Proceedings of the 3rd International Conference on Management Research and Economic Development
DOI: 10.54254/2754-1169/2025.24383

Research on the Impact of Deviation from Optimal Capital Structure on Corporate Performance —Adjustment effect Based on ESG performance

Xuzhou Liu

Business School, Qingdao University of Technology, Qingdao, China
1049361318@qq.com

Abstract. This study utilizes data from Chinese A-share listed companies between 2013 and 2023 to examine the relationship between capital structure, ESG performance, and corporate performance. The findings indicate that, among non-financial listed companies, deviation from the optimal capital structure—particularly due to excessive debt—significantly suppresses firm performance. Further analysis reveals an asymmetric moderating effect of ESG scores on this relationship: when firms are over-leveraged, strong ESG performance can mitigate the negative impact of capital structure deviation on performance; conversely, when firms are under-leveraged, improvements in ESG performance can amplify the positive effects of optimizing capital structure on corporate performance. Thus, the impact of capital structure on corporate performance varies depending on the level of ESG performance.

Keywords: Optimal Capital Structure, Leverage, ESG, Corporate Performance

1. Introduction

The relationship between capital structure and corporate performance has long been a central topic in the field of corporate finance, yet a consensus in the existing literature remains elusive. Graham et al. [1] argue that the two are positively correlated. In contrast, Qi Haodong and Liu Hao[2] suggest a negative relationship, contending that high leverage increases financial risk, raises the likelihood of bankruptcy, and suppresses firm performance. Meanwhile, studies by Li Lu, Liu Xiaoguang, and others[3][4] have found an inverted U-shaped relationship between debt levels and value creation, indicating that moderate levels of debt are necessary for maximizing firm value.

According to the trade-off theory of capital structure, there exists an optimal target capital structure—a point at which the costs and benefits of debt are balanced. A firm's actual capital structure is often influenced by a dynamic trade-off among tax shield benefits, agency costs, and bankruptcy risk. When the benefits of adjusting capital structure outweigh the associated costs, firms tend to realign their capital structures toward the theoretical optimum[5]. In recent years, China's macroeconomic policies have consistently emphasized the importance of optimizing capital structures. From the Central Financial and Economic Affairs Commission's proposal of "structural deleveraging" in April 2018 to the National Development and Reform Commission's policy direction in March 2023 of "stabilizing growth, stabilizing leverage, and preventing risks," the government has demonstrated a high level of concern regarding corporate capital structure management. Therefore, in the context of pursuing high-quality economic development, exploring the impact of deviations from the optimal capital structure on

DOI: 10.54254/2754-1169/2025.24383

corporate performance—along with its influencing factors—is crucial for helping firms enhance operational performance and achieve sustainable development by balancing financing costs and financial risk.

ESG (Environmental, Social, and Governance) is an emerging development paradigm that emphasizes the integration of environmental protection (E), social responsibility (S), and corporate governance (G) into business operations to promote harmonious development between firms and their stakeholders. ESG performance has become a key consideration in mainstream investment decisions, and an increasing number of firms view improving ESG outcomes as a critical strategy for enhancing long-term corporate value and strengthening market competitiveness[6]. According to data from China Chengxin Green Finance, as of June 30, 2024, there were 6,500 A-share and Chinese-funded Hong Kong-listed companies, of which 3,160 had disclosed ESG-related reports, yielding a disclosure rate of 48.62%. To date, most heterogeneous analyses of the relationship between capital structure and corporate performance have focused on structural characteristics such as industry type or ownership nature. Few studies have treated firms' dynamic performance—such as ESG levels—as continuous moderating variables to assess the variation in the leverage–performance relationship under different conditions. Therefore, based on panel data from Chinese A-share listed companies from 2013 to 2023, this study examines the impact of deviations from the optimal capital structure on corporate performance. It further investigates how different levels of ESG performance moderate this relationship, with the aim of providing a more comprehensive theoretical reference for corporate capital structure decisions and ESG practices.

