ISSN 2616-5902 Vol. 8, Issue 3: 1-9, DOI: 10.25236/AJBM.2026.080301

A Study on the Nonlinear Governance Effects of ESG Performance: Dual Evidence from ST Risk and ESG Rating Migration

Yuejia Dai[1,a,*], Yuanhua Liu[1,b]

[1]*Business School, University of Shanghai for Science and Technology, Shanghai, China*
[a]*3119464874@qq.com,* [b]*Liuyh1210@sina.com*
[*]*Corresponding author*

Abstract: *In the context of the "dual carbon" strategy and the growing integration of sustainable principles into business activities, ESG performance has become an essential non-financial indicator for corporate value. This study utilizes data from A-share listed businesses (2009–2024) and Huazheng ESG scores, employing a panel threshold Logit model to analyze the nonlinear effects of ESG performance on ST risk and ESG rating migration, as well as the underlying mechanisms. Findings indicate that ESG demonstrates a single threshold effect on reducing ST risk, with a threshold of approximately 70.013 for ST risk, 70.013 for rating upgrade and 75.060 for rating downgrade, beyond which the risk-mitigation effect significantly intensifies. Secondly, ESG influences rating migration asymmetrically: upward migration is limited by a "ceiling effect" for high ESG enterprises, whereas downward migration exhibits an asymmetric threshold effect, increasing downgrade risks for these entities. Third, financing constraints serve as a critical boundary condition, exerting a profound moderating effect. The environmental sensitivity of industries reveals structural heterogeneity: sensitive sectors exhibit stronger ST risk mitigation, whereas non-sensitive sectors face more severe upgrade constraints. This study elucidates the nonlinear structural impact of ESG in corporate extreme risk and ESG dynamics from a nonlinear governance viewpoint, providing theoretical and empirical backing for differentiated ESG strategies, improved rating systems, and augmented regulatory risk alerts.*

Keywords: *ESG; nonlinear governance effect; threshold effect; ESG rating migration; ST risk; financing constraints; industry heterogeneity*

1. Introduction

During the "dual carbon" transformation, ESG has transformed from a marginal component of CSR to a crucial connection between environmental regulations and company sustainability [1][2]. More stringent rules create compliance requirements, while capital markets increasingly emphasize non-financial criteria, rendering ESG essential for financing and risk management [3]. This prompts a critical inquiry: Does ESG influence Special Treatment (ST) risk and ESG ratings in a linear manner, or through a nonlinear "threshold" effect? In China's market, marked by a "rating inflation," the systemic influence of ESG on rating migration is still inadequately examined [4].

Current literature validates the risk-mitigation function of ESG but is deficient in examining its nonlinear impacts on ST risks and particular thresholds [5][6]. In assessing corporate sustainability capabilities, the international community and academia have widely adopted ESG ratings as a core measurement standard [7]. However, a local study observes a "ceiling effect" during periods of elevated ratings; nonetheless, empirical exploration of asymmetric mechanisms and threshold structures concerning upgrades vs. downgrades remains scarce [4]. Moreover, the moderating influence of internal financing constraints [8] on the ESG rating link remains inadequately comprehended.

The article uses the A-share listed companies as the panel threshold Logit model's data, and takes ESG from 2009 to 2024 to explore the nonlinear relationship with ST risk and ESG rating migration. The paper regards finance constraints (SA index) as a moderating factor. This paper combines ST risk theory and ESG rating theory in its theories section and examines if ESG is non-linear and has a threshold property. This paper gives us some ideas on ESG strategy, ESG score system and early warning of risk.

ISSN 2616-5902 Vol. 8, Issue 3: 1-9, DOI: 10.25236/AJBM.2026.080301

2. Theoretical Examination and Research Propositions

2.1. ESG Performance and ST Risk: Nonlinear Threshold Effects of Governance

ST means the last stage marker for companies to show their corporate finance problems or big operation problems in capital market and this is the general risk of a company. Anchored on stakeholder theory [9], information asymmetry theory [10]: ESG activities that are effective reduce the possibility for ST because they increase both internal and external supervision; better ESG performance gives stakeholders such as shareholders, creditors, regulators more confidence and support if the company has problems [4]. On the contrary, transparent ESG disclosure will bring visibility of operations and helps in spotting risks at an early stage so take corrective measures [11].

