2020) regulations, exemplified by initiatives like the cross-sector European Union Emissions Trading Scheme (EUETS) and the US Regional Greenhouse Gas Initiative (RGGI), which govern utilities. Furthermore, carbon reporting obligations, such as the Greenhouse Gases Reporting Rule (GGRR) enforced by the US Environmental Protection Agency (EPA), are prevalent (Saini, 2020). The diversities in accounting and reporting practices concerning climate change aspects, as elucidated by Lohmann (2009), not only render the comparison of accounting practices challenging but also present an intriguing opportunity for research into the formulation of accounting rules and practices. This is especially pertinent given the prevailing uncertainty surrounding the nature and scope of future regulations in this domain. The growing recognition of the financial implications associated with emission allowance accounting, coupled with the existing disparities in corporate reporting, serves as a compelling incentive to persuade a broader audience of scholars(Bhardwaj et al., 2021) and policymakers that the realm of financial accounting merits extensive and rigorous exploration. In essence, three fundamental categories of emissions demand our attention, alongside the intricacies of six distinct greenhouse gases delineated by the pivotal Kyoto Protocol. These gases encompass methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and carbon dioxide. The crux lies in converting emission quantities and densities into what is termed "carbon dioxide emission equivalents" to enable standardized comparisons(Kumazawa & Callaghan, 2012). In recent years, a substantial number of corporations, including industry giants there(Arora, 2021) are more than 126 NSE listed companies in India that have earned revenue from carbon credits. Even in regions with substantial carbon trading exposure like Europe(Tu, 2018), a consensus on emission allowance accounting remains elusive. In the United States, carbon traders are just beginning to navigate the intricate accounting challenges within this complex and unfamiliar market. As carbon markets continue to evolve and incorporate novel elements, fresh accounting complexities will invariably arise. Within this backdrop, it is vital to acknowledge the varying levels of understanding within the Indian industry regarding the imperative nature of carbon disclosure. Despite the Institute of Chartered Accountants of India (ICAI) issuing a 'Guidance Note on Carbon Accounting' as far back as 2009,(Zhang et al., 2022) the envisioned effects have not been realized . This research entails a comprehensive desk survey of the financial statements of select Indian firms, followed by a survey of educators and students to gauge their familiarity and preparedness in this domain. The absence of clear-cut rules from ICAI regarding the accounting for emission allowances has led to a multitude of divergent accounting models within this uncertain landscape. From a commercial perspective, the value of emission allowances traded in the EU Emissions Trading System (ETS) is substantial, signifying that carbon

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accounting provides crucial insights into the impacts of climate change policies, particularly those concerning carbon reduction, on corporations participating in this market (Kamat & kamat, 2013). Furthermore, in the absence of international accounting guidance, there exists a lack of uniform financial accounting treatment for emission allowances, necessitating comprehensive research to address practical and conceptual aspects regarding financial accounting practices in India.