2. Literature review

2.1 Capital structure and corporate performance

Capital structure refers to the composition and proportion of a firm's debt and equity financing. A well-structured capital mix can enhance a firm's profitability, debt-servicing capacity, and ability to access additional financing. On one hand, financial leverage can reduce a firm's income tax burden and increase its after-tax operating profit[7]. Lu Zhengfei et al. argue that debt serves a disciplinary governance function by mitigating agency costs arising from conflicts between shareholders and management. The obligation to repay debt principal and interest reduces the amount of free cash flow available to managers, thereby increasing external oversight[8]. In contrast, issuing equity exposes the firm to risks of control dilution and informational costs resulting from market asymmetries[9]. On the other hand, debt financing imposes fixed repayment obligations, placing pressure on the firm's cash flow[9]. Williamson suggests that equity financing enhances managerial autonomy, enabling managers to exercise greater flexibility in resource allocation and operational decision-making[10].

2.2 ESG and capital structure

From the environmental perspective, Ning Jinhui et al. found that government-implemented green credit policies significantly slow the pace at which firms in highly polluting industries adjust their capital structures, with this effect being more pronounced among state-owned enterprises[11]. From the dimension of social responsibility, Yang Nan's research indicates a negative correlation between corporate social responsibility (CSR) and capital structure. CSR performance influences investors' perceptions of business risk; as CSR levels improve, the perceived risk among investors declines, thereby reducing firms' financing costs[12]. From the corporate governance perspective, existing studies have shown that firms with poor governance structures exhibit significantly slower capital structure adjustments—whether they are over-leveraged or under-leveraged—compared to firms with higher governance quality[13]. Furthermore, Long Haiming and others, from a holistic ESG responsibility

DOI: 10.54254/2754-1169/2025.24383

perspective, found that improvements in ESG performance can facilitate both current and subsequent-period capital structure adjustments. Enhanced ESG outcomes help firms converge more rapidly toward their target capital structures and increase the flexibility of capital structure decision-making[14].

2.3 ESG and corporate performance

As an emerging comprehensive evaluation framework, ESG integrates multiple dimensions—including environmental, social, and governance factors—and aligns closely with the goals of corporate sustainable development[15]. In the early stages of ESG implementation, the long-term nature of returns from socially responsible investments often leads to a reduction in firm value. Increased expenditures on social responsibility initiatives may offset the stakeholder recognition effect, and may even trigger shareholder concerns regarding the underlying motivations of corporate decision-making, thereby significantly elevating financial risk[16]. In the long term, however, firms with superior ESG performance tend to reduce irrational over-investment behavior and alleviate financing constraints, thus improving investment efficiency[17]. Cui Xiumei et al. argue that companies can cultivate a favorable corporate image by proactively fulfilling social responsibilities and disclosing relevant information. This, in turn, helps mitigate adverse selection and moral hazard issues, thereby enhancing their advantage in areas such as credit approval[16]. In practice, an increasing number of studies have highlighted the positive impacts of ESG. Scholars have found that strong ESG performance can effectively reduce information asymmetry[18], lower financing costs[15], broaden financing channels[16], and curb tunneling behaviors by controlling shareholders[19].

3. Theoretical analysis and research hypotheses

Existing studies have shown that firms possess a target capital structure—namely, an optimal debt ratio—which varies across enterprises[20]. Therefore, evaluating whether a firm's actual capital structure is reasonable should not be based solely on the absolute level of leverage, but rather on the degree to which it deviates from the optimal capital structure. According to the trade-off theory, when a firm's debt ratio exceeds the optimal level, it enters a state of over-leverage. If the firm continues to expand its debt under these circumstances, the deviation from the optimal capital structure intensifies, and the cost of debt financing may surpass the returns on investment. First, the rise in financial risk increases the risk premium demanded by creditors. As total debt grows, the firm's interest expenses escalate significantly[2]. Additionally, an excessively high debt ratio undermines the firm's financial stability and increases the risk of bankruptcy. At this point, the marginal benefit of the tax shield effect brought by additional debt is far outweighed by the associated bankruptcy costs[16]. According to the study by Qi Haodong and Liu Hao, for over-leveraged firms, every 1% quarter-on-quarter decrease in the asset-liability ratio leads to a 0.229% quarter-on-quarter increase in return on equity[2]. Furthermore, to protect their interests, creditors such as banks often impose constraints on the investment decisions of over-leveraged firms, reducing both the scale and likelihood of further borrowing. These restrictions, in turn, inhibit new investments and innovation activities[21].

