Latin American Business and Sustainability Review
Academic Journal

Article

Strategic sustainability: ESG's role in shaping credit ratings in global banking and its impact on profitability and efficiency

Citation: Momo-Dino, S. (2025). Strategic sustainability: ESG's role in shaping credit ratings in global banking and its impact on profitability and efficiency. LABSREVIEW, 2(2): 18-35. https://doi.org/10.70469/labsreview.v2i2.41.
Academic Editor: Jorge Martín Diez
Received: 8/30/2025
Revised: 10/6/2025
Accepted: 12/2/2025
Published: 12/30/2025

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Abstract: This study examines the impact of Environmental, Social, and Governance (ESG) performance on the credit ratings, profitability, and operational efficiency of the world's largest banks. Using an explanatory sequential mixed-methods design, the research integrates quantitative analysis via Partial Least Squares Structural Equation Modeling (PLS-SEM) with qualitative content analysis of sustainability and annual reports from selected banks. The study explores the direct and moderating effects of ESG on asset turnover (AT), earnings before interest and taxes (EBIT), and credit ratings. Results show that ESG performance significantly improves credit ratings but negatively affects EBIT, indicating short-term profitability trade-offs. AT positively influences credit ratings, though reverse coding suggests a nuanced interpretation. ESG also moderates the AT–credit rating relationship, implying that high ESG performance may reduce the marginal benefit of operational efficiency on creditworthiness. However, ESG does not significantly moderate the EBIT–credit rating link. These findings highlight the complex role of ESG in financial evaluations and underscore the need for strategic alignment between sustainability initiatives and financial performance. The study advocates integrating ESG metrics into credit risk models and refining profitability indicators to account for ESG-related externalities, positioning ESG as a strategic lever to enhance institutional credibility and long-term resilience.

Keywords: credit ratings, ESG performance, global banking, profitability and efficiency, sustainability and risk assessment

1. Introduction

In the contemporary global economy, banks are not merely financial intermediaries; they are systemic institutions that influence capital allocation, economic development, and financial stability across borders. As the backbone of the financial system, global banks facilitate investment, manage risk, and support growth in both the public and private sectors. Their scale and interconnectedness mean that their operational decisions – particularly those related to risk management and sustainability – have far-reaching implications for markets and societies alike (Carè & Weber, 2023).

The importance of studying the relationship between ESG performance and credit ratings lies in the growing demand for transparency and accountability in financial markets. Credit ratings serve as a key signal of a bank's financial health and risk profile, influencing its access to capital and cost of borrowing. If ESG performance is indeed a determinant of creditworthiness, then it becomes a strategic lever for banks seeking to enhance their financial standing and stakeholder trust. Moreover, understanding whether ESG moderates the effects of

traditional financial metrics – such as profitability (measured by EBIT) and operational efficiency (measured by asset turnover) – can offer deeper insights into how sustainability integrates with core financial performance.

Despite its growing importance, empirical research on the impact of ESG on credit ratings and its moderating effects on financial indicators remains limited – particularly in the context of global banking. This study addresses that gap by examining whether ESG performance directly influences credit ratings and whether it amplifies or attenuates the impact of profitability and efficiency on creditworthiness. By doing so, it contributes to a more integrated understanding of how sustainability and financial performance intersect in shaping the risk profiles of the world's largest banks.

1.1 Statement of the Problem

This study answers the question: To what extent does ESG performance, along with financial indicators such as asset turnover and EBIT, influence the credit ratings of the world's largest banks, and how do interaction effects between ESG and financial indicators moderate this relationship?

1.2 Objectives of the Study

Specifically, this study aimed to:

1. Determine the causal effect of ESG performance on the credit ratings of global banks.
2. Assess the direct impact of financial indicators – specifically asset turnover and earnings before interest and taxes – on credit ratings.
3. Evaluate whether ESG performance moderates the relationship between asset turnover and credit rating.
4. Evaluate whether ESG performance moderates the relationship between EBIT and credit rating.
5. Analyze the effect of ESG performance on operational efficiency and profitability.
6. Identify the extent to which ESG performance, alone or in combination with financial indicators, explains the variance in credit ratings.
7. Contribute to theoretical advancement by demonstrating how seven foundational frameworks collectively explain the interplay between sustainability and credit risk.

2. Literature Review and Hypotheses Development

The literature review focused on empirical and theoretical insights on three key dimensions: (a) the direct impact of ESG performance on credit ratings, (b) the influence of ESG on financial indicators such as asset turnover (AT) and earnings before interest and taxes (EBIT), and (c) the moderating role of ESG in shaping the relationship between these financial indicators and credit ratings.