REVIEW OF LITERATURE

This review examines how accounting standards and carbon disclosure have changed over time, drawing on a broad range of research projects undertaken between 2015 and 2022. Borghei, 2021 research highlights the need for more worldwide integration between climate-related risk disclosure and carbon disclosure, offering a path forward for further study in this area. After reviewing the literature, He et al. (2021) found many streams that indicate the development of carbon accounting as a separate subject. These streams include disclosure, management, performance, and assurance. Global harmonization is necessary to maintain uniformity, as demonstrated by Johnson & Smith's (2019) comparative examination of carbon credit accounting practices across national boundaries. This opinion is echoed by Brown & Martinez (2018), who point out differences in reporting requirements and accounting systems and emphasize the need for harmonization. While Brown & Martinez (2017) compare the carbon credit accounting systems of five European nations, they find variations in frameworks and techniques of valuation. Ayaz (2017) focuses on enterprises inside the European Union and reveals a variety of carbon emission accounting approaches. To demonstrate a link between required environmental reporting and market value, Baboukardos (2017) investigates the market valuation of greenhouse gas emissions under a mandatory reporting framework in the UK. Tu's (2017) research focuses on post-Kyoto Protocol urban discussions on climate change, highlighting the necessity of precise environmental cost accounting at the urban level to guide policy choices. The efficacy of the Kyoto Protocol is assessed by Almer & Winkler (2015), who also provide insight into the issues raised by equality, efficiency, and cost-effectiveness. The study by Kumazawa & Callaghan (2012) examines how the Kyoto Protocol affects carbon dioxide emissions worldwide and shows that Annex B nations have seen a drop in pollution. Taking a national view, Bhardwaj & Prakash's (2022) research investigates how carbon credits affect taxation and accounting in India and identifies business prospects in the energy industry. The implications of China's entry into the carbon market and the regulatory framework are highlighted in Tiwari's (2022) analysis of carbon trading in India. In her study on carbon credit accounting in the Indian context, Arora (2021) highlights the legal responsibilities and concerns surrounding carbon taxation while highlighting the possibility of obtaining carbon credits via the Clean Development Mechanism (CDM) initiative. The analysis of the Indian carbon market by Gorain, Malakar & Chanda (2021) highlights the financial advantages of cutting emissions from burning agricultural waste. Insights into carbon credit trading, income appraisal, and compliance with environmental requirements are revealed by Agarwal's (2021) thesis on carbon credit accounting practices in Indian enterprises. It also highlights issues related to taxes and carbon credit purchasing. The review of a few Indian businesses by Prasanna (2021) explores carbon accounting, emissions, and mitigation programs in several industries. In Bhardwaj & Prakash's (2021)study on Uttarakhand, examines taxation and accounting concerns related to carbon credit emissions, finding differences in tariff considerations and accounting assumptions. Regarding financial performance, research by (P. Kumar & Firoz, 2020) finds a favorable correlation between Return on Equity (ROE) and Carbon Emission Reductions (CERs), indicating the trust of investors. The differences as compared to wealthy nations are shown by Banerjee's (2020) investigation of green accounting standards in India, which also highlights the tradability and tax consequences of carbon credits. There are notable variations in recognition, value, and tax classification, according to Soni and Bhanawat's(2018) research on accounting and taxes aspects of carbon credit transactions. Sedimbi(2017) uses the Delhi Metro Rail Corporation as a case study to investigate the impact of carbon credit accounting on financial statements. The assessment of views in carbon accounting in India by Kamat and Kamat (2017) highlights the growing understanding of carbon reporting and its beneficial effects on financial growth. The importance of carbon trading for environmental sustainability is emphasised by Rodrigues' (2017) investigation of carbon credit accounting. The study conducted by Patnaik (2016) on the awareness of carbon credit accounting among financial professionals and students in Odisha finds knowledge gaps, especially among female postgraduates.

In-depth analysis of the classification of carbon credits as intangible assets is provided by Kaushik's (2015) paper on the accounting characteristics of carbon credits, emphasising their special financial treatment. According to survey-based study on the carbon market's future conducted by Garg & Arya (2015), organisations are generally aware of the need to reduce carbon emissions through waste management practises. Arora (2021), Bhardwaj & Prakash (2022), Tiwari (2022), Gorain et al. (2021), and other researchers have made major contributions in recent years to our knowledge of the subtleties of carbon credit accounting and trading in the Indian context.

RESEARCH GAP

Research opportunities include analysing the long-term financial effects of Carbon Emission Reduction (CER) issuances, assessing the effectiveness of carbon credit trading mechanisms, analysing the gender differences in the knowledge of carbon accounting, conducting thorough assessments of carbon accounting within particular industries, and analysing the role of carbon accounting in influencing investment decisions. Strategies for harmonising carbon accounting standards globally are also being explored. Filling in these gaps will help us understand carbon-related practises more deeply and help us make sustainable decisions.

OBJECTIVES OF THE STUDY

1. To recognize the significance of carbon disclosure as depicted in the existing body of literature.
2. To know the impact of carbon credit revenue on company's profitability.

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RESEARCH METHODOLOGY

This study used a descriptive research design to examine how carbon credits are used by NSE-listed firms(L. Kumar & Aggarwal, 2022). It did this by using quantitative and qualitative methods. A thorough examination of current trends is ensured by the data, which is drawn from CMIE Prowess and spans the years 2018 through 2022. 106 enterprises using carbon credits were chosen from the 126 that were first found; 18 companies with missing data and 2 outliers were removed. Total Assets and log10 was used as the benchmark for standardising total income and income from carbon credits. To visually and statistically evaluate the effect of carbon credits on the overall revenue of NSE-listed firms, statistical studies, such as scatter graphs, correlation, and regression, were carried out using SPSS. This analytical approach seeks to offer detailed explanations of the relationships between Income from carbon credits and Total Income.