Based on the above analysis, the following hypothesis is proposed:

Hypothesis 1: When a firm's capital structure exceeds the optimal level, further increases in the debt ratio will have a significant negative impact on corporate performance.

Unlike previous studies, this paper argues that the relationship between capital structure and corporate performance is influenced by the firm's ESG performance. According to agency theory, managers of highly leveraged firms are more likely to reject high-quality investment projects that primarily benefit creditors, and instead prefer high-risk projects aimed at maximizing shareholder interests rather than firm value. Such short-sighted investment behavior is detrimental to long-term corporate performance[2]. Stakeholder theory suggests that maintaining sound relationships with

DOI: 10.54254/2754-1169/2025.24383

upstream and downstream partners is a key source of competitive advantage. ESG performance, as a reflection of quality and responsibility, enables stakeholders to perceive a firm's substantive efforts in enhancing core competitiveness and strengthening sustainable development capabilities. This helps mitigate information asymmetry, balances the diverse needs of information users, and strengthens mutual monitoring among creditors, shareholders, and management. As a result, managers are less likely to engage in opportunistic behavior and more likely to focus on creating long-term corporate value[16].

This suggests that ESG performance affects agency costs—one of the key pathways through which capital structure impacts corporate performance—thereby implying that ESG may serve as a moderating variable in the relationship between capital structure and corporate performance.

Accordingly, the following hypothesis is proposed:

Hypothesis 2: ESG performance moderates the relationship between deviation from the optimal capital structure and corporate performance.

According to the trade-off theory, when the returns from debt financing exceed the cost of capital, firms can achieve excess returns. However, as a firm's leverage increases, so does its bankruptcy risk, leading to rising financing costs that, in turn, weaken its market competitiveness[2]. Qi Haodong, Liu Hao, and others have found that financial risk plays a fully mediating role in the relationship between deleveraging and corporate performance[2]. From the perspective of external oversight, ESG performance can serve as a key criterion for regulators and financial institutions in evaluating corporate qualifications. Firms that proactively fulfill their social responsibilities are more likely to build a strong corporate image and gain recognition from regulatory authorities. This recognition facilitates access to bank loans, government subsidies, and diversified financing channels, thereby lowering financing costs and reducing the bankruptcy risks associated with high leverage[16].

Moreover, based on the resource-based view, a firm's unique resources and capabilities are sources of competitive advantage, and strategic advantage is gained through the effective integration of internal and external resources. Firms with strong ESG performance typically demonstrate superior resource integration capabilities and are more likely to prioritize long-term returns within their overall strategic planning[16]. Such firms are also more effective in deploying external debt capital into high-value operational activities.

Based on this, the following extended hypotheses are proposed:

Hypothesis 2.1: The moderating effect of ESG performance is asymmetric. Compared with under-leveraged firms, ESG performance plays a more significant role in mitigating the adverse impact of deviation from the optimal capital structure on corporate performance in over-leveraged firms.

Hypothesis 2.2: For under-leveraged firms, strong ESG performance positively moderates the relationship between reduced deviation from the optimal capital structure and corporate performance—such that as the deviation narrows, firm performance improves significantly.

4. Research design

4.1 Sample and variable selection

4.1.1. Data sources

This study selects A-share non-financial listed companies in China from 2013 to 2023 as the research sample. ESG data is sourced from Huazheng ESG Ratings, while other financial data is obtained from the CSMAR database. During the sample selection process, firms with abnormal values (asset-liability ratios greater than 1), companies under special treatment (ST), firms listed for less than one full year, and those with missing key variables were excluded. To mitigate the impact of outliers, all continuous variables were winsorized at the 1% level. After filtering, a final sample of 1,505 firms and 13,871 firm-year observations was obtained. Data processing was conducted using Excel and Stata 18.0.