2.1 ESG and Credit Ratings

ESG factors are considered non-financial performance indicators and are used to identify issues related to business ethics, corporate social responsibility, and corporate governance (Kim & Li, 2021). The growing body of literature examining the relationship between ESG performance and credit ratings reveals a consistent and increasingly robust link, particularly when ESG is measured as a composite score. Studies such as Agosto et al. (2023), Kim and Li (2021), Devalle et al. (2023), and Zanin (2021) provide compelling evidence that overall ESG scores are statistically significant predictors of credit ratings, even after controlling for financial indicators. Devalle et al. (2023) found that ESG scores positively influence long-term issuer credit ratings, with U.S. firms exhibiting greater significance of the broader ESG theme than European counterparts. Zanin (2021) confirmed that the aggregate ESG score significantly improves model fit across sectors and agencies, reinforcing the idea that ESG performance is increasingly factored into creditworthiness assessments. Agosto et al. (2023) further advanced this understanding by developing a Bayesian model that combines ESG scores from multiple providers, demonstrating improved predictive accuracy for credit rating classifications, especially for highly rated firms.

Some studies (Agosto et al., 2023; Devalle et al., 2023; Hentilä, 2022; Kim & Li, 2021; Kousa, 2023; Vaios, 2022) collected data for publicly listed companies in the US, Europe, and Asia, spanning the period of three to 20 years in various industries within the financial year 1990 to 2020. Vaios (2022) observed that companies with higher ESG scores were assigned higher credit ratings, indicating lower credit risk and easier access to debt financing. Agosto et al. (2023) found that the combined ESG scores were effective in predicting companies' credit ratings. This study suggested that a combined ESG rating was better at identifying the most creditworthy companies, with credit rating-class prediction accuracy higher than that obtained from a single ESG metric.

In contrast, studies focusing on individual ESG pillars yield more nuanced, and sometimes conflicting, findings. For instance, while Zanin (2021) and Chodnicka-Jaworska (2021, 2022) emphasize the Environmental pillar as the most influential, particularly in environmentally sensitive sectors like energy and mining, other studies, such as Devalle et al. (2017) and Kim and Li (2021), highlight the Social and Governance pillars as more impactful. Vaios (2022) and Brogi et al. (2022) also found that the social pillar was the most significant across regions and sectors. These discrepancies suggest that, while overall ESG scores offer a reliable signal of creditworthiness, the relevance of individual ESG dimensions may vary across sectors, regional regulatory environments, and credit rating agency methodologies. Therefore, while the integration of ESG into credit risk models is gaining traction, a one-size-fits-all approach may overlook important contextual differences in how ESG factors influence credit assessments.

H1: ESG performance improves Credit Ratings.

2.2 ESG and Asset Turnover (Efficiency)

ESG performance has increasingly been linked to operational efficiency, often captured by asset turnover (AT). Firms with strong ESG practices tend to adopt resource-efficient processes, optimize asset utilization, and implement sustainability-driven operational strategies, all of which can enhance AT (Kim & Li, 2021; Michalski & Low, 2021). ESG engagement not only improves a firm's reputation and stakeholder trust but also contributes to financial resilience by reducing operational risks and improving efficiency (Wu, 2023). Moreover, ESG performance serves as reputational insurance during periods of financial distress, thereby indirectly supporting operational stability and efficiency (Chodnicka-Jaworska, 2021; Devalle et al., 2023). These dynamics suggest that ESG initiatives, while primarily aimed at sustainability, can also yield operational benefits that strengthen a firm's ability to generate revenue from its asset base, thereby influencing creditworthiness through improved AT.

H2: ESG performance improves asset turnover.

2.3 ESG and Earnings before Interest and Taxes (Profitability)

Earnings Before Interest and Taxes (EBIT) is a key profitability measure, and its relationship with ESG performance is complex. While ESG initiatives can enhance long-term value creation, they often involve upfront costs that may temporarily reduce EBIT (Bonacorsi et al., 2022). However, ESG performance is increasingly recognized as a strategic asset that enhances long-term financial stability and creditworthiness by reducing default risk and improving access to capital (Aslan et al., 2021; Agosto et al., 2023). Henkel et al. (2024) introduced the Sustainable Performance Accounting (SPA) framework, which adjusts traditional EBIT to account for ESG-related externalities by defining Sustainable EBIT (SEBIT). This approach treats ESG costs (e.g., emissions) as provisions and ESG benefits (e.g., carbon sequestration) as assets, providing a more accurate representation of operational performance. Although conventional EBIT may understate the economic impact of sustainability investments, SEBIT demonstrates that ESG engagement can ultimately improve profitability when sustainability impacts are internalized. Thus, when properly integrated into financial metrics, ESG performance reinforces its materiality and its role in driving sustainable profitability (Henkel et al., 2024).