What are Carbon Disclosure ?

A carbon footprint quantifies the total greenhouse gas emissions generated directly and indirectly by individuals, events, organizations, or products. Carbon credit accounting plays a pivotal role in evaluating the carbon footprint and guides organizations in their efforts to combat climate change. In India, the business community is increasingly recognizing the importance of carbon accounting and reporting, with platforms like the Carbon Disclosure Project (CDP) and Sustainable Development Reports (SDR) being utilized for this purpose(Desai, 2022). Carbon Credits (CC) are certificates awarded to countries that reduce their greenhouse gas (GHG) emissions responsible for global warming. These credits are measured in units like Certified Emission Reductions (CER), Removal Units (RMU), or Emission Measurement Units (EMU), with each CER equivalent to one tonne of carbon dioxide reduction. The concept of carbon credits was formalized within the Kyoto Protocol, an international agreement encompassing over 170 countries(Sun et al., 2022). Carbon credits play a pivotal role in national and international emission trading schemes designed to mitigate global warming. They incentivize large-scale GHG emission reduction by imposing annual emission caps and assigning a monetary value to shortfalls, which can be traded in the market (Sarkar & Dash, 2011). The Kyoto Protocol introduced various mechanisms for climate change mitigation, including the Clean Development Mechanism (CDM), Joint Implementation (JI), and International Emission Trading (IET). Developed countries can set up projects in other nations with JI, earning carbon credits applied to their emission targets. CDM allows developed countries to undertake GHG reduction projects in developing nations, obtaining carbon credits for meeting their emission targets. Under IET, developed countries with emission reduction commitments can trade carbon credits in the international market, enabling entities exceeding emission limits to purchase credits from those under their limits. Carbon credits can be exchanged between businesses or sold in the international market.

Notably, CDM and IET are options exclusive to developed nations, while the CDM promotes collaboration between developed and developing countries under the Kyoto Protocol. There are varied estimates of CDM potential and projected financial flows to India, with a focus on power, steel, cement, and chemical sectors. India's GHG emissions predominantly stem from these sectors, making them crucial in CDM revenue generation. India is poised to tap into the market, with estimates suggesting it may garner a substantial share of global CDM revenue. Approximately one-third of all registered CDM projects with the United Nations Framework Convention on Climate Change (UNFCCC) originate from India, and the country accounts for a significant portion of the world's carbon credit trade. The demand for carbon credits in developed nations has spurred the preparations by developing countries to enter this market. It's anticipated that carbon credits generated from emission reduction projects in India will triple over the next three years. India is poised to play a substantial role in this market, with organizations like the Multi Commodity Exchange of India (MCX) and the Chicago Climate Exchange participating in carbon trading (Kılıç & Kuzey, 2019). However, foreign institutions' direct participation in Indian commodity exchanges remains restricted. The transfer and measurement of Certified Emission Reductions (CERs) are meticulously tracked through a registry system under the Kyoto Protocol (Jiang et al., 2021). Countries can engage in the international carbon credit market under the IET mechanism, enabling the sale of surplus credits to countries with emission commitments. Developed countries that surpass their emission limits have the option to reduce emissions, borrow, or buy carbon credits from developing countries.

Is Carbon Disclosure Important?

