

The Impact of China's Green Finance Pilot Policies on Corporate ESG Performance

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Abstract: Using panel data on A-share listed firms in China's Shanghai and Shenzhen stock markets from 2012 to 2024, this study examines the impact of green finance pilot policies on corporate ESG performance using a staggered difference-in-differences (DID) approach. The results indicate that these policies significantly improve corporate ESG performance, with stronger effects among firms in central and western China and non-state-owned enterprises. Mechanism analyses suggest that green technological innovation and the alleviation of financing constraints are important channels through which these policies enhance corporate ESG performance. These findings provide empirical insights into refining green finance policies and promoting corporate sustainability.

1. Introduction

Against the backdrop of global climate change, green finance plays an increasingly important role in promoting sustainable economic development. In pursuit of China's carbon peaking and carbon neutrality goals, green finance facilitates economic transformation, optimizes financial resource allocation, and supports green innovation through instruments such as green credit, green bonds, and green insurance. Meanwhile, environmental, social, and governance (ESG) performance has become a key indicator of corporate sustainability, reflecting firms' environmental responsibility, social responsibility, and governance effectiveness. In 2017, China began establishing Green Finance Reform and Innovation Pilot Zones to promote financial innovation and corporate green transformation. However, differences in regional economic development, financial resource availability, and corporate ownership structures may affect policy effectiveness. Therefore, examining the impact of these pilot policies on corporate ESG performance is of considerable theoretical and practical significance.

2. Literature Review

Existing studies have highlighted the close relationship between green finance and environmental, social, and governance (ESG) considerations. Sinha et al. (2022) examined the adoption of ESG assessment standards by stock exchanges worldwide and their role in developing

green financial markets ^[1]. Roy (2023) developed an ESG-based investment rating system through quantitative analysis, providing theoretical and methodological support for green asset allocation ^[2]. Focusing on Central and Eastern Europe, Khalil et al. (2023) investigated how financial technology facilitates the sustainable transformation of traditional financial institutions and enhances the efficiency of regional green capital allocation ^[3]. Makhkambaev et al. (2023) identified challenges associated with implementing ESG principles among firms in Russia and neighboring countries and proposed a policy framework to strengthen regional responses to climate change ^[4]. Using data from listed firms in emerging Asian capital markets, Aulia et al. (2023) examined ESG disclosure and its implications for strategic human capital decisions. Their findings suggest that a favorable corporate reputation can mitigate the adverse effects of financing constraints and reduce financing-related risks ^[5]. Similarly, Zhang et al. (2024) found that improved ESG management among Chinese listed firms can enhance human resource allocation and alleviate risks associated with financing difficulties ^[6].

Regarding the relationship between corporate ESG performance and green financial technology, Xu Mohan et al. (2024) documented an association between corporate ESG performance and the development of green financial technology ^[7]. From a macroeconomic perspective, Xiao Can (2024) examined the interactions between monetary policy and financial regulation within an ESG framework, emphasizing the role of institutional arrangements. Drawing on representative cases, Xu Hanyou and Yang Yudie (2024) identified greenwashing practices among certain financial institutions engaged in ESG investing and highlighted the need for stronger external oversight and improved internal governance mechanisms ^[8].

Regarding the impact of regional green finance development on corporate ESG performance, Li Xinwu et al. (2024) found that regional green finance development can improve corporate ESG performance, providing insights for resource allocation decisions by corporate managers and financial practitioners ^[9]. Using Guotai Junan as a case study, Li Junjie et al. (2024) examined how financial institutions can promote green finance practices through ESG-oriented strategies ^[10].

3. Research Hypotheses

H1: The Green Finance Reform and Innovation Pilot Zone Policy significantly improves corporate ESG performance.

H2: The Green Finance Reform and Innovation Pilot Zone Policy improves corporate ESG performance by alleviating firms' financing constraints.

H3: The Green Finance Reform and Innovation Pilot Zone Policy improves corporate ESG performance by promoting green innovation.

H4: The positive effect of the Green Finance Reform and Innovation Pilot Zone Policy on ESG performance is stronger for non-state-owned enterprises than for state-owned enterprises.

H5: The positive effect of the Green Finance Reform and Innovation Pilot Zone Policy on corporate ESG performance is stronger in central and western China than in eastern China.