The correlation between ESG and ST risk is non-linear. At lower ESG levels, business initiatives typically prioritize fundamental compliance, resulting in minimal governance advantages and inadequate ST risk mitigation [6]. When ESG performance exceeds a critical threshold, synergistic improvements emerge in green innovation strength, access to external capital, stakeholder relationships, and governance structures [12]. The effects of "reputational insurance" and "supervisory constraint" are highly magnified, accelerating the reduction of ST risk. This nonlinear pattern is indirectly corroborated by empirical studies demonstrating threshold or growing marginal benefits of ESG on corporate innovation quality, technological innovation [13], and firm value [14].

This study posits the following hypothesis:

H1: ESG performance has a major threshold on ST risk. Under the threshold, it's hard to reduce governance-driven risk; but once the threshold is passed, the marginal efficiency of risk suppression rises greatly.

2.2. ESG Performance and ESG Rating Migration: Asymmetric Signal Transmission Effects

In the context of ESG rating markets in China, there is a constant phenomenon of a "rating inflation," characterized by a broad-based inflationary pattern in the high rating segment, limiting rating distinctiveness and dynamism. In this context, companies with high ESG performance tend to be assigned high initial ratings, thereby establishing a system of "high baseline, constrained upgrade potential." Though high ESG performance enhances innovation quality [12], comprehensive performance [15]and sustainable value [16], this does not directly translate into rating migration due to institutional limitations, resulting in an unbalanced threshold effect. At high ESG performance levels, companies face a "ceiling effect" in seeking further rating upgrades when they are near the system's maximum rating threshold.

This paper posits the following hypothesis:

H2: Under China's "rating inflation" and high initial ESG ratings, ESG exerts an asymmetric threshold effect on ESG rating migration. Once ESG surpasses the threshold, high-ESG firms face constrained upgrade opportunities and an increased marginal probability of downgrades.

H2a: Within the Huazheng ESG framework, a higher lagged ESG score reduces the likelihood of a subsequent rating upgrade. This negative effect intensifies after crossing the threshold, reflecting a "ceiling effect" driven by the "high starting point, limited upside" constraint.

H2b: Under the "rating inflation" environment, a higher lagged ESG score increases the probability of a subsequent rating downgrade. After surpassing the threshold, this positive effect becomes more pronounced, indicating an "asymmetric threshold effect" whereby high-ESG firms are more prone to downgrades from elevated levels.

2.3. Mechanism Test: Moderating Influence of Financing Constraints

This current paper sees finance restrictions as an essential boundary situation for comprehending ST risk suppression and ESG rating changes; this research depends upon theoretical concepts including resource assignment [8] and signal disturbance [10]. A good ESG score is a sign of lasting value and stability, but if a lot of the money trouble happens in short time periods then that's short term cash problems no matter how much you try to stick with ESG long-term [7]. When negative signals are sent because of extreme financial pressure, outstanding ESG performance becomes proof of lasting worth which helps companies get needed external confidence and support when it's a crisis. So relative to

ISSN 2616-5902 Vol. 8, Issue 3: 1-9, DOI: 10.25236/AJBM.2026.080301

their more fortunate rivals, companies that encounter serious financial limits depend on this form of contact much more, thereby contradictorily intensifying the mitigating function of ESG about ST risk.

Furthermore, it would take great investment to break through the ratings ceiling at high ESG levels; however, there were very serious financial constraints on how much a firm could allocate its resources toward sustainable development. Capital shortage forces management to put resources first for short-term survival needs, which leads to a lack of long-term, high-quality ESG investment This dynamic worsens the "ceiling effect", further limiting upward rating movement for those with initial high ratings.

Lastly on the rating downgrades, in these kind of finances shortfalls where companies get very high initial ESG scores are not just resource limits, but stand in strong contrast to prior positive ESG score. This conflicting condition amplifies outside concerns about how weak the company is, making it very probable that there will be a drop.

This study posits the subsequent mechanism hypothesis:

H3: Financing constraints serve as a critical boundary condition that moderates the governance effects of ESG performance. Specifically, elevated financing constraints are expected to strengthen the risk-mitigation effect on ST risk, exacerbate the "ceiling effect" for rating upgrades, and amplify the marginal probability of rating downgrades for high-ESG firms.