H3: ESG performance improves earnings before interest and taxes.

2.4 Asset Turnover on Credit Ratings

Asset turnover (AT), as a measure of operational efficiency, remains a significant predictor of credit ratings in traditional and ESG-integrated models. Studies confirm that AT and related efficiency ratios are consistently included in credit risk models, alongside leverage and liquidity indicators (Chodnicka-Jaworska, 2021; Devalle et al., 2023). Higher AT generally signals effective resource utilization, which credit rating agencies interpret as a sign of financial stability and lower default risk (Michalski & Low, 2021). While ESG factors are gaining prominence, research shows that operational efficiency metrics, such as AT, continue to play a critical role in explaining creditworthiness, particularly when combined with other financial indicators (Billio & Giacomelli, 2022; Agosto et al., 2023). These findings underscore that AT remains a core component of credit rating methodologies, reflecting its importance in assessing a firm's ability to generate revenue from its asset base.

H4: Asset turnover improves Credit Rating.

2.5 Earnings before Interest and Taxes on Credit Ratings

Earnings Before Interest and Taxes (EBIT) is widely recognized as a fundamental measure of profitability and a key determinant of credit ratings. Multiple studies confirm that EBIT and related profitability ratios, such as EBIT/Total Revenue and EBITDA, significantly influence credit risk assessments (Brogi et al., 2022; Devalle et al., 2017). Higher EBIT indicates stronger operating performance and debt-servicing capacity, which rating agencies associate with lower credit risk (Kim & Li, 2021; Michalski & Low, 2021). However, some research notes that EBIT's explanatory power may vary across contexts, with liquidity and leverage sometimes exerting stronger effects (Kousa, 2023). Despite these variations, EBIT remains integral to credit rating models, often serving as a primary indicator of financial health and resilience, even when ESG factors are incorporated (Billio & Giacomelli, 2022; Bonacorsi et al., 2022).

H5: EBIT improves Credit Rating.

2.6 Moderation Role of ESG on the Relationship Between Asset Turnover and Credit Ratings

Several studies suggest that ESG performance can moderate the impact of operational efficiency, measured by asset turnover (AT), on credit ratings. ESG mitigates risk by reducing information asymmetry and perceived risk, thereby amplifying the positive effect of strong operational efficiency on creditworthiness (Cubas-Díaz & Sedano, 2018; Devalle et al., 2017). Chodnicka-Jaworska (2021) provides evidence that ESG factors can offset negative financial signals, such as high leverage, and enhance the explanatory power of efficiency metrics in credit rating models. Similarly, Agosto et al. (2023) demonstrate that firms with weaker financial fundamentals, but strong ESG performance, can still achieve favorable credit ratings, indicating that ESG can compensate for deficiencies in operational indicators. Kousa (2023) further supports this by showing that ESG scores remain significant even when controlling for financial ratios, suggesting that ESG strengthens the predictive relationship between AT and credit ratings, particularly in sectors where sustainability is material.

H6: ESG moderates the relationship between AT and Credit Rating.

2.7 Moderation Role of ESG on the Relationship Between EBIT and Credit Ratings

The moderating role of ESG on the relationship between profitability, measured by EBIT, and credit ratings is well documented in the recent literature. ESG performance can buffer the adverse effects of low profitability, allowing firms with weaker EBIT to maintain stronger credit ratings when sustainability practices are robust (Chodnicka-Jaworska, 2021; Hentilä, 2022). Agosto et al. (2023) confirm that ESG scores improve the accuracy of credit risk assessments by mitigating the effects of poor financial performance, particularly for speculative-grade firms. However, the strength of this moderation varies across contexts; for example, Kim and Li (2021) note that ESG-profitability interactions are stronger in large firms with stronger governance structures. Bonacorsi et al. (2022) also highlight that ESG's moderating effect is context-dependent, influenced by sectoral and regional factors. Overall, these findings indicate that ESG integration not only enhances the explanatory power of EBIT in credit rating models but also provides a strategic buffer against profitability-related risks.

H7: ESG moderates the relationship between EBIT and Credit Rating.

2.8 Research Gap

While numerous studies have examined the individual effects of ESG performance, financial efficiency, and profitability on credit ratings, there remains a lack of integrated analysis of their joint and interactive impacts, particularly within the global banking sector. Most existing literature focuses on either ESG or financial indicators in isolation, often within specific regions or industries. Furthermore, the moderating role of ESG in the relationship between financial performance and creditworthiness remains underexplored, particularly through quantitative models that capture interaction effects.