4. Research Design

4.1. Sample Selection and Data Sources

This study uses an unbalanced panel of 34,937 firm-year observations from Chinese A-share listed companies on the Shanghai and Shenzhen stock exchanges from 2012 to 2024. After excluding financial firms, ST/*ST and delisted firms, firms with debt-to-asset ratios above one, and observations with missing variables, all continuous variables are winsorized at the 1st and 99th percentiles. ESG data are obtained from Huazheng, financial and governance data from CSMAR,

Wind, and CNRDS, and pilot-zone information from official government documents. The establishment of eight pilot cities in five provinces and regions in June 2017 serves as the policy shock.

Additional sample screening was conducted for heterogeneity analyses. After excluding observations with missing regional information or interprovincial relocation, the regional analysis included 34,918 observations. For the ownership analysis, observations with changes in ultimate controlling shareholder status or incomplete ownership disclosures were excluded, resulting in 30,686 observations. These screening procedures do not affect the robustness of the baseline regression results.

4.2. Variable Selection

Table 1: Variable Definitions

Variable type	Variable	Symbol	Definition
Dependent variable	ESG performance	ESG	Based on Huazheng ESG rating scores
Explanatory variable	Green finance pilot policy	did	See definition above
Control variable	Firm size	Size	Natural log of year-end total assets
	Leverage	Lev	Year-end liabilities / year-end assets
	Largest shareholder stake	Top1	Shareholding of the largest shareholder
	Return on assets	ROA	Net income / average total assets
	Revenue growth	Growth	Current-year revenue / previous-year revenue – 1
	Cash flow ratio	Cashflow	Net operating cash flow / current liabilities
	Tobin's Q	Tobin's Q	(firm market value + book value of liabilities) / replacement cost of assets
Mediator	Financing constraints	SA	$SA = -0.038 \times \text{Size} - 0.037 \times \text{Size}^2 - 0.04 \times \text{Age}$
	Innovation input	RD	Share of funds allocated to green technology projects
	Innovation output	Patent	Natural log of green patent applications

The dependent variable, corporate ESG performance, is measured using the Huazheng ESG rating system. Following its November 2022 update, the system provides a composite score ranging from 0 to 100, with higher scores indicating better ESG performance. The key explanatory variable is the difference-in-differences (DID) interaction term, defined as $DID = \text{treat} \times \text{post}$. The variable *treat* equals 1 if a firm is located in a pilot zone and 0 otherwise, while *post* equals 1 for the period from 2017 to 2024 and 0 for the period from 2012 to 2016. Accordingly, *DID* equals 1 for firms in pilot zones during the post-policy period and 0 otherwise. Definitions of all variables are provided in Table 1.

5. Empirical Analysis of the Effects of the Green Finance Reform and Innovation Pilot Zone Policy on Corporate ESG Performance

5.1. Descriptive Statistics

Table 2 reports the mean ESG score is 73.703, indicating relatively high ESG performance with variation across firms. The mean of the *DID* variable is 0.035, reflecting the proportion of observations in the treated post-policy group. Firm size, leverage, and ROA average 22.290, 0.402,

and 0.043, respectively. Revenue growth shows substantial dispersion, while the mean cash flow ratio and largest shareholder ownership are 0.052 and 0.337, respectively. The mean Tobin's Q is 1.995. Overall, the statistics indicate considerable heterogeneity across firms, providing a basis for further regression analysis.

Table 2: Descriptive Statistics

VarName	Obs	Mean	SD	Min	Median	Max
ESG	34937	73.703	5.266	36.620	73.790	100.000
did	34937	0.035	0.183	0.000	0.000	1.000
Size	34937	22.290	1.332	18.848	22.062	28.791
Lev	34937	0.402	0.195	0.008	0.394	0.997
ROA	34937	0.043	0.069	-0.805	0.041	1.285
Growth	34937	0.262	11.500	-1.309	0.088	1878.372
Cashflow	34937	0.052	0.069	-0.744	0.050	0.839
Top1	34937	0.337	0.150	0.011	0.314	0.900
TobinQ	34937	1.995	1.356	0.611	1.608	41.081

5.2. Correlation Analysis

As shown in Table 3, the correlation analysis reveals a positive association between corporate ESG performance and policy implementation (DID), with a correlation coefficient of 0.031 that is statistically significant at the 1% level. This provides preliminary evidence of a positive relationship between the policy and corporate ESG performance. ESG performance is negatively correlated with leverage (-0.079 , $p < 0.01$), suggesting that financial pressure may constrain ESG-related investment. In contrast, ESG performance is positively correlated with return on assets (0.199 , $p < 0.01$), suggesting that more profitable firms may have greater capacity to improve their ESG performance. The positive correlation between ESG performance and cash flow (0.102 , $p < 0.01$) also suggests that stronger liquidity may support ESG-related activities. The correlations among the explanatory and control variables are also examined to assess potential multicollinearity concerns before conducting the regression analysis.

