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The Relationship Between Managerial Overconfidence and ESG: Emphasizing The Role of Environmental Costing

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Abstract

This study aimed to examine the relationship between managerial overconfidence and ESG, emphasizing the moderating role of environmental costing in Iraqi firms and assessing whether environmental costing moderates the relationship between managerial overconfidence and ESG reporting among Iraqi companies. A multivariate regression model was employed to test the research hypotheses. The hypotheses were tested using panel data techniques with a fixed-effects model for firms listed on the Iraq Stock Exchange (ISE) from 2014 to 2023. The results showed a strong positive link between managerial overconfidence and ESG reporting. In addition, the findings suggested that environmental costing played a moderating role in the relationship between managerial overconfidence and ESG reporting. This study is unique in that it was the first to explore the interaction among environmental cost-effectiveness, managerial overconfidence, and corporate ESG reporting among firms on the ISE. The unique characteristics of Iraq's emerging market environment created a distinctive context for this research. This study also examines the moderating role of environmental costing in the relationship between managerial overconfidence and ESG reporting. The research provided a fresh perspective on corporate financial management, particularly under crisis conditions. The results not only illustrated useful insights for managers, analysts, and regulatory institutions in Iraq but also enriched the existing literature in this regard.

Keywords:
Environmental Costing, ESG, Managerial Overconfidence

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1. Introduction

Today, sustainability has emerged as a strategic issue for business entities due to global challenges such as global warming, environmental degradation, pollution, and energy crises. In other words, organizations face increasing challenges across economic, social, and environmental dimensions in today's fast-paced and complex world. In this context, Environmental, Social, and Governance (ESG) has in recent times become a hot topic as an existing comprehensive framework for disclosures to measure an organization's sustainability performance. In 2004, the United Nations Global Compact introduced ESG, framing it in its seminal report "Who Cares Wins" as a modern perspective on corporate governance, with an emphasis on the costs of environmental damage. Since that point, ESG has advanced rapidly due to growing global concerns over climate change, environmental degradation, and resource depletion (Alduais, 2023; Al Amosh and Khatib, 2022; Linnenluecke, 2022). This growth has accelerated in recent years, driven by growing awareness of the hidden, systemic environmental costs that have become unavoidable and must be disclosed. Increasingly, governments around the world particularly in Europe but also elsewhere have been attempting to turn ESG principles, and specifically the environmental costing element, into law through regulations requiring firms to recognize and report their environmental costs. The turning point came in 2020 at the United Nations General Assembly, when the Chinese government laid out goals to peak carbon emissions by 2030 and to achieve carbon neutrality by 2060 (Malik and Kashiramka, 2024; Firmansyah et al., 2023; Alduais, 2023; Alsayegh et al., 2020). The key element here is that governments are committing to reducing environmental costs and moving toward a low-carbon economy, which has been critical to exercising ESG, particularly with respect to environmental costs. Nowadays, ESG, particularly environmental costing, has gained significance in corporate practice (Feng and Wu, 2023). It is essential to quantify the environmental expenses, both monetary and non-monetary, and to disclose them as accurately as possible. It enables them to make more informed decisions on resource allocation, production, and investment, thereby reducing environmental costs and increasing profitability. With the connotation of sustainable development, ESG emphasizes environmental costs and the social link to financial elements, which is strategically and pragmatically significant for the firm aiming for sustainable quality expansion. A reflection of corporate social and environmental accountability, ESG plays an important role in establishing long-term value and stakeholder trust among investors, consumers, and employees. However, other factors play a role in ESG performance; managerial characteristics and decision-making are among them (Wang et al., 2023).