Embracing CDP (Carbon Disclosure Project) disclosure represents a pivotal step in a company's commitment to environmental responsibility and sustainability. The first key aspect lies in "Compliance with Regulatory Mandates." CDP disclosure ensures that organizations rigorously adhere to environmental regulations and stringent reporting mandates concerning greenhouse gas emissions. Non-compliance with these regulations can subject companies to onerous legal consequences and significant financial penalties. Secondly, "Enhanced Investor and Stakeholder Confidence" is a critical outcome of CDP disclosure. It serves to elevate the confidence of discerning investors, shareholders, and a diverse range of stakeholders. By unequivocally showcasing a company's unwavering dedication to environmental stewardship, CDP disclosure magnetizes prudent investors and fortifies the company's enduring financial stability. The third dimension involves "Prudent Risk Mitigation (Luo, 2019)." Corporations that meticulously gauge and disclose their environmental risks are well-positioned to adroitly mitigate these challenges. This proactive approach acts as a bulwark against costly environmental mishaps and plays a vital role in safeguarding the company's esteemed reputation. Furthermore, "Competitive Distinction" is another advantage (Wang, 2023). Transparent and conscientious environmental practices bestow organizations with a distinctive edge in the market. Companies that earnestly champion sustainability and carbon reduction tend to attract a clientele that is not only environmentally conscious but also discerning, potentially enlarging their market share and fostering strategic partnerships. Lastly, "Access to Capital" is greatly facilitated through CDP disclosure. It beckons the interest of financial institutions that

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judiciously evaluate a company's environmental performance when extending loans or investments. This access to capital affords companies the means to secure funding for their sustainability initiatives and strategic expansion, further solidifying their commitment to environmental responsibility(P. Kumar & Firoz, 2019). In sum, CDP disclosure is a multifaceted strategy that not only ensures compliance but also contributes to financial stability, risk mitigation, competitive advantage, and access to the capital needed for sustainable growth in a conscientious and environmentally responsible manner.

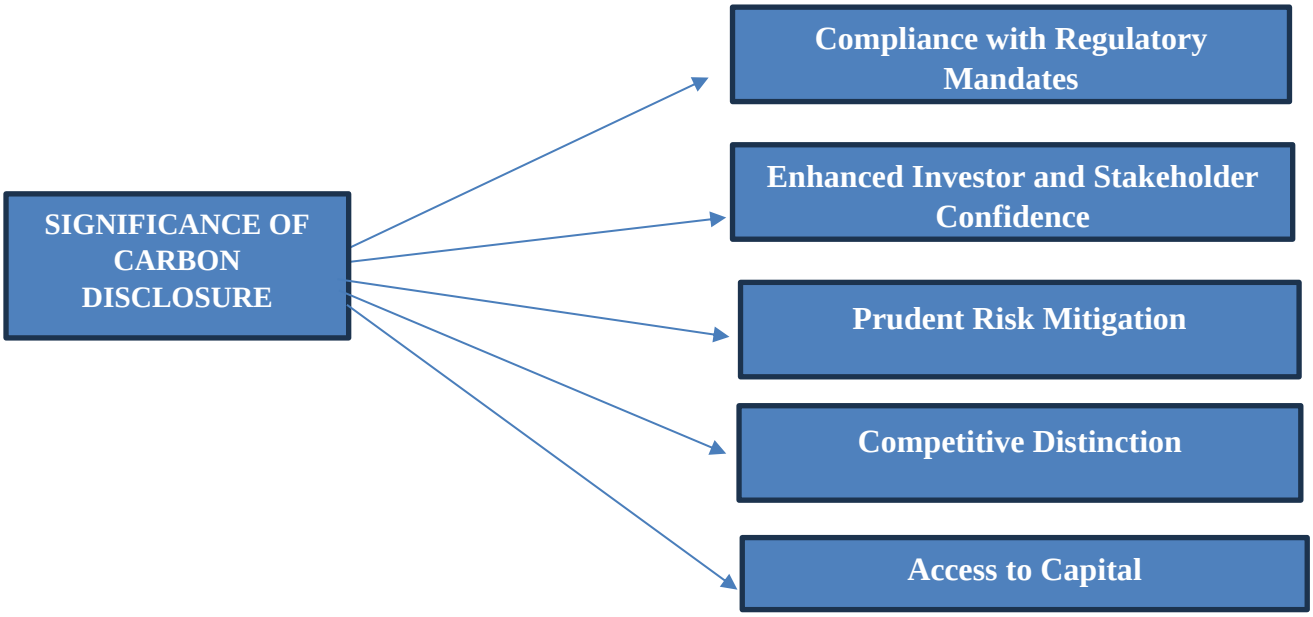
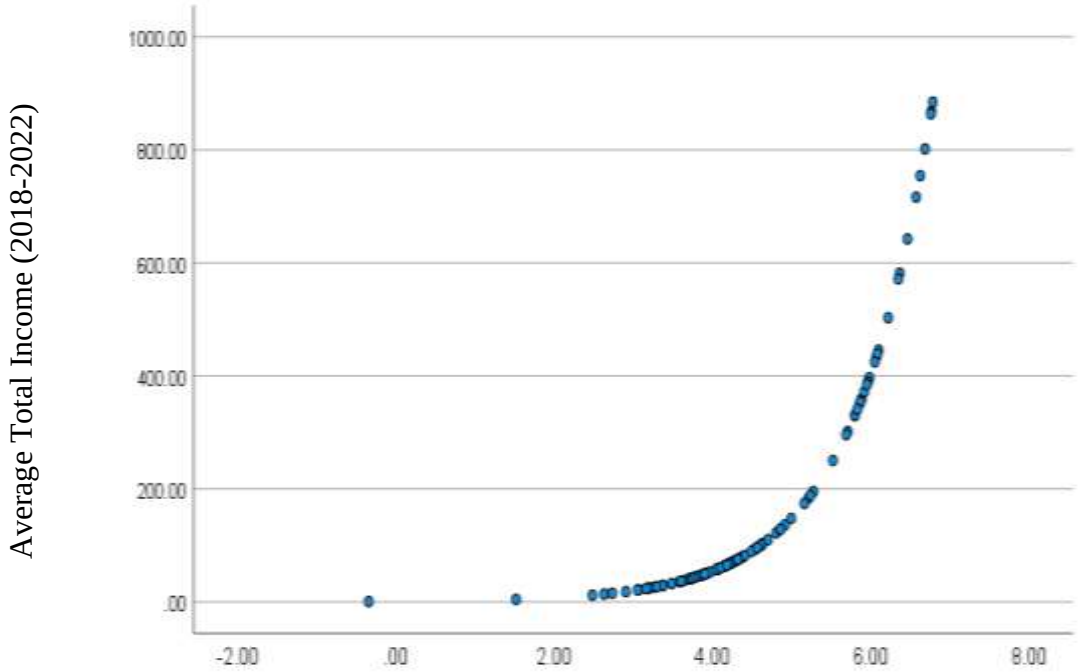