Table 3: Correlation analysis

	ESG	did	Size	Lev	ROA	Growth	Cashflow	Top1	TobinQ
ESG	1								
did	0.031***	1							
Size	0.213***	0.011**	1						
Lev	-0.079***	0.008	0.521***	1					
ROA	0.199***	0.016***	-0.008	-0.338***	1				
Growth	-0.005	0.002	0.020***	0.010*	0.005	1			
Cashflow	0.102***	0.037***	0.073***	-0.164***	0.448***	-0.005	1		
Top1	0.088***	0.020***	0.178***	0.025***	0.143***	0.000	0.107***	1	
Tobin's Q	-0.025***	-0.010*	-0.296***	-0.273***	0.190***	-0.001	0.114***	-0.072***	1

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

5.3. Baseline Regression Analysis

The baseline regression results indicate that the policy (did) significantly improves corporate ESG performance, with an estimated coefficient of 1.155 ($p < 0.01$). This positive effect remains

significant after controlling for firm characteristics, confirming the robustness of the relationship. Further analysis of ESG dimensions reveals that the policy significantly enhances environmental (E) and social (S) performance, with coefficients of 1.557 and 1.377, respectively, while its effect on governance (G) is positive but insignificant (0.463). These findings suggest that the policy primarily promotes ESG performance through improvements in environmental protection and social responsibility, driven by stronger regulatory requirements and policy incentives. In contrast, corporate governance improvements depend more on long-term institutional development and internal management practices, limiting the policy's short-term impact on governance. The results are presented in Table 4.

Table 4: Baseline Regression Results

	(1)	(2)	(3)	(4)	(5)
	ESG	ESG	E score	S score	G score
did	1.155*** (4.522)	0.974*** (3.890)	1.557*** (4.528)	1.377*** (3.552)	0.463 (1.635)
Size		1.776*** (22.398)	1.563*** (15.113)	1.470*** (12.502)	1.062*** (11.860)
Lev		-7.152*** (-23.620)	-3.785*** (-9.933)	0.780* (1.821)	-10.720*** (-30.189)
ROA		1.644*** (3.010)	-0.665 (-1.018)	4.047*** (5.463)	4.548*** (6.091)
Growth		-0.004*** (-3.042)	-0.004** (-2.209)	-0.006*** (-4.332)	-0.001 (-0.779)
Cashflow		-1.078** (-2.447)	1.628*** (2.926)	-1.014 (-1.458)	-3.008*** (-4.823)
Top1		2.317*** (4.810)	1.526** (2.487)	-0.481 (-0.615)	3.078*** (5.612)
TobinQ		-0.044* (-1.774)	-0.097*** (-2.892)	0.088*** (2.581)	-0.033 (-1.135)
_cons	73.663*** (3069.817)	36.264*** (20.788)	28.078*** (12.357)	42.893*** (16.361)	59.189*** (30.093)
N	34937	34937	34937	34937	34937
R2	0.4417	0.4631	0.5138	0.4966	0.4710

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

5.4. Tests of Mediating Effects

As shown in Table 5, the policy coefficient in the SA regression is -0.076 ($p < 0.01$), indicating a significant decrease in the SA index. When SA is included in the ESG regression, its coefficient is -7.907 ($p < 0.01$). These results suggest that easing financing constraints may be an important channel through which the green finance pilot policy improves corporate ESG performance. Financing constraints thus appear to play a partial mediating role.

For innovation input (RD), the policy coefficient is 0.002 ($p < 0.01$), indicating a significant increase in R&D investment. The coefficient on RD in the ESG regression is 29.075 ($p < 0.01$), suggesting that greater R&D investment is positively associated with corporate ESG performance. This may reflect firms' increased investment in cleaner technologies and more sustainable products. Innovation input therefore appears to partially mediate the relationship between the policy and ESG performance.

For innovation output (Patent), the policy coefficient is 0.062 ($p < 0.01$), while the coefficient on Patent in the ESG regression is 0.473 ($p < 0.01$). These findings suggest that the policy promotes green patenting and that greater innovation output is positively associated with corporate ESG performance. Patents related to environmental technologies, energy conservation, and emissions reduction may contribute to improvements in ESG performance. Innovation output therefore also appears to play a partial mediating role.

Table 5: Mediating effect test

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	ESG	SA	ESG	RD	ESG	Patent	ESG
did	0.974*** (3.890)	-0.076*** (-14.262)	0.947*** (3.811)	0.002*** (2.594)	0.989*** (3.951)	0.062*** (3.026)	0.940*** (3.628)
SA			-7.907*** (-13.525)				
RD					29.075*** (10.720)		
Patent							0.473*** (5.030)
Size	1.776*** (22.398)	-0.156*** (-64.993)	1.664*** (20.995)	0.001*** (9.657)	1.829*** (22.972)	0.011** (2.379)	1.926*** (23.129)
Lev	-7.152*** (-23.620)	-0.014* (-1.701)	-6.435*** (-21.173)	-0.003*** (-3.996)	-7.091*** (-23.453)	0.167*** (7.332)	-7.025*** (-22.299)
ROA	1.644*** (3.010)	0.405*** (28.156)	1.659*** (3.066)	-0.012*** (-8.453)	1.789*** (3.288)	0.755*** (18.069)	0.416 (0.721)
Growth	-0.004*** (-3.042)	0.000* (1.721)	-0.004*** (-2.844)	-0.000 (-0.489)	-0.004*** (-3.118)	-0.000 (-0.042)	-0.003** (-2.540)
Cashflow w	-1.078** (-2.447)	-0.104*** (-8.936)	-1.007** (-2.288)	0.006*** (5.448)	-1.202*** (-2.735)	0.238*** (4.649)	-1.079** (-2.375)
Top1	2.317*** (4.810)	0.530*** (40.353)	1.454*** (2.999)	-0.008*** (-6.810)	2.297*** (4.770)	-0.137*** (-3.857)	2.018*** (4.087)
TobinQ	-0.044* (-1.774)	-0.003*** (-5.668)	-0.066*** (-2.623)	0.001*** (9.628)	-0.069*** (-2.741)	-0.004*** (-2.838)	-0.029 (-1.141)
_cons	36.264*** (20.788)	-0.572*** (-10.532)	69.393*** (24.578)	-0.007* (-1.875)	34.394*** (19.549)	0.161 (1.458)	32.685*** (17.751)
N	34937	34937	34937	34937	34937	33231	33231
R ²	0.4631	0.8726	0.4675	0.8619	0.4651	0.5731	0.4749

Note: The values in parentheses represent the t-statistics after clustering adjustment at the firm level; ***, **, * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

5.5. Heterogeneity Analysis

5.5.1. Regional Heterogeneity

The regional heterogeneity analysis reveals a stronger ESG-enhancing effect of the green finance pilot policy in central and western China than in eastern China. The estimated policy coefficients are 0.549 in the eastern region (significant at the 10% level) and 2.176 in the central and western regions (significant at the 1% level). A Chow test indicates that the difference is statistically significant ($F = 43.66$, $p < 0.001$). One possible explanation is that the policy helps alleviate

financing constraints more effectively in central and western China, where financial markets are relatively less developed and firms have fewer financing channels. Consequently, policy support may generate greater marginal benefits in these regions. By contrast, firms in eastern China generally operate in more developed financial markets with more diversified funding sources, potentially reducing the incremental benefits of policy support. Their more established ESG practices may also leave less room for further improvement. In central and western China, the policy may improve access to financing and encourage firms to strengthen their ESG practices. Relatively weak initial ESG performance and a greater presence of traditional manufacturing industries may further increase the potential benefits of policy-supported green transformation (See Table 6).

5.5.2. Ownership Heterogeneity

Ownership heterogeneity analysis reveals significant differences in policy effects. The policy has no statistically significant effect on state-owned enterprises (coefficient = -0.237), but significantly improves the ESG performance of non-state-owned enterprises (coefficient = 1.089 , $p < 0.01$). A Chow test confirms significant differences between the two groups ($F = 4.36$, $p = 0.013$), supporting the existence of ownership-based heterogeneity (See Table 7).

Table 6: Regional Heterogeneity

	(1)	(2)
	Eastern region	Central and western regions
did	0.549*	2.176***
	(1.949)	(4.314)
Size	1.678***	2.084***
	(18.124)	(12.740)
Lev	-7.268***	-6.280***
	(-21.118)	(-9.813)
ROA	1.044*	3.515***
	(1.695)	(3.022)
Growth	-0.003***	-0.150***
	(-3.774)	(-4.512)
Cashflow	-0.958**	-1.464
	(-1.987)	(-1.456)
Top1	2.794***	1.064
	(4.918)	(1.133)
TobinQ	-0.041	-0.057
	(-1.448)	(-1.022)
_cons	38.545***	28.807***
	(18.877)	(8.019)
N	26065	8853
R2	0.4602	0.4735
Chow Test	43.66***	

Note: The values in parentheses are t-statistics.

Table 7: Heterogeneity in the nature of property rights

	(1)	(2)
	SOEs	non-SOEs
did	-0.237	1.089***
	(-0.653)	(3.070)
Size	1.522***	1.505***
	(9.832)	(14.685)
Lev	-5.086***	-5.872***
	(-7.845)	(-15.882)
ROA	0.646	1.538**
	(0.480)	(2.401)
Growth	-0.109***	-0.008
	(-3.157)	(-1.557)
Cashflow	0.308	-0.893
	(0.349)	(-1.643)
Top1	-1.848**	2.845***
	(-2.343)	(4.170)
TobinQ	-0.030	-0.034
	(-0.554)	(-1.161)
_cons	42.452***	41.796***
	(12.323)	(18.633)
N	9845	20841
R ²	0.5066	0.4927
Chow Test	4.36**	

5.5.3. Robustness Tests

The parallel trends and placebo tests provide further support for the baseline findings. The parallel trends test shows that the estimated coefficients for the pre-policy periods are statistically

insignificant, whereas those for the post-policy periods are positive and statistically significant. The estimated effects also increase over time, providing support for the parallel trends assumption underlying the DID approach and suggesting a persistent positive policy effect (Figure 1). The placebo test randomly assigns policy implementation dates and re-estimates the regression model across repeated simulations. The resulting placebo estimates are statistically insignificant, suggesting that the baseline findings are unlikely to be driven by random chance or unobserved factors unrelated to the policy (Figure 2).

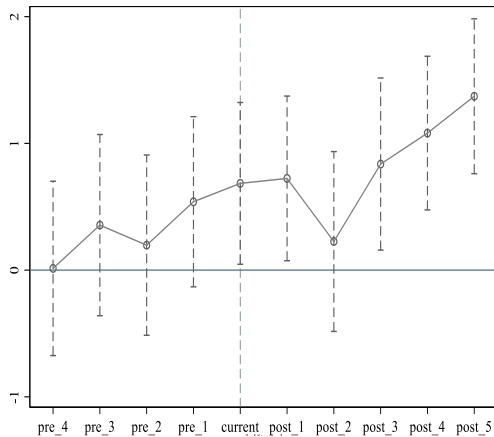


Figure 1: Parallel trends test

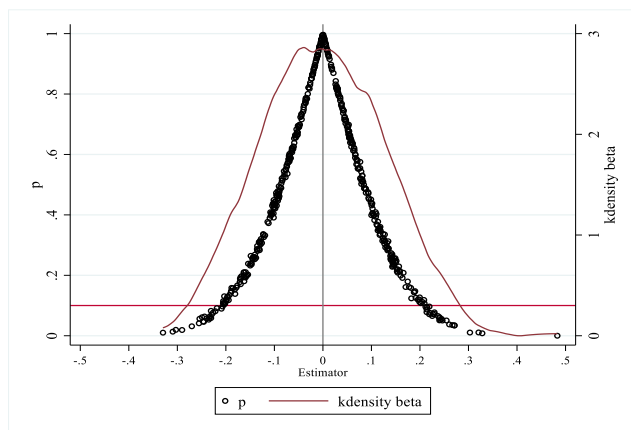


Figure 2: Placebo test

6. Policy Recommendations

6.1. Strengthening Policy Guidance

The government should gradually expand the coverage of green finance pilot zones, prioritizing regions with strong potential for green development to leverage policy spillover effects and improve corporate ESG performance. It should refine supporting policies based on successful pilot experiences, strengthen coordination among financial, fiscal, and industrial policies, and establish robust monitoring and evaluation mechanisms to ensure effective implementation and facilitate timely policy adjustments.