However, environmental costing, as a management tool, can be critical to improving an organization's ESG performance. Environmental costing accurately measures, identifies, and assigns costs related specifically to environmental activities, and transforms environmental decision-making by allowing managers to provide their organizations with full information on how they affect the environment and what actions can be taken in that context. The emergence of the ESG concept has sparked greater academic interest in the nexus between managerial overconfidence and ESG, as well as in environmental costing. Yet research on such is limited. The majority of the previous studies examining the impact of ESG focuses primarily on two outcomes: firm performance and cost of capital (e.g., Li et al., 2024; Malik and Kashiramka, 2024; Wang et al., 2021; Yu et al., 2021), as well as financial performance (Malik and Kashiramka, 2024; Chen et al., 2023; Mittal et al., 2008; Nollet et al., 2016; Friede et al., 2015; Possebon et al., 2024). Very few studies have explored the association between managerial overconfidence and ESG performance (Wang et al., 2023). Moreover, research by Raimo et. al (2021) and Houqe et al. (2020). As demonstrated by Arora and Sharma (2022), Priem and Gabellone (2024), and (2020), higher ESG scores typically lead to a lower cost of debt for firms. A literature review suggests that, due to the peculiarities of the economic and political climate in

developing countries, research investigating the association between managerial overconfidence and ESG performance is scarce. This shortage highlights substantial gaps in the existing evidence base and presents unique opportunities for generating innovative ideas and creating knowledge in this area of research. Iraq, as an immature yet still-decomposing country, faces certain political, ecological, and financial challenges. These challenges highlight the importance of studying the relationship between managerial overconfidence and ESG performance in this environment, as well as the necessity for localized, context-specific knowledge building. Apart from filling current gaps in the literature, the current work offers an opportunity to advance theoretical knowledge and provide fresh perspectives on the relationship between managerial overconfidence and ESG performance. By examining this relationship in the context of Iraq, one can gain a deeper understanding of the factors that may influence ESG performance among businesses operating in developing contexts. Therefore, this paper explores the link between managerial overconfidence and ESG performance by concentrating on the moderating role of environmental costs. In this way, this paper provides both a theoretical and an empirical foundation, largely focused on better understanding the connection between these two subjects, while contributing useful insights to minimize managerial overconfidence and improve ESG performance through environmental costing as a management tool. First, this study develops research hypotheses based on prior studies on management overconfidence, ESG, and environmental costing. It is then tested with data from companies listed on the ISE. Finally, the research presents its findings and implications for external stakeholders, managers, and investors. This paper provides a comprehensive, pragmatic perspective that enhances organizational ESG performance and creates long-term value.

2. Theoretical framework and hypothesis development

However, in light of developments in the field of behavioral finance, a great deal of research has examined managerial decision-making through the lens of cognitive biases and irrational behavior. One of the best-known psychological traits in this context is managerial overconfidence. It can also play a major role in corporate decision-making and, ultimately, in company ESG performance (Reber et al., 2022). More confident managers display a stronger risk appetite and a willingness to engage in ESG-related activities. In other words, they are motivated to invest more funds into ESG projects because they believe in the potential benefits of such investment and, in this way, improve ESG performance. According to stakeholder theory, a firm's transparent and comprehensive disclosure of its ESG performance can reduce the information asymmetry between the firm and external stakeholders, thereby enhancing stakeholder trust. On the flip side, ESG projects often entail long-term commitments that require large upfront investments but have yet to yield rewards, or the rewards remain unknown. Overconfident managers tend to understate related risks and overstate the potential profits of specific projects. This cognitive error might cause business resources to be overallocated to ESG investments. Moreover, overconfident managers are usually driven to provide a credible and good corporate image. Managers are often motivated to emphasize firm ESG performance to the above groups (Bissoondoyal-Bheenick et al., 2023), as well as to seek esteem and reputation by adopting a high managerial focus on corporate ESG efforts, which will attract external actors.