Fig 1: Showing Significance of Carbon Disclosure as per CDP Report

As per the CDP report, the commitment to CDP disclosure represents a pivotal milestone in a company's journey towards environmental responsibility and sustainability. By adhering to regulatory mandates, bolstering investor confidence, mitigating risks, and distinguishing themselves in the competitive landscape, organizations can not only safeguard their financial stability but also contribute to a more sustainable and environmentally conscious future(Datt et al., 2019). With the promise of increased access to capital, companies embracing CDP disclosure are better equipped to pursue their sustainability initiatives and drive positive change, exemplifying a steadfast dedication to environmental stewardship that resonates with both discerning investors and the broader community.

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RESULTS AND DISCUSSIONS



Source: Author's computation (using SPSS)

This finding indicates a positive and direct association between the two variables—average total revenue and average income from carbon credits among 106 Indian NSE listed businesses. Demonstrating that variations in total income are probably having a comparable impact on variations income from carbon credits. The relevance of the found association within the framework of the research article is emphasized by this empirical data, which is crucial for verifying the research hypothesis and providing insightful information to the study's objectives.

Table1: Descriptive statistics (Author's computation)

Corelation			
Particulars		**Income from Carbon Credit**	**Total Income**
Income from carbon credit	Pearson Correlation	1	.842**
	Sig. (2-tailed)		0
	Sum of Squares and Cross-products	154.773	23171.18
	Covariance	1.474	220.678
	N	106	106
Total Income	Pearson Correlation	.842	1
	Sig. (2-tailed)	0	
	Sum of Squares and Cross-products	23171.18	4889471.906
	Covariance	220.678	46566.399
	N	106	106
Descriptive Statistics			
	Mean	Std. Deviation	N
Avg. Income from Carbon credit	4.5606	1.2141	106
Avg. Total Income	182.4806	215.79249	106

Table 2: Corelation test has been applied to check the relationship Income from carbon credits on total Income

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Table 3: Showing level of confidence

Confidence Intervals				
	Pearson Correlation	Sig. (2-tailed)	95% Confidence Intervals	
			Lower	Upper
Income from carbon credit - Total Income	0.842	0.000	0.776	0.890

As shown in the tables above, Income from Carbon Credit and Total Income showed a substantial positive association (r = 0.842) according to the correlation study. This finding provides strong support for the relationship between these two variables in the context of the research, indicating that changes in revenue from carbon credits are highly consistent with changes in overall income, with a 95% confidence range ranging from 0.776 to 0.890.