Table 1. Research gaps

		Contextual Gaps			
Authors	Variables Studied	Demographic	Temporal	Geographic	Methodological
Devalle et al. (2017)	ESG, Credit Ratings	Yes	Yes	Yes	Yes
Cubas-Díaz & Sedano (2018).	Sustainability performance, Credit Ratings	Yes	Yes	No	Yes
Jang et al. (2020)	ESG scores, Bond Returns	Yes	Yes	Yes	Yes
Aslan et al. (2021)	ESG scores, credit default probabilities	Yes	Yes	Yes	Yes
Chodnicka-Jaworska (2021)	ESG, financial ratios, Credit Ratings	Yes	Yes	Yes	Yes
Michalski & Low (2021)	ESG, financial ratios	Yes	Yes	No	Yes
Kim & Li (2021)	ESG, ROA, Credit Ratings	Yes	Yes	No	Yes
Zanin (2021)	ESG, Credit rating	Yes	Yes	Yes	Yes
Kim & Kim (2022)	Environmental Risk (GHG emissions, energy use), Credit Ratings, Market Competition (HHI)	Yes	Yes	Yes	Yes
Brogi et al. (2022)	ESG, Altman Z-score, PD	Yes	Yes	No	Yes
Chodnicka-Jaworska (2022)	ESG, financial ratios, Credit Ratings	Yes	Yes	Yes	Yes
Billio & Giacomelli (2022)	ESG, Financial performance (Revenue, Opex, Capex, debt structure), Credit rating, Probability of default	Yes	Yes	Yes	Yes
Bonacorsi et al. (2022)	ESG, Altman Z-score, accounting ratios	Yes	Yes	Yes	Yes
Vaios (2022)	ESG ratings, Credit Ratings	Yes	Yes	No	Yes
Hentilä (2022)	ESG, Credit Ratings, Financial Controls	Yes	Yes	Yes	Yes
Agosto et al. (2023)	ESG, Credit Ratings, Financial Ratios	Yes	Yes	Yes	Yes
Agosto et al. (2023)	ESG, credit ratings, and financial ratios	Yes	Yes	Yes	Yes
Agosto et al. (2023)	ESG, Credit ratings	Yes	Yes	Yes	Yes
Kousa (2023)	ESG, credit ratings, EBIT margin, current ratio, equity ratio, industry, revenue	Yes	Yes	Yes	Yes

Wu (2023)	ESG, trade credit financing (accounts payable/total assets)	Yes	Yes	Yes	Yes
Devalle et al. (2023)	ESG, credit ratings	Yes	Yes	Yes	Yes

Source: Compiled by Author

2.9 Multi-theoretical Framework

A critical observation from the literature reviewed is the absence of explicit theoretical or conceptual frameworks guiding empirical investigations into the relationship between ESG performance and credit risk. Hence, this study is grounded in a multi-theoretical framework that integrates sustainability, strategic management, and financial signaling perspectives to explain the joint and moderating effects of ESG performance, asset turnover (AT), and earnings before interest and taxes (EBIT) on credit ratings in the global banking sector.

- Triple Bottom Line (Elkington, 1994). The overarching framework is the Triple Bottom Line (TBL), which posits that firms should simultaneously pursue environmental, social, and economic goals. ESG performance reflects this multidimensional approach to value creation. In this study, ESG is conceptualized as a composite construct encompassing environmental, social, and governance dimensions, which collectively influence both financial performance and creditworthiness.
- Stakeholder Theory (Freeman, 1984) and Legitimacy Theory (Suchman, 1995). These theories support the role of ESG in managing stakeholder relationships and maintaining societal legitimacy. Banks that perform well on ESG dimensions are more likely to gain trust from regulators, investors, and the public, which can translate into improved credit ratings. These theories justify the hypothesized direct effect of ESG on credit ratings.
- Resource-Based View (Barney, 1991). The Resource-Based View (RBV) suggests that ESG capabilities – such as sustainable operations, ethical governance, and social responsibility – can be strategic resources that enhance operational efficiency (AT) and profitability (EBIT). This supports the hypothesized paths from ESG to AT and EBIT.
- Sustainable Performance Accounting (Henkel et al., 2024). This modern accounting framework, as discussed in Section 2.2, introduces Sustainable EBIT, which adjusts traditional EBIT to account for ESG-related externalities. It reinforces the idea that ESG investments, while potentially costly in the short term, contribute to long-term financial resilience and should be integrated into profitability assessments.
- Signaling Theory (Spence, 1973). Signaling theory underpins ESG's role as a signal of reduced risk and enhanced transparency. ESG disclosures can reduce information asymmetry between banks and credit rating agencies, thereby influencing credit ratings directly and moderating the effects of financial indicators. This supports the inclusion of interaction terms (ESG × AT and ESG × EBIT) in the model.
- ESG (UN, 2004). UN outlines the critical context for understanding the strategic integration of ESG into financial decision-making. In its report, the UN called on major financial institutions to incorporate ESG factors into asset management, securities brokerage, and research processes. It emphasized that ESG considerations are not merely ethical imperatives but are material to long-term financial performance and risk management. The report catalyzed the mainstreaming of ESG in investment analysis and laid the groundwork for subsequent regulatory and institutional shifts. Its influence is evident in the evolving methodologies of credit rating agencies, which increasingly factor ESG metrics into their assessments.