As news travels fast these days, the better a company's ESG performance, the more it can improve its reputation and credibility, with this information potentially allowing managers to attract greater resources. Doing the right thing with ESG will create a win-win, provide considerable economic, social, and environmental benefits, and help authorities build an excellent corporate image that enters the public consciousness by helping managers gain recognition from third parties (Wang et al., 2023). Overconfident managers, by their nature, want to be in the spotlight and also tend to interpret opportunities to demonstrate their talents positively. This is because they perceive praise and

recognition as outputs that lead to satisfaction and motivation (Wallace and Baumeister, 2002). Their strong internal drive may thus translate into enhanced ESG performance, as the admiration and appreciation they receive reinforce their sense of superiority. Additionally, overconfidence is often linked to a psychological phenomenon called the better-than-average effect—an insidious cognitive bias that causes people, including managers, to systematically underestimate their abilities, talents and judgments. In other words, overconfident managers see themselves as being very capable and much more competent than their peers. This enhanced version of Beyoncé affects them in their actions and choices. It first makes them want to seek situations where they can prove their talent and dominance. They seek projects that offer the opportunity to glean and receive praise from others. While in the ESG domain, this type of tendency can lead to aggressive investment in green and social projects; overconfident managers may believe their institutions can achieve more than others.

Second, the better-than-average effect leads managers to underestimate project risks and challenges. Convinced that their capabilities are above average, they believe the risk of failure is low and embark confidently on ambitious or risky undertakings. Such overconfidence may lead to unreasonable investments and expensive mistakes (Wang et al., 2023). Third, this particular cognitive bias only fuels managers' self-promoting and self-enhancing tendencies, leading them to surround themselves with sycophants who praise their every decision. They aspire to get recognized and build their image in the domain of ESG, often taking advantage of media and PR opportunities. This tendency may give rise to impression management behaviors and a greater attention to the symbolic aspects of ESG performance (Taylor and Brown, 1988). With the advent of ESG performance as an important measure of entrepreneurial success, overconfident managers tend to set high standards for their efforts. This strategy gives them a chance to display their abilities and gain public approval for admission. Therefore, consistent with the literature, managerial overconfidence is hypothesized to be positively related to and statistically significant in affecting ESG performance.

H1: There is a positive and significant relationship between managerial overconfidence and ESG performance.

In today's business environment, ESG (Environmental, Social, and Governance) performance has become a key indicator of corporate success (Al Amosh et al., 2023). Managers are the main decision-makers who allocate resources and develop strategies to improve some aspect of ESG (Almeyda and Darmansya, 2019). In fact, Managerial overconfidence, an important psychological trait, could significantly impact ESG decision-making (Wang et al., 2023). Carefree managers tend to take on the risks associated with ESG projects. The best of them are optimistic about future returns on such programs, so they invest further in them. However, this optimism comes with an underestimation of the real risks and costs associated with ESG-related projects (Amarna et al., 2024). As an environmental management tool, costing can likewise be employed to address this issue. Environmental costing provides a clear and precise picture of the environmental costs of corporate life (Alsayegh et al., 2020). This data allows managers to allocate resources more effectively in ESG projects. Environmental costing can lessen the impacts of managerial overconfidence in ESG decision-making by reducing uncertainty and increasing transparency. For example, when overconfident managers base their decisions about the environmental costs of ESG projects on precise calculations, they are less likely to underassess the risks and difficulties involved. Furthermore, by providing granular information on the financial value-creation potential of ESG projects, environmental costing can make the case for investing in ESG. Environmental costing can be a moderating variable on the relationship between managerial overconfidence and ESG performance. This tool assists managers in making more rational, informed decisions about investing in ESG projects by providing transparent, accurate data. The opposite is also true. One common pattern is that overconfident managers have a biased view of ESG initiatives: they underestimate the costs and

risks associated with them but overestimate their benefits. Environmental costing can temper this unrealistic optimism by providing accurate, data-driven estimates of real-world environmental externalities and holding managers accountable to the financial and operational realities of ESG initiatives. Therefore, managers will not make irrational, non-value-adding investments; they will avoid high costs and low or negative returns. As environmental costing can enhance or diminish the relationship between managerial overconfidence and ESG performance, hypothesis 2 was stated in a two-tailed form.

H2: Environmental costing moderates the relationship between managerial overconfidence and ESG performance.

3. Methodology

This study is classified as causal-correlational research employing a quasi-experimental ex post facto design. The primary objective is to examine the relationships between variables within the framework of positive accounting research using real-world data. In terms of its nature and purpose, the study is considered *applied research* aimed at developing practical knowledge in a specific area.