DOI: 10.54254/2754-1169/2025.24383

This study adopts the Huazheng ESG Rating as the moderating variable in examining the relationship between deviation from the optimal capital structure and corporate performance. The Huazheng ESG Rating draws from major international evaluation frameworks and integrates characteristics of the Chinese market. It constructs a multi-tiered indicator system that incorporates key factors such as environmental governance, risk control, and corporate governance, thereby providing a comprehensive and scientific reflection of a firm's ESG performance. ESG performance is measured using the composite ESG score released in the fourth quarter of each year from 2013 to 2023. Corporate performance is used as the dependent variable in this study and is measured by return on equity (ROE), a profitability indicator.

Furthermore, the core explanatory variable—deviation from the optimal capital structure—is constructed following the methodology of Lu Zhengfei et al.[20], by establishing a model to estimate the firm's target leverage ratio. As shown in Model (1), the firm's actual asset-liability ratio is taken as the dependent variable, while the factors influencing the target debt ratio are used as lagged independent variables. These include: ownership nature (Soe), return on assets (Roa), growth potential (Grow), firm size (Size), ownership concentration (Holder1), fixed asset ratio (Fx), and the industry-year median debt ratio (Li). α_0 represents the constant term, and α_1 to α_7 denote the regression coefficients.

$$\mathrm{Lev}_{i,t} = \alpha_0 + \alpha_1 \mathrm{Soe}_{i,t-1} + \alpha_2 \mathrm{Roa}_{i,t-1} + \alpha_3 \mathrm{Grow}_{i,t-1} + \alpha_4 \mathrm{Size}_{i,t-1} + \alpha_5 \mathrm{Holder1}_{i,t-1} + \alpha_6 \mathrm{Fx}_{i,t-1} + \alpha_7 \mathrm{Li}_{i,t-1} + \varepsilon_{i,t} \quad (1)$$

First, based on Model (1), Tobit regressions are conducted annually and by industry across the sample to obtain the predicted optimal capital structure, denoted as Lev∗. The degree of deviation from the optimal capital structure, Dl, is then calculated as the difference between the firm's actual capital structure Lev and the predicted optimal capital structure Lev∗. When Dl>0, the firm's actual capital structure exceeds the optimal level, indicating an over-leveraged state; conversely, when Dl<0, the capital structure falls below the optimal level, reflecting an under-leveraged condition.

To test Hypothesis 1, a panel data regression model is constructed as follows:

$$\mathrm{Roe}_{i,t} = \alpha_0 + \beta_1 \mathrm{Dl}_{i,t} + \beta_2 \mathrm{Size}_{i,t} + \beta_3 \mathrm{Far}_{i,t} + \beta_4 \mathrm{Cr}_{i,t} + \beta_5 \mathrm{Holder1}_{i,t} + \beta_6 \mathrm{Age}_{i,t} + \beta_7 \mathrm{Idd}_{i,t} + \beta_8 \mathrm{Lnjs}_{i,t} + \varepsilon_{i,t}$$

To test Hypothesis 2, a panel data regression model is constructed by introducing an interaction term:

$$\mathrm{e}_{i,t} = \alpha_0 + \beta_1 \mathrm{Dl}_{i,t} + \beta_2 \mathrm{Esg}_{i,t} + \beta_3 \mathrm{Dl}_{i,t} \times \mathrm{Esg}_{i,t} + \beta_4 \mathrm{Size}_{i,t} + \beta_5 \mathrm{Far}_{i,t} + \beta_6 \mathrm{Cr}_{i,t} + \beta_7 \mathrm{Holder1}_{i,t} + \beta_8 \mathrm{Age}_{i,t} + \beta_9 \mathrm{Grow}_{i,t} + \beta_{10} \mathrm{Idd}_{i,t} + \beta_{11} \mathrm{Lnjs}_{i,t} + \mu_{i,t} +$$

Where i represents a specific firm, t denotes the time period, $\mu_{i,t}$ captures unobservable individual heterogeneity, and $v_{i,t}$ is the residual random error term. Drawing on existing studies[2][12], this paper includes a series of control variables, namely: firm size (Size, log-transformed), fixed asset ratio (Far), current ratio (Cr), ownership concentration (Holder1, shareholding ratio of the largest shareholder), firm age (Age), sustainability capacity (Grow, main business revenue growth rate), proportion of independent directors (Idd), and supervisory board size (Lnjs, natural logarithm of the number of supervisors). Additionally, year and industry fixed effects are controlled for, with industry classification following the CSRC (China Securities Regulatory Commission) standards.