Figure 1 presents a multi-theoretical framework and provides a robust theoretical basis for examining how ESG and financial indicators jointly shape credit ratings in the banking sector, in line with Creswell and Creswell (2023, pp. 51–78). The authors emphasize that when a single theory is insufficient to explain a multifaceted phenomenon, researchers should integrate multiple theoretical perspectives to enhance explanatory depth and analytical rigor.

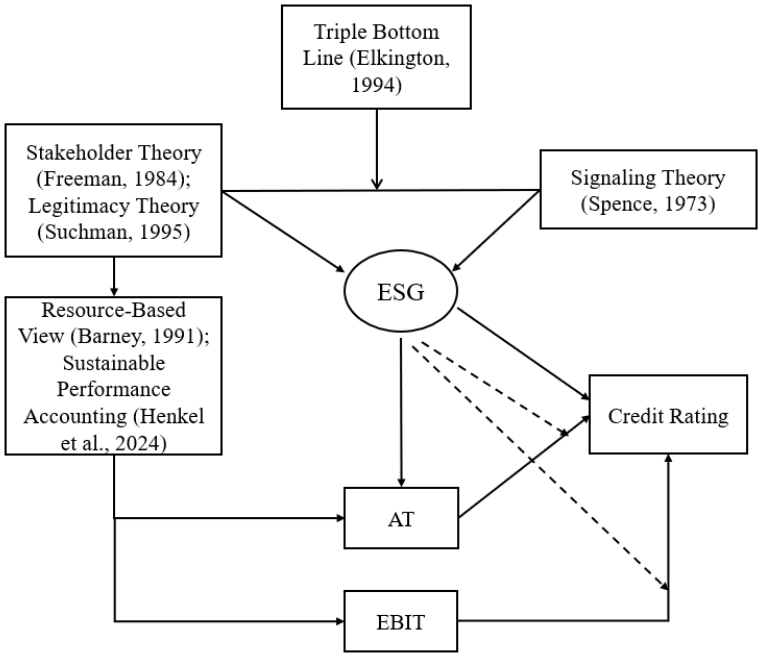

Figure 1. Multi-theoretical Framework.
Source: Triple Bottom Line (Elkington, 1994), Stakeholder Theory (Freeman, 1984), Legitimacy Theory (Suchman, 1995), the Resource-Based View (Barney, 1991), Sustainable Performance Accounting (Henkel et al., 2024), Signaling Theory (Spence, 1973) and ESG (UN, 2004)

3. Materials and Methods

3.1 Research Design

This study employed a cross-sectional research approach and used an explanatory sequential mixed-methods design, in which results were first analyzed quantitatively and then further explained and deepened through qualitative research (Creswell & Creswell, 2023). The research utilized secondary data and applied PLS-SEM to test the hypothesized relationships.

3.2 Sample and Data Sources

The initial sample was drawn from the top 100 banks ranked by S&P; however, 5 banks were excluded due to incomplete data, resulting in a final sample of 95 banks. This represents a 95% usable rate, which meets the minimum sample size threshold recommended for PLS-SEM (Hair et al., 2022). The data pertains to the fiscal year 2024 to ensure consistency in ESG evaluation and financial reporting.

Table 2. Summary profile of selected banks by continent

Continent	Countries Represented	No. of banks	Mean scores/rating					
			E	S	G	AT	EBIT	CR
Asia	China, Japan, India, Qatar, Singapore, South Korea	38	38.53	46.13	45.39	0.0190	$11.6b	7.21
Australia	Australia	4	69.00	61.00	60.25	0.0180	$7.19b	4.00
Europe	Austria, Belgium, Denmark, Finland, France, Germany, Italy, Netherlands, Norway, