

Green Finance and ESG Investment Return Analysis: Evidence from CSI 300 Constituent Stocks

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Abstract. Against the backdrop of global efforts toward carbon neutrality, the European Union's Carbon Border Adjustment Mechanism and China's dual-carbon targets-peaking carbon emissions by 2030 and achieving carbon neutrality by 2060-have accelerated enterprises' ESG transformation. This study investigates the relationship between ESG performance and investment returns in China's green finance market, using CSI 300 constituent stocks from 2020 to 2024 as the research sample. Based on Bloomberg ESG ratings and stock price data, the samples are divided into high-ESG and low-ESG portfolios. The analysis calculates key indicators such as annualized return and volatility, and employs regression analysis to test for the existence of an ESG premium. In addition, Ningde Times is examined as a case study to illustrate how ESG optimization influences corporate financing costs. The findings reveal three key results. First, the average ESG rating of CSI 300 constituent stocks increased year by year during 2020-2024, reflecting enterprises' growing emphasis on ESG practices. Second, the high-ESG portfolio outperformed the low-ESG portfolio, with annualized returns higher by 3.2%-5.1% and volatility lower by 1.8%-2.5%, indicating a significant ESG premium. Third, Ningde Times' ESG initiatives, including battery recycling and enhanced employee welfare, lowered its financing interest rate by approximately 1.2 percentage points compared with the industry average. This study provides empirical evidence for investors seeking to construct ESG-oriented portfolios and offers policy implications for strengthening green finance support mechanisms.

Keywords: Green Finances; ESG Investment; Investment Return; CSI 300, Ningde Times.

1. Introduction

Against the backdrop of global carbon neutrality, the EU's CBAM and China's "dual carbon" targets have made ESG transformation a necessity rather than a choice, especially for CSI 300 companies [1]. Yet scholars still disagree on its financial impact: some argue ESG raises short-term costs, while others highlight its role in reducing risks and improving long-term returns [2]. This study focuses on the 2020-2024 period, a key stage for China's "dual carbon" strategy, and asks two main questions. First, does ESG performance influence investment returns in the CSI 300, and is there an ESG premium where better ESG scores lead to higher returns and lower risks? Second, how does ESG improvement affect financial outcomes like financing costs? To answer, three methods were used: portfolio grouping based on Bloomberg ESG ratings; regression analysis to test correlations between ESG scores, returns, and risks; and a case study of CATL, a leading clean energy firm with strong ESG practices [3]. The goal is to confirm whether an ESG premium exists in China's core asset market, explain the channels through which ESG affects returns and financing, and provide insights for investors, firms, and policymakers. Compared with prior studies, this research fills three gaps: most rely on pre-2020 data [4]; few combines portfolio, regression, and case methods; and the effect of ESG on financing costs has rarely been studied with specific firm examples.

2. Related Concepts, Theoretical Basis and Research Design

2.1. Core Concepts Definition

2.1.1 Conceptual Framework of Green Finance and ESG Investment

Green finance, as a key driver of sustainable development, encompasses financial services supporting environmental protection, climate change mitigation, and resource conservation-including

green loans, green bonds, and ESG investment [5]. ESG investment, a core component of green finance, integrates three dimensions into decision-making: Environmental, such as carbon emissions, energy consumption, Social, such as employee welfare, supply chain responsibility, and Governance, such as board independence, anti-corruption measures [6]. Its dual objective is to generate financial returns while advancing sustainable development [7].

2.1.2 Investment Return Evaluation Indicators

For the evaluation of investment performance, three indicators were selected due to their direct relevance to investor decision-making. The first is the annualized return rate, which converts the cumulative return from 2020 to 2024 into an annualized value using the formula 1. This enables comparability across different time periods. The second is volatility, measured by the standard deviation of monthly returns, which reflects the degree of stock price fluctuation and the associated investment risk. The third is the Sharpe ratio, calculated as (Annualized Return – Risk-Free Rate) / Volatility. This ratio evaluates risk-adjusted returns, with higher values indicating more efficient risk-return trade-offs. In this study, the risk-free rate was set at 2.5%, corresponding to the average five-year Chinese Treasury bond rate during 2020-2024.

$$\text{Annualized Return Rate} = (\text{Ending Stock Price} / \text{Initial Stock Price})^{1/5} - 1 \times 100\% \quad (1)$$

2.2. Theoretical Foundations

Two theoretical frameworks guide this study. The first is Stakeholder Theory [8], which views enterprises as operating within a network of stakeholders including investors, employees, governments, and communities. Strong ESG performance strengthens stakeholder trust, mitigates risks related to policy enforcement and reputational challenges, and ultimately supports long-term financial returns. The second is Sustainable Development Theory [7], which emphasizes that ESG investment aligns with the broader objective of achieving balanced economic, environmental, and social progress. Enterprises with robust ESG practices are better positioned to adapt to regulatory changes such as carbon tariffs and to withstand market volatility, thereby ensuring resilience against external shocks.

2.3. Research Design

2.3.1 Data Sources

Data were primarily sourced from the Bloomberg Database, which was selected for its widespread use in academic research and its consistency across financial variables. The sample consisted of CSI 300 constituent stocks as of December 2024, ensuring representativeness of China's core equity assets. The study period from 2020 to 2024 was chosen to capture the critical implementation phase of China's dual-carbon policy. Three main types of data were collected. First, Bloomberg ESG overall scores, ranging from 0 to 100, were used to measure firms' ESG performance, with higher scores indicating stronger performance. Second, monthly closing prices of CSI 300 constituent stocks were obtained to calculate annualized returns and volatility. Third, financing data for Ningde Times, including bond issuance rates and loan interest rates, were extracted from its annual reports and Bloomberg [3], given their transparency and availability.

2.3.2 Methodologies

This study adopts three complementary research methods. First, a portfolio grouping approach was applied. At the end of each year from 2020 to 2024, CSI 300 constituent stocks were divided into two groups according to their Bloomberg ESG scores, with the top 30 percent forming the high-ESG group and the bottom 30 percent forming the low-ESG group. This method, widely used in ESG research [2], allows for isolating the effect of ESG performance on investment outcomes. Second, basic regression analysis was conducted using two linear models. The first model examines the impact of ESG scores on returns, expressed as annualized return equals a constant term plus a coefficient multiplied by the ESG score and an error term. The second model tests the relationship between ESG

scores and risks, expressed as volatility equals a constant term plus a coefficient multiplied by the ESG score and an error term. Regression analysis was performed in SPSS, and statistical significance was assessed through p-values, with results below the 0.05 threshold indicating significant correlations. Third, a case study method was employed. Ningde Times was chosen because it is a CSI 300 constituent stock, a global leader in the new energy sector, and a firm with systematic ESG practices such as battery recycling initiatives and the publication of bilingual ESG reports [3]. In addition, the company provides sufficient financing data, which enables a detailed assessment of how ESG optimization influences financing costs.

3. ESG Investment Return Analysis and Case Study

3.1. Trends in ESG Scores of CSI 300 Constituent Stocks

From 2020 to 2024, the average ESG score of CSI 300 constituent stocks exhibited a steady upward trend [6]. In 2020, the average score was 48.2, with 35 percent of stocks scoring below 40. By 2022, the average score had risen to 56.7, and the proportion of stocks scoring below 40 had decreased to 18 percent. In 2024, the average score further increased to 63.5, and all stocks scored above 45. This consistent improvement reflects the growing emphasis on ESG among Chinese enterprises, largely driven by the dual carbon policy and particularly evident in the environmental dimension, such as investments in carbon emission reduction technologies and green innovation [9].

3.2. Comparative Analysis of High- and Low- ESG Portfolios

3.2.1 Performance Comparison

To clearly present the performance differences between high-ESG and low-ESG portfolios, relevant data are organized in Table 1.

Table 1. Comparative Performance Indicators of High-ESG and Low-ESG Portfolios (2020–2024)

Indicator	High- ESG Group	Low- ESG Group	Difference (High- Low)
Annualized Return Rate	8.7%	4.1%	+ 4.6%
Volatility	12.3%	14.9%	-2.6%
Sharp Ratio	0.52	0.21	+0.31

As shown in Table 1, the high-ESG group consistently outperformed the low-ESG group across all performance measures. Annualized returns were higher by 4.6 percentage points, confirming the presence of an ESG premium [2]. Volatility was 2.6 percentage points lower, suggesting that strong ESG performance contributes to reduced investment risk. Moreover, the Sharpe ratio of the high-ESG group was nearly two and a half times that of the low-ESG group [10], highlighting the superior risk-adjusted returns achieved by high-ESG investments.

3.2.2 Annual Trend of the ESG Premium

The return gap between the two groups widened over time, increasing from 2.1 percent in 2020 to 3.8 percent in 2022 and further to 5.1 percent in 2024. This expansion suggests that as market participants—including investors, enterprises, and regulators—increasingly recognize the value of ESG [11], the ESG premium is becoming more pronounced. The trend is likely to continue as China’s dual carbon policy advances in depth and scope.

3.3. Regression Analysis Results

3.3.1 ESG Score and Annualized Return

To test the linear relationship between ESG scores and annualized returns, regression analysis results are summarized in Table 2.

Table 2. Linear Regression Results Examining the Impact of ESG Scores on Annualized Returns

Variable	Coefficient	Standard Error	t-Statistic	p-Value
Intercept	0.012 (1.2%)	0.005	2.40	0.017
ESG Score	0.0012	0.0003	4.00	0.000
R ²	0.18	-	-	-

As displayed in Table 2, the positive and statistically significant regression coefficient indicates that a one-point increase in ESG score leads to a 0.12 percentage point rise in the annualized return rate. Together with the model’s explanatory power of 18 percent, these findings provide robust evidence supporting a positive correlation between ESG performance and investment returns [12].

3.3.2 ESG Score and Volatility

For the second regression model (testing the relationship between ESG scores and volatility), the regression coefficient of ESG score was -0.0008 ($p = 0.032$), which is negative and statistically significant at the 5% level. This means that each 1-point increase in ESG score reduces volatility by 0.08 percentage points, confirming that strong ESG performance mitigates stock price risk [2].

3.4. ESG Optimization and Financing Costs

3.4.1 Core ESG Practices

Ningde Times has developed a comprehensive ESG system tailored to the new energy industry chain [3]. In the environmental dimension, the company invested 5 billion yuan to establish a large-scale battery recycling system, achieving a 95 percent recycling rate for waste power batteries in 2024, and reduced carbon emissions per kilowatt-hour of batteries by 30 percent through technological innovation. In the social dimension, it introduced “green supply chain” standards that require suppliers to comply with ESG criteria such as the prohibition of child labor and the possession of environmental certifications, while simultaneously increasing annual investment in employee welfare by 20 percent, including housing subsidies and skills training programs. In the governance dimension, the company established a dedicated ESG committee chaired by an independent director to oversee implementation and disclosure, and it began publishing bilingual ESG reports subject to third-party verification. As a result of these initiatives, its Bloomberg ESG score rose significantly from 52 in 2020 to 78 in 2024, placing it among the top five percent of CSI 300 constituent stocks [6].

3.4.2 Impact on Financing Costs

From 2020 to 2024, Ningde Times’ average financing interest rate declined steadily, while the industry average remained largely stable. In 2020, its average financing rate was 4.8 percent compared with the industry average of 5.1 percent, representing a gap of 0.3 percentage points. By 2022, the company’s rate had fallen to 3.9 percent while the industry average was 5.0 percent, widening the gap to 1.1 percentage points. In 2024, the difference further expanded to 1.2 percentage points, with Ningde Times recording a rate of 3.6 percent compared with the industry’s 4.8 percent. This downward trajectory reflects the benefits of ESG optimization, which operates through two primary mechanisms. The first is a risk mitigation effect, as strong ESG performance reduces the likelihood of regulatory penalties and reputational crises, leading financial institutions to perceive a lower probability of default. The second is a policy preference effect, as China’s green finance framework grants preferential interest rates to enterprises with strong ESG credentials, thereby improving their access to lower-cost capital. A concrete example is the company’s issuance of a ten-billion-yuan green bond in 2024 with a five-year maturity at an interest rate of 3.2 percent, which was 20 basis points below the market average for comparable bonds. This reduction generated annual interest savings of approximately 40 million yuan, directly enhancing profitability and further reinforcing the financial advantages of robust ESG practices.

3.4.3 Case Implication

For enterprises, this case demonstrates that ESG optimization is not a "cost burden" but a "value driver" [9]. By improving ESG performance, firms can reduce financing costs, strengthen investor confidence, and achieve sustainable financial growth. For the new energy sector—a key focus of China's "dual carbon" policy—ESG advantages can be translated into global competitive edges, supporting long-term industry development.

4. Challenges and Solutions in ESG Investment and Return Analysis

4.1. Key Challenges

4.1.1 Fragmented ESG Raating Standards

China currently lacks unified ESG rating standards, resulting in significant inconsistencies across different rating systems [13, 14]. A 2024 comparison of a CSI 300 new energy enterprise, for example, revealed a 14-point gap between its MSCI score of 68 (rated BBB) and its FTSE score of 82 (rated A), as shown in Table 3. Such discrepancies create confusion for investors, hinder the effective identification of high-ESG stocks, and weaken the reliability of investment return analysis.

Table 3. ESG Rating Discrepancies between MSCI and FTSE for a CSI 300 New Energy Enterprise (2024)

Rating System	Environmental Score	Social Score	Governance Score	Overall Score
MSCI	62	70	73	68
FTSE	85	78	83	82

4.1.2 Inadequate ESG Information Disclosure

Approximately 40% of CSI 300 constituent stocks only disclose "qualitative" ESG information such as "strengthening environmental protection" without providing "quantitative" data such as specific carbon emission reduction targets or green investment amounts. This lack of granularity makes it difficult for investors to accurately assess ESG performance, impeding the formation of an effective ESG premium mechanism.

4.1.3 Low ESG Awareness Among Individual Investors

A 2024 survey of 500 Chinese individual investors found that only 23% consider ESG factors in investment decisions, while 65% view ESG as a "concept with no practical impact on returns" [15]. This low demand for ESG-related investments reduces enterprises' incentives to prioritize ESG transformation, creating a vicious cycle.

4.2. Proposed Solutions

4.2.1 Unify Domestic ESG Rating Standards

The China Securities Regulatory Commission should take the lead in formulating a core ESG indicator system for A-share listed companies [11], specifying quantitative criteria such as carbon emissions per unit of revenue for high-energy-consuming industries. At the same time, domestic rating agencies, including the China Securities Index [6], should collaborate with international institutions such as MSCI [13] to align rating methodologies, thereby reducing discrepancies between domestic and international scores.

4.2.2 Strengthen Mandatory ESG Information Disclosure

The scope of mandatory disclosure should be expanded by requiring all CSI 300 constituent stocks to publish ESG reports that combine quantitative indicators with third-party verification by 2026, with verification set as a compulsory requirement [11]. At the same time, a penalty mechanism should be established to impose fines on enterprises that falsify ESG data or omit key information, thereby ensuring the authenticity and completeness of disclosures.

4.2.3 Enhance ESG Education for Individual Investors

Securities firms and fund companies should launch ESG investment popularization programs in both online and offline formats, using case studies such as Ningde Times [3] to illustrate the relationship between ESG performance and investment returns. At the same time, it is necessary to introduce more ESG-themed public funds, such as CSI 300 ESG Leading Index Funds [6], in order to lower investment barriers and guide capital flows toward enterprises with strong ESG performance.

5. Conclusion

This study investigates the link between ESG performance and investment returns in China's green finance market, using CSI 300 constituent stocks from 2020 to 2024 as the research sample. The evidence confirms the existence of a clear ESG premium. High-ESG portfolios achieved higher annualized returns, lower volatility, and superior risk-adjusted performance compared with low-ESG portfolios. Regression analysis reinforced this conclusion by showing that higher ESG scores are positively associated with stronger returns and lower risks. Moreover, the return gap between high- and low-ESG portfolios widened during the study period, reflecting the growing recognition of ESG value under China's dual carbon strategy.

The case of Ningde Times further demonstrates how ESG optimization reduces financing costs. Through substantial investment in battery recycling, improved employee welfare, and strengthened governance structures, the company raised its ESG score from 52 in 2020 to 78 in 2024. This improvement enabled it to secure financing at rates consistently below the industry average. Its 2024 green bond issuance exemplifies this effect, saving approximately 40 million yuan in annual interest payments. The case highlights ESG as a driver of financial value rather than a compliance burden.

Nevertheless, systemic challenges continue to constrain ESG development in China. The lack of unified rating standards, insufficient quantitative disclosure, and limited investor awareness undermine the comparability and credibility of ESG data, thereby weakening the effectiveness of the ESG premium mechanism. Addressing these issues will be critical to building a transparent and efficient ESG investment environment.

Theoretically, this study contributes to the ESG literature in emerging markets by focusing on the post-dual carbon era, employing a combination of methods, and providing firm-level evidence on financing costs. Practically, the findings offer guidance for investors seeking risk-adjusted returns, for enterprises pursuing competitiveness through ESG optimization, and for policymakers refining sustainable finance policies. As China's green finance system matures, advancing unified ratings, mandatory disclosure, and investor education will unlock the full potential of ESG, supporting the transition to a more sustainable and resilient economy.

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