3. Research Design and Data Sources

3.1. Sample Selection and Data Sources

The study looks at A-share listed firms from 2009 to 2024. ESG data is taken from Huazheng ESG database: It can be seen that financing constraints are an important moderating variable and the Size-Age Index was used as a measurement of this [8]: SA index company size, age information comes from CSMAR.

After initial data processing, the full sample has 51,654 firm-year observations. As our main explanatory variable ESG_lag1 needs to lag by one period and rating migration variables require two periods of ratings, the sample in every threshold regression such as ST risk, rating upgrade and rating downgrade is 46,225 samples.

3.2. Definitions of Variables

In this paper, important variables are divided into 4 categories: Dependent Variable, Explanatory Variables, Mechanism Testing Variable, Control Variable to study on nonlinear effects of ESG performance on ST risk, movement of ESG score and inner working. The detailed definitions for all four variable categories are listed in Table 1.

Table 1: Definitions and Explanations of Variables.

Variable Type	Variable Name	Variable Symbol	Construction Method
Dependent Variable	ST risk	ST risk	Dummy variable: 1 if the firm is ST in the current year, 0 otherwise
	Rating Upgrade	Upgrade	Huazheng ESG Rating (C~AAA) converted to numerical values (C=1, CC=2, CCC=3, B=4, BB=5, BBB=6, A=7, AA=8, AAA=9). If current rating > previous rating, set to 1; otherwise set to 0
	Rating Downgrade	Downgrade	Constructed logically analogous to rating upgrade: takes value 1 if current rating < previous rating, otherwise takes value 0
Explanatory Variables	Lagged ESG Score	ESG_lag1	Sorted by "Company - Year," the overall ESG composite score is lagged by one period (ESG_lag1=ESG_{t-1}); winsorized at the 1st and 99th percentiles
Control Variables	Company Fixed Effects	Firm FE	Construct dummy variables using stock codes as identifiers (N companies correspond to N-1 dummy variables)
	Year Fixed Effects	Year FE	Construct dummy variables based on rating years (2009–2024; 16 years corresponding to 15 dummies)
	Industry × Year Fixed Effects	Industry × Year FE	CSRC Industry (New) Classification × Year Interaction Dummy Variable
Mechanism Testing Variable	Financing Constraints	SA	Calculated using the formula: $SA_{it} = -0.737 \times Size_{it} + 0.043 \times Size_{it}^2 - 0.04 \times Age_{it}$ (Note: A higher SA value indicates weaker financing constraints)
	High Financing Constraint Group	HighFC	Dummy variable: 1 if SA index < sample median (High Financing Constraint), 0 otherwise (Low Financing Constraint)

Note: 1. Huazheng ESG ratings consist of 9 stages, with rigorous numerical assignments to guarantee quantitative consistency. 2.

ISSN 2616-5902 Vol. 8, Issue 3: 1-9, DOI: 10.25236/AJBM.2026.080301

Winsorization is applied to reduce the impact of outliers on regression outcomes.

3.3. Model Construction

3.3.1. Panel Threshold Logit Model

This work develops a panel threshold Logit model to evaluate hypotheses H1 and H2, defined as follows:

$$Logit(P(ST\_risk_{it}=1)) = \alpha_i + \delta_{jt} + \beta_1 ESG\_lag1_{it} \cdot I(ESG\_lag1_{it} \le \gamma) + \beta_2 ESG\_lag1_{it} \cdot I(ESG\_lag1_{it} > \gamma) \quad (1)$$

$$Logit(P(Upgrade_{it}=1)) = \alpha_i + \delta_{jt} + \beta_1 ESG\_lag1_{it} \cdot I(ESG\_lag1_{it} \le \gamma_{up}) + \beta_2 ESG\_lag1_{it} \cdot I(ESG\_lag1_{it} > \gamma_{up}) \quad (2)$$

$$Logit(P(Downgrade_{it}=1)) = \alpha_i + \delta_{jt} + \beta_1 ESG\_lag1_{it} \cdot I(ESG\_lag1_{it} \le \gamma_{down}) + \beta_2 ESG\_lag1_{it} \cdot I(ESG\_lag1_{it} > \gamma_{down}) \quad (3)$$

Where: $Logit(p) = ln\left(\frac{p}{1-p}\right)$ is the Logit link function; α_i denotes company fixed effects; δ_{jt} indicates the industry × year fixed effect for industry j in year t; $I(\cdot)$ is an indicator function equal to 1 when the condition in parentheses is satisfied, and 0 otherwise; $\gamma, \gamma_{up}, \gamma_{down}$ are the corresponding ESG threshold values for the model; β_1 and β_2 denote the marginal impact of ESG_lag1 on ST risk for values below and above the threshold, respectively. γ is the threshold value established by grid search inside the 10%–90% percentile range of ESG_lag1. The Bootstrap approach (B=500) is employed to evaluate the relevance of the threshold effect.

3.3.2. Mechanism Model

This study takes finance constraint as an important moderating mechanism to test the boundaries of the effect of ESG. Based on Jiang's [17] recommendation to use heterogeneity analysis for causal mechanisms, we take a moderate approach to evaluate how financing constraints these boundaries impact governance effectiveness according to ESG.

(1) Following Hadlock & Pierce, financing constraints are proxied by the Size-Age (SA) Index [8], constructed as follows:

$$SA_{it} = -0.737 \times Size_{it} + 0.043 \times Size_{it}^2 - 0.04 \times Age_{it} \quad (4)$$

Where $Size_{it}$ denotes the natural logarithm of firm i's total assets in year t; Age_{it} represents the firm's listing duration.

(2) To examine whether ESG significantly influences financing constraints, the following panel fixed-effects model is constructed:

$$SA_{it} = \alpha_i + \delta_{jt} + \beta_1 ESG\_lag1_{it} + \varepsilon_{it} \quad (5)$$

Where SA_{it} represents financing constraints (SA index); ϵ_{it} is the random error term.

To test the moderating function of financial constraint on ESG-risk/rating link, we carry out grouped regression based on constraint level, in line with principle connecting moderation effects with heterogeneity analysis [17]. This study uses two approaches to analyze, one is group-regression and the other is interaction-term.

1) Grouped Regression Model

The sample is divided into High Financing Constraint (HighFC=1) and Low Financing Constraint (HighFC=0) groups based on the median SA index. Panel Logit models are estimated separately to examine ESG's impact on ST risk, rating upgrades, and rating downgrades. The model takes the following form:

$$Logit(P(Y_{it}=1)) = \alpha_i + \delta_{jt} + \beta_1 ESG\_lag1_{it} \quad (6)$$

Where: Y_{it} denotes the dependent variable (ST risk, rating upgrade, or rating downgrade).

2) Interaction Term Model

To formally test the statistical significance of group differences, the following interaction term model is constructed:

ISSN 2616-5902 Vol. 8, Issue 3: 1-9, DOI: 10.25236/AJBM.2026.080301

$$Logit(P(Y_{it}=1)) = \alpha_i + \delta_{jt} + \beta_1 ESG\_lag1_{it} + \beta_2 HighFC_{it} + \beta_3 (ESG\_lag1_{it} \times HighFC_{it}) \quad (7)$$

Where $HighFC$ is a dummy variable equal to 1 if a firm's SA index is below the median (i.e., High Financing Constraint), and 0 otherwise (Low Financing Constraint).

4. Empirical Analysis

4.1. Descriptive Statistics of Principal Variables

Table 2 provides the descriptive statistics for main variables (N=46,225 firm-years): The average value of ST risk is 0.039; that is, about 3.9% of companies are subjected to ST treatments annually. Upgrades on average have a probability of 0.233, and downgrades 0.254. There are more downward than upward rating transitions by a small margin. ESG_lag1 mean was 73.273(SD=4.838), which means relatively large levels with big cross-sectional variation.

Table 2: Descriptive Statistics of Key Variables.

Variable	Obs	Mean	Std. Dev.	Min	Max
ST risk	46225	.039	.193	0	1
Upgrade	46225	.233	.423	0	1
Downgrade	46225	.254	.435	0	1
ESG_lag1	46225	73.273	4.838	56.02	89.3
SA	46225	-3.847	.294	-4.556	-2.729

4.2. Benchmark Regression Analysis

This paper attempts to analyze the non-linear effect of ESG scores on ST risk and ESG rating migration, and it also looks into the possibility of ESG's threshold effect at different levels of thresholds. Table 3 presents the effects of threshold on ST risk and rating migration by ESG.

Table 3: Threshold Effects of ESG on ST Risk and Rating Migration.

Dependent Variable	(1) ST risk	(2) Upgrade	(3) Downgrade
Threshold Value ($\hat{\gamma}$)	70.013 (p<0.001)	70.013 (p<0.001)	75.060 (p<0.001)
ESG_lag1 $\leq \hat{\gamma}$	-0.106*** (0.009)	-0.0456*** (0.0041)	0.0191*** (0.0037)
ESG_lag1> $\hat{\gamma}$	-0.113*** (0.008)	-0.0618*** (0.0037)	0.0305*** (0.0033)
Control Variables	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes
Likelihood Ratio Statistic(LR)	37.49 (p=0.002)	23.63 (p<0.001)	463.28 (p<0.001)
Observations	46,225	46,225	46,225

Note: 1. Values in parentheses indicate robust standard errors adjusted for firm-level clustering to control for intra-firm annual serial correlation; 2. * p<0.1, ** p<0.05, *** p<0.01; 3. Thresholds determined via 10%-90% quantile grid search (1 quantile step size), with LR statistics based on 500 pair-cluster bootstrap tests.

As for H1, ESG has only 1 turning effect on ST risk. when ESG is less than 70.013 the mitigation is limited(-0.106) but after crossing this threshold it lowers risk much more (−0.113), thus supporting H1.

A "ceiling effect" is present for rating upgrades in H2. When ESG exceeds 70.013, its negative effect on upgrades amplifies (-0.0618), corroborating H2a. An "asymmetric threshold effect" arises for downgrades. When ESG surpasses 75.060, its positive effect on downgrade probability amplifies (0.0305), signifying more downgrade susceptibility for high ESG enterprises, hence validating H2b.

The results validate substantial nonlinear, threshold-dependent influences of ESG on both ST risk and rating migration, with the intensity of impact significantly escalating beyond certain thresholds.

4.3. Robustness Test

A Probit threshold model is used to check if the results from the main model stay true when using a different model than Logit. The threshold effects of ESG on ST risk, upgrading and downgrading were

ISSN 2616-5902 Vol. 8, Issue 3: 1-9, DOI: 10.25236/AJBM.2026.080301

re-assessed without changing the set parameters in terms of thresholds search and fixed effects. This tests whether core outcomes depend on the type of model being used Table 4 shows the Probit estimates.

Table 4: Robustness Test: Probit Threshold Model Replacement.

Dependent Variable	(1) ST risk	(2) Upgrade	(3) Downgrade
ESG_lag1 ≤ $\hat{\gamma}$	-0.051*** (0.007)	-0.024*** (0.002)	0.012*** (0.002)
ESG_lag1> $\hat{\gamma}$	-0.055*** (0.006)	-0.034*** (0.002)	0.018*** (0.002)
Constant	1.857*** (0.692)	2.221** (1.121)	3.330*** (0.660)
Observations	46,225	46,225	46,225
Control Variables	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes

Robust standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01

The Probit model estimates strongly correspond with the Logit results, supporting the fundamental conclusions. Regarding ST risk, ESG has a substantial negative impact on both sides of the threshold, with a greater coefficient magnitude in the high interval (-0.055 vs. -0.051), affirming the robustness of the single-threshold effect. For rating upgrades, the negative effect intensifies after crossing the threshold, corroborating the "ceiling effect". For rating downgrades, the coefficient in the low-ESG interval is 0.012 (p<0.01) and increases to 0.018 (p<0.01) in the high-ESG interval, further validating the "asymmetric threshold effect" for high-ESG firms.

The Probit robustness tests validate that the nonlinear threshold effects of ESG on ST risk and rating migration are consistent across several model parameters, indicating significant resilience.

4.4. Mechanism Analysis

Drawing on the research paradigm of Jiang [17], which advocates for strengthening causal arguments through moderating-effects analysis, this study adopts a dual-verification approach combining grouped regression and interaction term models to comprehensively examine how financing constraints (SA index), acting as a boundary condition, moderate the governance efficacy of ESG.

4.4.1. Baseline Regression

Before the heterogeneity test, we look at how ESG performance and financing constraints relate. Table 5 is the panel fixed-effect results. SA negative index, larger is weaker finance constraint.

Table 5: Baseline Regression: Relationship between ESG Performance and the SA Index.

Dependent Variable	Financing Constraints (SA Index)
ESG_lag1	0.001*** (0.0003)
Constant	-3.590*** (0.015)
Observations	46,225
Number of firm id	5,017
R-squared	0.789
Control Variables	Yes
Firm FE	Yes
Year FE	Yes
Industry × Year FE	Yes

Robust standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01

Table 5 shows that there exists a statistically significant positive relationship between ESG_lag1 and the SA index at the 1% level. Considering the fact that the SA index is mainly based on company size and age, it can be seen from this result that with the continuous development of an enterprise, its better ESG will come with structural financing constraints easing up at the same time.

However, the SA index captures a firm's structural financing capacity derived from static characteristics, rather than reflecting its short-term liquidity constraints or immediate financial distress. In the context of the "dual carbon" transition, high-ESG firms may face considerable short-term cash flow pressures due to heavy investments in green technologies or environmental retrofitting. The coexistence of this structural advantage and periodic financial stress implies that the moderating

ISSN 2616-5902 Vol. 8, Issue 3: 1-9, DOI: 10.25236/AJBM.2026.080301

direction of financing constraints on ESG governance effects cannot be generalized, thereby highlighting the necessity of further heterogeneity analysis and interaction tests.

4.4.2. Moderating Effect Test: Grouped Regression

We used a moderation approach based on heterogeneity to divide the sample into two parts, and divided them into 2 categories. One category is tighter with less constrained financing marked by low SA scores while the other one has looser financial restrictions represented by higher SA scores.

Table 6: Moderating effect of Financing Constraints: Grouped Regression Results.

Dependent Variable	(1) ST risk (High FC)	(2) ST risk (Low FC)	(3) Upgrade (High FC)	(4) Upgrade (Low FC)	(5) Downgrade (High FC)	(6) Downgrade (Low FC)
ESG_lag1	-0.134*** (0.014)	-0.117*** (0.014)	-0.042*** (0.003)	-0.035*** (0.003)	0.011*** (0.003)	-0.003 (0.003)
Constant	4.592*** (1.449)	5.500*** (1.333)	1.963*** (0.256)	1.287*** (0.278)	-1.985*** (0.283)	-0.797*** (0.286)
Observations	23,112	23,113	23,112	23,113	23,112	23,113
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01
FC: Financing Constraint

From Table 6 it can be observed that the risk reduction function of ESG on ST risk is stronger for the group with high constraint (-0.134, p <0.01), when compared with that of the low constraint group (-0.117, p <0.01). This implies that ESG provides better protection when there is a financial distress situation. Also similar to this is that ESG has a larger negative effect on rating upgrades in the category of firms constrained very highly than on those not as constrained (-0.042 vs. -0.035) which means that financing constraints reinforce this "ceiling effect." And most importantly, in the high-constraint group, ESG improved the chances of downgrade (0.011, p<0.01) and was worse off in the low-constrain group (-0.003). These results validate that finance restrictions amplify the downgrading risks brought about by ESG and support H3.

4.4.3. Moderating Effect Test: Interaction Term Regression

The present study proposes an interaction model between ESG and financing constraints, aiming to explicitly test the moderating effect of financing constraints, as presented in Table 7.

Table 7: Moderating effect of Financing Constraints: Interaction Term Regression Results.

Dependent Variable	(1) ST risk	(2) Upgrade	(3) Downgrade
ESG_lag1	-0.117*** (0.014)	-0.035*** (0.003)	-0.002 (0.003)
HighFC	0.241 (1.219)	0.545** (0.267)	-0.818*** (0.303)
ESG_lag1 × HighFC	-0.004 (0.017)	-0.007* (0.004)	0.011*** (0.004)
Constant	2.612* (1.417)	1.327*** (0.232)	-0.953*** (0.248)
Observations	46,225	46,225	46,225
Control Variables	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes

Robust standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01

The interaction item regression result in Table 7 gives further insight into how financing constraints moderate. In the rating downgrade model, the coefficient of the interaction term ESG_lag1×HighFC is significantly positive at the 1% level (0.011). Calculations tell us that with more limitations on finance, the positive effect of ESG on downgrade probability increases significantly by 0.011. It means high finance limit is a key boundary condition that makes the release of downgrade risk for ESG enterprises. Also, the interactive-term coefficient from the rating upgrade model was significantly negative (-0.007, p < 0.1). This implies that extremely tight financing restrictions further restrict firms having very good environmental and social performance's potential to improve their ratings; it makes "ceiling effect" stronger during up-movement across grades.

ISSN 2616-5902 Vol. 8, Issue 3: 1-9, DOI: 10.25236/AJBM.2026.080301

But the interaction item in Table 7 is not significant (-0.004, p>0.1). Table 6 and Table 7 contrast showing that financing limitations' cushioning function on ST risks does not work just via one ESG element, rather, tough financial restrictions change how open up the firm to unforeseen structural dangers. Grouped regression captures this global heterogeneity by allowing these fixed-effect controls to vary flexibly across groups; whereas in contrast model imposes a unified baseline constraint on them so absorb or mask some moderation effects [18].

4.5. Heterogeneity Test

This study carries out subgroups analyses for the analysis of moderating effect of industry heterogeneity on ESG governance effects. Industry environmental sensitivity is given special attention The aim is to see if there's a big difference in how much the threshold of ESG affects ST risk and rating migration when comparing environmentally sensitive industries to ones that are not so sensitive. The results of heterogeneity test are listed in Table 8.

Table 8: Heterogeneity Analysis：Industry Environmental Sensitivity.

VARIABLES	(1) ST risk (Env-Sensitive)	(2) ST risk (Non-Env-Sensitive)	(3) Upgrade (Env-Sensitive)	(4) Upgrade (Non-Env-Sensitive)	(5) Downgrade (Env-Sensitive)	(6) Downgrade (Non-Env-Sensitive)
ST risk (ESG_lag1 ≤ γ)	-0.113*** (0.016)	-0.083*** (0.026)	——	——	——	——
ST risk (ESG_lag1 >γ)	-0.120*** (0.015)	-0.092*** (0.024)	——	——	——	——
Upgrade (ESG_lag1 ≤ γ)	——	——	-0.028*** (0.005)	-0.098*** (0.008)	——	——
Upgrade (ESG_lag1 >γ)	——	——	-0.046*** (0.004)	-0.109*** (0.007)	——	——
Downgrade (ESG_lag1 ≤ γ)	——	——	——	——	0.018*** (0.004)	0.017** (0.007)
Downgrade (ESG_lag1 >γ)	——	——	——	——	0.029*** (0.004)	0.029*** (0.006)
Constant	5.126*** (1.337)	2.477 (2.030)	1.411*** (0.481)	8.371*** (0.870)	-2.970*** (0.457)	-1.800** (0.839)
Observations	34,352	11,873	34,352	11,873	34,352	11,873
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01

Threshold's effect on ST risk changes in different industry. Environmental sensitive business, ESG has a bigger effect in reducing the ST risk (coefficient over threshold: -0.120), while for non-sensitive industry, it's smaller (-0.092), indicating ESG governance synergies appear more prominently under severe environmental pressure.

Interestingly the asymmetry threshold effect on rating downgrades shows systemic consistency rather than industry significant discrepancy. In both environmentally sensitive and non-sensitive industries, the downgrade coefficient reaches 0.029 within the high ESG realm. This suggests that vulnerability to downgrades in terms of elevated ESG is mainly driven by a market wide "rating inflation" phenomenon as opposed to environmental penalties unique to certain industries.

The environmental sensitivity of an industry has a big effect on the strength of ESG's threshold effects: Sensitive industries have bigger ST risks decreased; at the high ESG level both sensitive and insensitive feel downgrade pressures similar, but those from sensitive are more significant. And non-sensitive industries face stricter upgrade limitations (coefficient-0.109) compared with environmentally sensitive ones(coefficient-0.046). This can also be used as basis for development of specific ESG strategies per industry

5. Conclusion

The study looked into the non-linear effect of ESG on ST risk and changes in ESG ratings. Our main results: I) There is a singular threshold for ESG as it relates to ST risk, scoring 70.013 or above indicates significant progress towards improved risk mitigation; II) An asymmetric effect exists between ESG and rating migration. A "ceiling effect" restricts any upgrades past 70.013 points, whereas an "asymmetric threshold effect" makes it more probable for those scoring over 75.060 to experience downgrades reflecting China's "rating inflation"; III) Financing constraints have an all-round moderating effect. Severe financing constraints (HighFC=1) fundamentally change the sensitivity of ST risk to governance variables, slightly exacerbating the "ceiling effect" on rating upgrade sensitivity, and greatly increasing the possibility of downgrades for high-ESG firms. IV) The environmental sensitivities of different industry types exhibit structural differences, i.e., sensitive

ISSN 2616-5902 Vol. 8, Issue 3: 1-9, DOI: 10.25236/AJBM.2026.080301

sectors show stronger ST-risk reduction effects while non-sensitive ones face more severe upgrade "ceiling effect". It's interesting that both sorts of sectors feel almost exactly the same pressure being penalized because they're good citizens with regard to ESG standards, this suggests that we're dealing with an issue where there's not just one area affected by ratings puffer but rather something much bigger at play across all parts of the market.

These findings provide empirical support for the implementation of differentiated ESG strategies and the enhancement of rating frameworks.

References

[1] The State Council Information Office of the People's Republic of China. China's actions on carbon peaking and carbon neutrality[R/OL]. 2025. https://www.gov.cn/zhengce/202511/content_7047492.htm.

[2] Shanghai Stock Exchange. Action plan for enhancing ESG ratings of listed companies on the Shanghai Stock Exchange[R/OL]. 2025. https://www.sse.com.cn/aboutus/mediacenter/hotandd/c/c_20250619_10782405.shtml.

[3] Caixin Think Tank, China ESG30 Forum. China ESG development white paper 2025[R/OL]. 2025. https://promote.caixin.com/esg2025/.

[4] Ruan L, Li J N, Huang S Q. ESG rating adjustment and capital market pricing efficiency: Evidence from China[J]. International Review of Economics and Finance, 2025, 98: 103845.

[5] Sahu N C, Mahanta A, Jena N R. From corporate responsibility to corporate sustainability: A study of how ESG mitigates corporate default risk using serial mediation analysis[J]. Global Finance Journal, 2026, 69: 101225.

[6] Shi Z F, Long F, Duan X M, et al. The impact of ESG performance on corporate performance and incentive mechanisms[J]. China Environmental Management, 2024, 16(4): 34-43.

[7] Xu L G, Lu X L, Zhang Z Q, et al. Green innovation, financialization, and ESG performance[J]. International Review of Economics & Finance, 2025, 102: 104404.

[8] Hadlock C J, Pierce J R. New evidence on measuring financial constraints: Moving beyond the KZ index[J]. The Review of Financial Studies, 2010, 23(5): 1909-1940.

[9] Freeman R E. Strategic management: A stakeholder approach[M]. Boston: Pitman, 1984.

[10] Akerlof G A. The market for "lemons": Quality uncertainty and the market mechanism[J]. The Quarterly Journal of Economics, 1970, 84(3): 488-500.

[11] Yang R B, Deng C T, Hou X Z. The impact of ESG performance on corporate financial performance[J]. Technology & Economy, 2023, 42(8): 124-134.

[12] Li Y, Li S. ESG performance and innovation quality[J]. International Review of Economics and Finance, 2024, 92: 1361-1373.

[13] Zhang X, Li W, Ji T, et al. The impact of ESG performance on firms' technological innovation: Evidence from China[J]. Frontiers in Environmental Science, 2024, 12: 1342420.

[14] Zheng Y, Feng Q. ESG performance, dual green innovation and corporate value—Based on empirical evidence of listed companies in China[J]. Environment, Development and Sustainability, 2024, 27: 609-624.

[15] Cabaleiro-Cerviño G, Mendi P. ESG-driven innovation strategy and firm performance[J]. Eurasian Business Review, 2024, 14(1): 137-185.

[16] Tan W, Cai Y, Luo H, et al. ESG, technological innovation and firm value: Evidence from China[J]. International Review of Financial Analysis, 2024, 96: 103546.

[17] Jiang T. Mediating effects and moderating effects in empirical research on causal inference[J]. China Industrial Economics, 2022, 44(5): 100-120.

[18] Hoetker G. The use of logit and probit models in strategic management research: Critical issues[J]. Strategic Management Journal, 2007, 28(4): 331-343.