3.1. Population of the study

The statistical population consists of all companies listed on the ISE from 2014 to 2023.

3.2. Sampling method

A systematic elimination method was used for sampling. After applying the following criteria, the final sample of the study was determined:

1. The company must have been listed on the ISE by 2014.
2. The company must have provided the complete financial information required for the study throughout the research period.
3. The company must not operate in investment, banking, insurance, or financial intermediation sectors.

The final sample was obtained from data collected by the end of 2023, in accordance with Table 1.

Table 1. Number of companies in the statistical population and application of selection criteria for sample selection

Iraq Stock Exchange Member Companies	Number of Companies	Selected Companies
Total number of listed companies in Iraq		123
Banks and Financial Institutions		
Number of Banking Companies: 39		
Number of Insurance Companies: 5		
Number of Investment Companies: 9	72	
Money Transfer Companies: 17		
Telecommunications Companies 2		
Non-disclosure of information	30	
Total Sample Companies		21

3.3. Data collection method and methods

Company data (balance sheets and income statements) were used as the research tool. The raw and primary data necessary to test the hypotheses were collected from a database of the ISE and other relevant sources.

3.4. Data analysis

A cross-sectional and year-by-year (panel data) approach was employed in this study. A multiple linear regression method was used to test the hypotheses. Descriptive and inferential statistical methods were employed to analyze the collected data. Specifically, frequency distribution tables were

used to describe the data. The following tests were applied for hypothesis testing at the inferential level: the F-test, the Hausman test, the normality test, and multiple linear regression analysis.

Table 2. The variable measurement

Measurement	Variables	
It is mentioned in detail below.	Environmental, Social, and Governance	ESG
Environmental costing is measured based on each industry's carbon dioxide (CO_2) emissions. A binary variable is used for operationalization: if a company's annual CO_2 emissions exceed the industry average for the corresponding year, the value is coded as 1; otherwise, it is coded as 0.	Environmental Costing	EC
Managerial overconfidence is assessed using two proxies.	Managerial Overconfidence	Overcon
This variable represents the consecutive years that the same auditor has audited the firm up to the year under review. A longer auditor tenure is considered an indicator of managerial overconfidence.	Auditor Tenure	Tenure
A dummy variable equals 1 if the firm changed its auditor in the year under review; otherwise, it equals 0. Frequent changes in auditors may reflect behavioral patterns associated with managerial overconfidence.	Auditor change	Audchg
This is calculated as the ratio of total debt to total assets.	Financial Leverage	LEV
This is measured by the natural logarithm of the company's total assets.	Company Size	SIZE
If the company incurs a loss in the year under consideration, the value is set to 1; otherwise, it is 0.	Loss Indicator	LOSS
This is calculated by dividing the net income by total assets.	Return on Assets	ROA
Defined as operating cash flows divided by total assets.	Operating Cash Flow	CFO
Calculated as the equity market value divided by the shareholders' equity book value.	Market-to-Book Ratio	MTB
Operating profit after tax + Depreciation and other non-cash expenses – Changes in working capital – Capital expenditures.	Free Cash Flow	FCF
Measured as the percentage of shares held by institutional investors, including financial institutions, insurance companies, credit institutions, and government-owned entities.	Institutional Ownership	Inst
Measured as the ratio of independent (non-executive) board members to the total number of board members.	Board Independence	IBD

3.5. Research model

Model one was used as follows to test the first hypothesis of the research:

Model (1):

$$ESG_{it} = a_0 + a_1\text{Overcon}_{i,t} + a_2 EC_{i,t} + a_3 Tenure_{i,t} + a_4 Audchg_{i,t} + a_5\text{IBD}_{i,t} + a_6\text{Size}_{i,t} + a_7\text{ROA}_{i,t} + a_8\text{CFO}_{i,t} + a_9\text{LEV}_{i,t} + a_{10}\text{MTB}_{i,t} + a_{11} FCF_{i,t} + a_{12} Inst_{i,t} + a_{13} Industry_{it} + a_{14} Year_{it} + \varepsilon_{i,t}$$