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.842[a]	0.709	0.707	116.87045

a. Predictors: (Constant), log income from carbon credit

Table 4: Regression test has been applied to know the impact of Income from carbon credits on total Income

The regression analysis yields a highly significant model with an R-squared of 0.709, indicating a substantial explanatory power, while the correlation coefficient (R = 0.842) demonstrates a strong positive association. Even with model complexity accounted for, the adjusted R-squared remains high at 0.707, indicating model adequacy. The standard error of the estimate (116.87045) suggests reasonable predictive accuracy. These findings support the model's reliability and its potential contribution to empirical research.

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3468966.995	1	3468966.995	253.975	.000[b]
	Residual	1420504.911	104	13658.701		
	Total	4889471.906	105			

a. Dependent Variable: total Income

b. Predictors: (Constant), Income from carbon credit

Table 5 : ANOVA has been used to check significance of the model

The ANOVA test underscores the regression model's high significance in explaining the variance in total income. The F-statistic of 253.975 ($p < 0.001$) indicates strong model significance, emphasizing the role of the independent variable, income from carbon credit. The model effectively accounts for a substantial portion of the total variance, making it a valuable tool for understanding the relationship between these variables within the research context.

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-500.284	44.321		-11.288	0.000
	Total income	149.710	9.394	0.842	15.937	0.000

a. Dependent Variable: total income

Table 6: Coefficients (Beta)

The regression analysis results indicate a significant relationship between income from carbon credit and total income. For every unit increase in income from carbon credit, total income is expected to increase by 149.710 units. The standardized coefficient (Beta) of 0.842 confirms the strength and significance of this positive relationship. Both the constant term and the total income coefficient have highly significant t-statistics, reinforcing the reliability of their impact on total income of the firm. These findings underscore the importance of income from carbon credit has an impact on profitability of the firm.

SUGGESTIONS

NSE Nifty-listed businesses are urged to improve their carbon disclosure procedures in order to increase transparency and build stakeholder confidence, based on the study's findings. The established relationship between overall revenue and income from carbon credits highlights how crucial it is to put strong carbon credit policies into place for financial viability. Long-term financial sustainability is promoted by incorporating sustainability into company strategy with specific environmental goals. Enhancing the accessibility of data in online reports guarantees that stakeholders may access and understand the company's environmental actions with ease. It is advised to conduct impact assessments on a regular basis to track changes in the relationship between overall revenue and carbon credit income. A business may demonstrate its commitment to environmental responsibility even more by collaborating with other industries and teaching stakeholders about carbon disclosure practises. Companies should also keep up with new environmental standards so that they may align their practises with internationally recognised frameworks and

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maintain their reputation in the marketplace. Together, these suggestions help NSE Nifty-listed firms solve carbon accounting and profitability issues in a thorough and long-lasting manner.

Implications of the study

The consequences of this work are considerable in terms of both academic research and practical application. These findings highlight the vital necessity of include income from carbon credits in financial analysis in the scientific sector. Furthermore, the strong association established in our analysis provides a solid foundation for future investigations targeted at improving a firm's financial well-being through tactics that maximise carbon credit income. This research highlights the potential financial benefits that companies may get via the identification and integration of sustainability measures that capitalise on carbon credit income. The research findings unambiguously indicate that effective handling of carbon credit income may result in enhanced financial outcomes, therefore harmonising business goals with ecological accountability. In addition, it recommends that stakeholders and policymakers take into account promoting and rewarding sustainable business practises for both environmental and financial gains.

CONCLUSION

In light of our study, the analysis's findings provide insightful information on the connection between total revenue and carbon credit income. Significant explanatory power (R-squared = 0.709) and a good correlation (R = 0.842) between the variables are shown by the regression model. Furthermore, the significant relevance of the model in explaining the variation in total income is confirmed by the ANOVA test. This implies that the firm's overall income and financial performance are significantly impacted by
carbon credit income.

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