5. Empirical results and analysis

5.1 Descriptive statistics and correlation analysis

As shown in Table 1, among the 13,871 samples, the mean value of ROE is 0.036, with a maximum of 0.339 and a minimum of -1.065, indicating significant performance disparities across firms. The deviation in capital structure reaches a maximum of 78.3% and a minimum of -58.6%, demonstrating that some firms' capital structures substantially deviate from the optimal level. The median and mean

DOI: 10.54254/2754-1169/2025.24383

ESG scores both approximate 73%, suggesting that the overall environmental and social governance performance of A-share listed companies generally lies in the moderately high range. Most firms emphasize fulfilling ESG responsibilities and have allocated corresponding resources to environmental protection and social welfare initiatives. However, the individual variation in ESG scores is considerable, with a maximum of 84.6% and a minimum of only 57%.

Table 1: Descriptive statistics

Variable	Mean	Standard Deviation	Minimum	Median	Maximum
Roe	0.036	0.171	-1.065	0.059	0.339
Lev	0.490	0.204	0.074	0.493	0.929
Dl	-0.001	0.158	-0.586	0.001	0.783
Esg	0.732	0.052	0.570	0.733	0.846
Size	22.840	1.432	19.942	22.708	26.860
Far	0.236	0.185	0.001	0.192	0.744
Cr	1.837	1.599	0.252	1.389	10.903
Holder1	36.818	15.193	10.645	34.720	76.129
Age	16.162	7.465	1.000	17.000	30.000
Grow	0.128	0.409	-0.582	0.067	2.607
Idd	37.411	5.520	33.330	35.710	57.140
Lnjs	1.317	0.281	1.099	1.099	2.079

Table 2 reports the core test results of the relationship between deviation from optimal capital structure and corporate performance for over-leveraged firms. In the baseline regressions, a stepwise regression strategy was employed. Column (1) controls only for time and industry fixed effects; the regression coefficient of the deviation from optimal capital structure (Dl) is -0.307 and is statistically significant at the 1% level. In Column (2), after adding a partial set of control variables, the coefficient magnitude increases slightly to -0.386, likely because the inclusion of controls reduces interference from other factors, making the explanatory variable's effect on performance clearer. Column (3) presents the results when all control variables are included in the model, with company and industry fixed effects controlled; the Dl coefficient is -0.322 and remains significant at the 1% level. Column (4) reports the results using Ordinary Least Squares (OLS) regression, controlling for year and industry-fixed effects, with significance levels unchanged. These results indicate that for firms with excessive leverage, a positive deviation from the optimal capital structure significantly reduces corporate performance, demonstrating a significant negative correlation between the two. Therefore, Hypothesis 1 receives empirical support.

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Table 2: Deviation from optimal capital structure and corporate performance

Variable	(1) Roe	(2) Roe	(3) Roe	(4) Roe
Dl	-0.307*** (-10.41)	-0.310*** (-9.84)	-0.322*** (-10.22)	-0.178*** (-8.08)
Size			0.017*** (2.63)	0.018*** (9.87)
Far		-0.155*** (-4.24)	-0.190*** (-5.27)	-0.094*** (-6.05)
Cr		0.006*** (2.6)	0.007*** (3.00)	0.006*** (3.59)
Holder1			0.001*** (2.91)	0.001*** (8.5)
Age			-0.005*** (-5.06)	-0.001* (-1.96)
Grow		0.077*** (17.75)	0.072*** (16.91)	0.070*** (15.27)
Idd			0 (-0.48)	-0.001* (-1.80)
Lnjs			-0.008 (-0.45)	0.012 (1.64)
Constant	0.104** (2.07)	0.051*** (4.66)	-0.206 (-1.36)	-0.419*** (-9.32)
N	6,970	6,970	6,970	6,970
Industry	YES	YES	YES	YES
Year	YES	YES	YES	YES
Adj.R^2	0.043	0.086	0.101	0.114

Note: ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. The figures in parentheses are t-statistics; the same applies below.

5.2 Robustness checks

1. The explanatory variable is replaced with a dummy variable (Dl*), where Dl* is assigned a value of 1 if the firm's debt ratio increases compared to the previous period, and 0 otherwise. The results are shown in Column (1) of Table 3.

2. To more intuitively capture the firm's operational performance, return on total assets (ROA) growth (Croat = Roat -Roat-1) is used as the dependent variable. The results are reported in Column (2) of Table 3.

3. The sample period is adjusted to control for potential endogeneity caused by major adverse financial shocks affecting firm performance and financing behavior. Specifically, since the 2015–2016 stock market crash and its aftermath significantly impacted the capital markets, data from this period are excluded for testing; the results appear in Column (3) of Table 3. Additionally, the COVID-19 pandemic severely disrupted the economic environment and may have influenced firm decisions. To eliminate this effect, samples from 2020 to 2022 are removed, and regressions are re-run, with results shown in Column (4) of Table 3. The regression outcomes demonstrate that the core conclusions of this study remain highly robust.

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Table 3: Robustness checks

Variable	Alternative Explanatory Variable	Alternative Dependent Variable	Excluding 2 Years of Stock Market Crash	Excluding Stock Market Crash and 3 Years of Pandemic
	Roe	Croa	Roe	Roe
Dl*	-0.043*** (-7.67)			
Dl		-0.298*** (-18.17)	-0.563*** (-8.36)	-0.606*** (-7.39)
Control Variables	Included	Included	Included	Included
Constant	-0.318 (-1.04)	0.266*** (4.87)	-0.048 (-0.18)	0.292 (1.04)
N	5,791	6,970	5,878	3,774
Ind	YES	YES	YES	YES
Year	YES	YES	YES	YES
Adj.R2	0.103	0.226	0.137	0.14

5.3 Moderation effect test

Table 4 reports the results of testing the moderating effect of ESG performance. The ESG score variable (Esg) and the first-order interaction term between optimal capital structure deviation and ESG score (Dl × Esg) are introduced to examine the moderating effect separately in samples of under-leveraged and over-leveraged firms. Given that studies related to ESG often face endogeneity concerns, this paper incorporates the lagged ESG score as the moderator to mitigate reverse causality effects. The results show that in all models, the coefficient of the optimal capital structure deviation is significantly negative, while the coefficient of the interaction term is significantly positive, indicating a positive moderating effect of ESG performance on the relationship between capital structure deviation and firm performance. Thus, Hypothesis 2 is supported. Moreover, the lagged ESG's moderating effect is stronger than that of the current period, suggesting that the market response to a firm's ESG efforts requires a certain time lag.

Notably, among over-leveraged firms, the coefficient, significance level, and correlation of ESG's moderating effect are greater, indicating an asymmetry in ESG's moderating role. Compared with under-leveraged firms, ESG performance more significantly alleviates the negative impact of capital structure deviation on firm performance for over-leveraged firms. Therefore, Hypothesis 2.1 is supported.

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Table 4: Moderating effect of ESG performance

	Dl<0		Dl>0	
Variable	Esg Roe	Esg_{t-1} Roe	Esg Roe	Esg_{t-1} Roe
Dl	-0.865*** (-2.58)	-1.176*** (-4.11)	-2.741*** (-3.88)	-3.209*** (-3.54)
Esg	0.364*** (4.63)	0.218*** (3.19)	-0.021 (-0.17)	-0.351** (-2.28)
Dl×Esg	1.184*** (2.67)	1.596*** (4.18)	2.991*** (3.02)	3.443*** (2.76)
Control Variables	Included	Included	Included	Included
Constant	-0.578*** (-3.44)	-0.825*** (-3.76)	0.163 (0.65)	0.15 (0.46)
Observations	6,901	5,085	6,970	5,128
Industry	YES	YES	YES	YES
Year	YES	YES	YES	YES
Adj.R^2	0.098	0.102	0.145	0.157

6. Further research

The baseline model analysis shows that for over-leveraged firms, actual capital structure deviations from the optimal level significantly reduce performance. However, firms often have an inherent tendency to increase leverage. Therefore, for firms that are not over-leveraged, what impact does appropriately increasing the debt ratio to reduce capital structure deviation have on performance? To accurately identify the economic consequences of optimal capital structure deviation for firms with different ESG levels, this study divides the sample based on the median ESG score (Esg_median) and conducts grouped empirical analyses on the impact of capital structure deviation.

The effects of optimal capital structure deviation on firm performance for firms with different ESG scores are reported in Table 5. The results indicate that strong ESG performance positively moderates the relationship between capital structure deviation and performance, with this positive effect being more pronounced among over-leveraged firms. Among firms that are not over-leveraged (Dl < 0), those with high ESG scores show a significant positive correlation between the increase in Dl (i.e., a reduction in deviation from the optimal capital structure) and performance at the 1% significance level. This suggests that firms with superior non-financial performance are better able to enhance financial performance by expanding their operations, thereby supporting Hypothesis 2.2. Conversely, firms with lower ESG scores exhibit a negative correlation between capital structure deviation and performance at the 10% significance level, indicating that for firms with weaker sustainability capabilities, increasing financial leverage may not be an ideal way to improve performance.

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Table 5: Grouped regression results testing hypothesis 2.2

Variable	Dl<0 Esg>Esg_median	Dl<0 Esg<Esg_median	Dl>0 Esg>Esg_median	Dl>0 Esg<Esg_median
	Roe	Roe	Roe	Roe
Dl	0.089***	-0.074*	-0.468***	-0.712***
	3.24	(-1.76)	(-5.09)	(-8.37)
Control Variables	Included	Included	Included	Included
Constant	-0.17	-0.629***	0.756**	0.016
	(-1.13)	(-2.72)	(2.22)	(0.04)
Observations	3,453	3,451	3,487	3,486
Industry	YES	YES	YES	YES
Year	YES	YES	YES	YES
Adj.R^2	0.141	0.081	0.148	0.13

7. Research conclusions and policy implications

This study uses data from Chinese A-share listed companies over the period 2013–2023 to empirically examine the relationship between deviation from optimal capital structure and corporate performance from an ESG perspective. The analysis reveals that under conditions of excessive leverage, a greater deviation from the optimal capital structure significantly reduces financial performance. Furthermore, corporate ESG performance plays a significant moderating role in this relationship: for firms with insufficient leverage but high ESG levels, an increase in debt financing ratio can enhance performance; for over-leveraged firms, ESG substantially mitigates the negative impact of deviation from the optimal capital structure on performance. This indicates that stakeholder recognition brought about by superior ESG performance helps reduce the performance losses associated with high-leverage operations.

This study offers the following policy implications:

First, enterprises should dynamically assess their optimal capital structure and proactively balance risks and returns to avoid deviations caused by overly aggressive expansion or excessively conservative financing strategies. At the same time, capital structure decisions must incorporate the influence of ESG performance. When ESG levels are high, firms can synergistically increase their debt financing ratios to maximize value. Conversely, for firms with lower ESG performance, priority should be given to improving ESG governance to broaden debt financing channels and prevent liquidity crises triggered by environmental compliance risks.

Second, enterprises should fully recognize the crucial role of ESG principles in enhancing performance. Overleveraged firms, in particular, need to strive to improve their ESG performance by strengthening internal governance structures and fulfilling external responsibilities. High-ESG-performing companies should proactively showcase their growth potential and cultivate a responsible corporate image, thereby efficiently integrating social resources and addressing stakeholder demands. This, in turn, facilitates expanded investment, optimized capital structure, and improved overall performance.

Third, regulatory authorities should accelerate the standardization of ESG information disclosure and rating mechanisms, improving the ESG disclosure system to reduce information asymmetry. This will enable enterprises' self-optimization efforts to be promptly reflected in the capital markets, guiding market resources toward companies with higher resource allocation efficiency and stronger ESG responsibilities, thereby promoting the coordinated advancement of both short-term market performance and long-term sustainable development.

DOI: 10.54254/2754-1169/2025.24383

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