6.2. Promotion of Green Technological Innovation

The government should increase financial support for corporate green R&D through dedicated funding programs, subsidies, and tax incentives to alleviate financing constraints. It should also strengthen collaboration among universities, research institutions, and enterprises to facilitate technology transfer and commercialization. Furthermore, policymakers should enhance incentive mechanisms for green patent development and technology adoption, encouraging firms to translate technological innovation into tangible environmental benefits.

6.3. Alleviation of Financing Constraints

The government should encourage financial institutions to expand green lending, reduce financing costs, and improve credit accessibility through measures such as green credit risk compensation mechanisms. It should also promote the diversification of financing instruments, including green bonds, to meet firms' diverse financing needs. Furthermore, the government should strengthen information disclosure and credit assessment mechanisms to reduce information asymmetry and improve the efficiency of financial resource allocation, particularly for smaller

firms and those facing severe financing constraints.

6.4. Implementation of Differentiated Policies

The government should formulate targeted policies based on regional economic conditions and corporate ownership structures. In economically developed regions, it should strengthen capital market development and enhance incentives for ESG investment. In less developed regions, it should improve green financial infrastructure and expand access to financing. For state-owned enterprises, the government should strengthen ESG evaluation systems and governance-related incentives. For non-state-owned enterprises, it should reduce financing barriers and broaden access to green financial resources to enhance policy effectiveness.

7. Conclusions

Using Shanghai and Shenzhen A-share listed companies from 2012 to 2024 as the research sample, this study employs a staggered difference-in-differences model to examine the impact of green finance pilot policies on corporate ESG performance and the underlying mechanisms. The results show that the policies significantly improve corporate ESG performance, with findings remaining robust across multiple tests. Mechanism analysis indicates that the policies enhance ESG performance by alleviating financing constraints, increasing innovation input, and promoting innovation output. Heterogeneity analysis further reveals that the positive effects are more pronounced among firms in central and western China and non-state-owned enterprises.

References

- [1] Sinha A B, Sinha A. *Green Finance and ESG: Compliance of Global Stock Exchanges* [J]. *IUP Journal of Applied Finance*, 2022, 328 (3):1-20.
- [2] Roy P K. *Enriching the green economy through sustainable investments: An ESG-based credit rating model for green financing* [J]. *Journal of Cleaner Production*, 2023, 360:132150.
- [3] Khalil R G, Damrah S, Bajaher M, et al. *Unveiling the relationship of ESG, fintech, green finance, innovation and sustainability: case of Gulf countries* [J]. *Environmental Science and Pollution Research*, 2023, 30 (54):1-15.
- [4] Makhkambaev A T, Karanina E V, Sinyavsky N G, et al. *Development of Green Finance Based on ESG Tools of Investment Management in Russia and Central Asia* [M]//*ESG Management of the Development of the Green Economy in Central Asia*. Cham: Springer International Publishing, 2023:439-447.
- [5] Aulia A, et al. *ESG Disclosure and Green Finance Performance in Indonesia, Malaysia & Singapore Exchanges* [J]. *Jurnal Akuntansi dan Ilmiah*, 2023, 10 (1):79-98.
- [6] Zhang D, Wang C, Miao S, et al. *The impact of firms' ESG performance on the skill premium: Evidence from China's green finance reform pilot zone* [J]. *Journal of Financial Analysis*, 2024, 93:103213.
- [7] Xu, M. H., Sun, D. T., & Lu, M. F. (2024). *The impact of corporate ESG performance on the development of green financial technology and its underlying mechanisms: Evidence from A-share listed companies*. *Financial Economy*, (5), 42–53, 65.
- [8] Xu, H. Y., & Yang, Y. D. (2024). *Greenwashing and anti-greenwashing in ESG investments by financial institutions: A case study of DWS Group*. *Contemporary Economic Management*, 46(4), 89–106.
- [9] Li, X. W., Huang, R., & Yao, B. S. (2024). *The impact of regional green finance development on corporate ESG performance*. *Financial Theory and Practice*, (3), 1–10.
- [10] Li, J. J., Lu, C. X., Wang, R., et al. (2024). *Guotai Junan deepens ESG practices and leverages its distinctive advantages in green finance in the interbank market*. *China Money*, (3), 1–5.