The following model was used to test the second hypothesis:

Model (2)

$$ESG_{it} = a_0 + a_1\text{Overcon}_{i,t} + a_2 EC_{i,t} + a_3\text{Overcon} \times \text{EC}_{i,t} + a_4 Audchg_{i,t} + a_5\text{IBD}_{i,t} + a_6\text{Size}_{i,t} + a_7\text{ROA}_{i,t} + a_8\text{CFO}_{i,t} + a_9\text{LEV}_{i,t} + a_{10}\text{MTB}_{i,t} + a_{11} FCF_{i,t} + a_{12} Inst_{i,t} + a_{13} Tenure_{it} + a_{14} Industry_{it} + a_{15} Year_{it} + \varepsilon_{i,t}$$

Which variable measurement is present in Table 2

ESG Performance (ESG): ESG performance is measured using a weighted composite index adapted from Fakhari et al. (2017). The index incorporates environmental, social, and governance dimensions using the following formula:

ESG = 0.337E + 0.388s + 0.275G

E represents the environmental score, S represents the social score, and G represents the governance score.

According to Table 3, ESG reflects the extent of a company's disclosure and performance in environmental, social, and governance areas.

Table 3. The indicators used to measure each ESG dimension

Governance Indicators (G)	Social Indicators (S)	Environmental Indicators (E)
Shareholders' rights protection	Health, safety, and productivity	Pollution, waste, and emissions
Committees	Labor rights	Energy efficiency and water usage
Risk management	Stakeholder social perception	Biodiversity
Performance-based compensation	Product health and safety	Climate change
Ethics and codes of conduct	Non-discrimination and social inclusion	Environmental risk assessment
Corporate governance transparency	Customer and supply chain social issues	Environmental aspects in services and supply chain
Legal compliance	Adherence to human rights	Environmental education
Board composition	Social Development and Philanthropy	Environmental management systems
Investment risk management	Socially responsible investment	Environmental disclosure
Related-party transactions	Brand preservation and anti-competitive behavior	
Number of board meetings	Social learning and training	
The existence of a corporate website	Social transparency	
Timeliness of information disclosure		
Ownership structure		
Future planning disclosures		
Employment reporting		

After reviewing the board of directors' reports and explanatory notes, a score of 1 is assigned to each indicator (or its sub-components) if it is disclosed. In the final step, the scores for the three ESG dimensions are calculated separately and entered into the weighted formula $ESG = 0.337E + 0.388s + 0.275G$ .The resulting value represents the firm's final ESG score.

Managerial Overconfidence (Overcon): In this study, managerial overconfidence is measured using a proxy for excess investment in assets, following Schrand and Zechman (2012). This index captures the degree of overinvestment by managers and is calculated as follows:

Abnormal Asset Investment is the estimated residual from an industry-year-specific regression of total asset growth on sales growth. The firm is classified as overconfident when the residual is greater than zero (Overcon equals 1); otherwise, it is coded as 0. This is based on the rationale that firms in which assets grow faster than sales are probably led by overconfident managers who outinvest their peers.

$$Assets.Gr_{it} = a_0 + a_1 sales.Gr_{it} + \varepsilon_{it}$$

4. Data analysis

4.1. Descriptive statistics

Using multiple regression for hypothesis testing of the role assigned to cost management in connecting firm risk and financial resilience on the part of Iraqi companies. This dataset comprises

data from 21 firms over the period 2014-2023. The descriptive statistics for our research variables (the number of observations, mean, standard deviation, and minimum and maximum values) can be found in Table 4.

Table 4. Descriptive statistics

	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis
ESG	3.220	2.930	8.540	1.100	1.320	0.790	3.890
OVER_CON	0.650	1.000	1.000	0.000	0.480	-0.640	1.400
EC	0.630	1.000	1.000	0.000	0.490	-0.520	1.270
EC_OVER_CON	0.420	0.000	1.000	0.000	0.500	0.310	1.090
AUDCHG	0.070	0.000	1.000	0.000	0.250	3.510	13.300
CFO	0.180	0.090	0.840	0.000	0.210	1.350	3.970
FCF	0.320	0.150	7.420	0.000	0.650	7.460	76.870
IBD	0.710	0.710	1.000	0.250	0.120	-0.710	5.480
INST	0.530	0.550	0.760	0.000	0.160	-0.840	3.460
LEV	0.280	0.190	2.510	0.000	0.390	3.810	19.710
MTB	26.010	0.600	3652.530	-47.206	262.630	13.440	185.580
ROA	0.14	0.030	5.040	-0.340	0.560	6.280	45.930
SIZE	21.190	20.790	28.040	16.800	2.590	1.130	4.050
TENURE	4.820	5.000	12.000	1.000	2.540	0.260	2.300

4.2. Results of Hausman, F, and Breusch-Pagan Tests

Table 5. Results of Hausman, F, and Breusch-Pagan Tests

Limer's F-test Cross Section		Limer's F-test Time		Limer's F-test Cross Section and Time		Breusch-Pagan Cross Section		Breusch-Pagan Time		Breusch-Pagan Cross Section and Time		Hausman Test		Result
Statistic	P-value	Statistic	P-value	Statistic	P-value	Statistic	P-value	Statistic	P-value	Statistic	P-value	Statistic	P-value	
5.600	0.000	38.850	0.000	5.090	0.000	52.460	0.000	43.540	0.000	54.380	0.000	72.010	0.000	Panel with fixed effects for both cross-section and time

According to Table 5, the cross-sectional F-test evaluates the null hypothesis of pooled effects across sections against the alternative hypothesis of fixed effects. Given the test statistic and its associated p-value (0.00, less than 0.1), the null hypothesis is rejected, and the alternative hypothesis is accepted. The cross-sectional and time F-test examines the null hypothesis of pooled effects across sections and periods against the alternative of a panel model with cross-sectional and time-fixed effects. The null hypothesis is rejected based on the test statistic and the p-value ($0.00 < 0.1$).

The Breusch-Pagan cross-sectional test evaluates the null hypothesis of pooled effects across sections against the alternative hypothesis of a panel model with cross-sectional random effects. Considering the test statistic and the corresponding p-value ($0.00 < 0.1$), the null hypothesis is rejected, indicating the presence of random effects across sections.

The Breusch-Pagan cross-sectional and time tests assess the null hypothesis of pooled effects across both dimensions against the alternative of random effects in cross-sections and time. The null hypothesis is rejected based on the test statistic and p-value ($0.00 < 0.1$), confirming the presence of cross-sectional and time-random effects in the panel model.

Given that the null hypothesis of pooled effects is rejected in both tests, the F-Limer test supports

the alternative hypothesis of fixed effects. In contrast, the Breusch-Pagan test supports the random-effects alternative; the Hausman test determines the appropriate final model. This test assesses the null hypothesis of a random-effects panel model against the alternative hypothesis of a fixed-effects model. The null hypothesis is rejected based on the test statistic and the p-value ($0.00 < 0.1$), indicating that the final model is a panel model with both cross-sectional and time fixed effects.

4.3. Results of testing research hypotheses

Table 6. Results of testing the first hypothesis

Variable	Coefficient	Std. Error	t-Statistic	Prob.
OVER_CON	1.037	0.301	3.450	0.075
EC	-0.643	0.071	-9.080	0.012
AUDCHG	-0.838	0.112	-7.450	0.018
CFO	-0.819	0.229	-3.570	0.023
FCF	0.281	0.056	5.030	0.007
IBD	0.739	0.024	30.310	0.021
INST	0.427	0.345	1.240	0.433
LEV	-0.316	0.095	-3.310	0.080
MTB	-0.011	0.003	-4.050	0.056
ROA	0.660	0.137	4.830	0.040
SIZE	-0.079	0.075	-1.050	0.484
TENURE	0.040	0.014	2.900	0.211
C	5.078	1.823	2.790	0.219
R-squared	0.785	Mean dependent var		3.365
Adjusted R-squared	0.742	S.D. dependent var		1.453
S.E. of regression	1.329	Akaike info criterion		3.596
Sum squared resid	266.103	Schwarz criterion		3.954
Log-likelihood	-296.370	Hannan-Quinn criter.		3.953
F-statistic	2.479	Durbin-Watson stat		2.260
Prob(F-statistic)	0.000			

Hypothesis 1 test results in Table 6 show that managerial overconfidence has a significantly positive relationship with ESG. The results reveal that higher managerial overconfidence within a firm leads to greater participation in ESG-related activities in the case of Iraqi firms.

This is confirmed by the p-value of 0.07 at the 10% level, indicating a positive coefficient (1.037) between these two variables. In addition, the overall model significance level is 0.00, suggesting the model is both statistically significant and robust.

Table 7. Results of the second hypothesis test

Variable	Coefficient	Std. Error	t-Statistic	Prob.
OVER_CON	0.591	0.179	3.300	0.081
EC	0.812	0.205	3.950	0.059
EC_OVER_CON	-1.480	0.213	-6.940	0.020
AUDCHG	0.730	0.432	1.690	0.093
CFO	1.921	0.928	2.070	0.041
FCF	0.293	0.050	5.820	0.002
IBD	0.484	0.200	2.420	0.061
INST	0.567	0.620	0.910	0.362
LEV	-0.256	0.072	-3.550	0.071
MTB	-0.001	0.000	-1.820	0.071
ROA	0.492	0.085	5.800	0.029
SIZE	-0.082	0.046	-1.780	0.078
TENURE	0.125	0.048	2.580	0.011
C	3.313	1.346	2.460	0.015
R-squared	0.818	Mean dependent var		3.246
Adjusted R-squared	0.803	S.D. dependent var		1.328
S.E. of regression	1.283	Akaike info criterion		3.413
Sum squared resid	263.270	Schwarz criterion		3.667
Log-likelihood	-282.924	Hannan-Quinn criter.		3.516
F-statistic	1.957	Durbin-Watson stat		1.996
Prob(F-statistic)	0.028			

The independent and moderating variables are statistically significant based on the corresponding *t*-statistics and p-values. Since the p-value is less than 0.1 (p-value: 0.00 and 0.03), the null hypothesis (The coefficient is zero) can be rejected. Thus, the null hypothesis that measures of coefficients are statistically insignificant is rejected.

The goodness of fit of the model, measured using the R^2 value, is found to be 0.61, which means that the independent variables can together explain 61% of the variance in the dependent variable - Criticism score. The F-statistic and the corresponding p-value also indicate that we can reject the null hypothesis of model insignificance, thereby establishing overall model significance.

The results in Table 7 show that variable environmental costing moderates the relationship between managerial overconfidence and ESG. More specifically, this association attenuates in the context of environmental costing ($\beta = -1.480$, $p < 0.05$) at the level set to a cut-off point at 5%, suggesting that environmental costing, in fact, strongly, moderately, or entirely decreases the effect of managerial overconfidence on firms' ESG performance, as based on their respective coefficients found for underperformers in Iraq.

4.4. Additional analyses

The Robust Least Squares (RLS) method is an advanced regression technique designed to minimize the influence of outliers and noisy data in model estimation. In sharp contrast with OLS, which is particularly sensitive to outliers, the RLS method improves a model's fit with atypical observations (Rousseeuw and Leroy, 1988). This approach is advantageous when the dataset contains noise or outliers, as it enables the creation of more robust models with lower predictive error, leading to better scientific and practical choices. Accordingly, in this study, the Robust Least Squares method was used to corroborate these results. The results are presented in Table 8.

Based on the additional analysis test results in Table 8, a significant positive relationship exists between managerial overconfidence and corporate ESG. The results suggest that managers' overconfidence levels are also positively related to higher ESG engagement among firms in Iraq. To this end, the null hypothesis was tested, yielding a p-value of 0.016 below the 5% threshold, indicating

that we can reject the null hypothesis and that there is a positive direct correlation between the two variables, with a coefficient of 1.018. In addition, a one-tailed significance coefficient of 0.00 indicates the model's overall statistical validity and robustness. Besides, the results also show that environmental costing moderates the effect of managerial overconfidence on ESG. At a glance, each variable in environmental costing weakens this association, with a coefficient of -1.834 and a p-value of 0.018, which is less than the significance level of 5%. Therefore, environmental costing strongly moderates and reduces the impact of managerial overconfidence on ESG performance in Iraqi firms. These findings demonstrate that the results obtained using the Robust Least Squares method are consistent with those from the study's primary analytical approach, thereby reinforcing the validity of the leading research results.

Table 8. Additional analysis test results

Variable	Coefficient	Std. Error	z-Statistic	Prob.
OVER_CON	1.018	0.417	2.440	0.016
EC	1.641	0.675	2.430	0.018
EC_OVER_CON	-1.834	0.760	-2.410	0.018
AUDCHG	3.320	1.043	3.180	0.002
CFO	3.163	1.894	1.670	0.098
FCF	2.000	0.663	3.020	0.004
IBD	1.779	0.869	2.050	0.044
INST	0.689	0.597	1.150	0.248
LEV	-1.090	0.445	-2.450	0.017
MTB	-0.001	0.000	-1.840	0.066
ROA	0.565	0.292	1.930	0.057
SIZE	-0.068	0.044	-1.530	0.125
TENURE	0.113	0.047	2.430	0.015
C	3.394	1.296	2.620	0.009
R-squared	0.72	Adjusted R-squared		0.643
Rw-squared	0.77	Adjust Rw-squared		0.775
Akaike info criterion	218.26	Schwarz criterion		265.649
Deviance	204.40	Scale		1.028
R-squared statistic	22.87	Prob(Rn-squared stat.)		0.043

5. Discussion and conclusion

ESG performance, which combines environmental, social, and corporate governance elements, has become increasingly important in today's competitive scene. As corporate leaders, managers are essential in determining ESG strategies and direction. Emphasizing the moderating effect of environmental expenses, this study investigated how managerial overconfidence affected ESG performance in Iraqi businesses. Statistical analysis revealed a significant positive association between corporate ESG performance and managerial overconfidence. Overconfident managers are more likely to invest in and support ESG initiatives. This finding is consistent with what Wang et al. (2023) reported. It is a good result considering the unstable, uncertain local environment in Iraq. This was likely to inspire greater self-confidence and may encourage Iraqi managers to take bolder actions and invest in ESG-related projects under such conditions. In contexts with poor access to credible information, excessive managerial optimism could therefore misestimate the risks and costs of ESG activities. This study implies that environmental costing can be a valuable managerial tool that may diminish the positive relationship between managerial overconfidence and ESG performance. The results show that environmental costs weaken this link, implying that a clear and accurate environmental costing system may help reduce the effect of managerial overconfidence on ESG performance, thereby encouraging more rational and informed decision-making on ESG goals.

For more accurate assessments of ESG operations and to prevent costly or irrational decisions,

environmental costing provides managers with reliable information on the environmental costs and benefits of initiatives. This study highlights the need to create and implement an effective environmental costing system in Iraqi firms. Using environmental costing, managers may make better ESG-related decisions and reduce resource misallocation even when reliable data is hard to come by. In addition to reducing the negative effects of overconfident management, environmental costing can increase transparency and accountability inside companies on ESG matters. Trust can be built, and overall performance can be improved when stakeholders get information that is both accessible and accurate. The unique context of Iraq necessitates further research into the factors influencing the relationship among managerial arrogance, environmental costs, and ESG performance. These factors may include organizational culture, ownership structure, and government regulations. Environmental costing's impact on Iraqi businesses' investment choices and bottom lines might also shed light on promising avenues for further study. This study shows that environmental costing is an effective tool for mitigating the negative effects of managers' arrogance on ESG outcomes. Iraqi businesses can boost their ESG performance and speed up their path to sustainable growth by implementing an efficient environmental costing system.

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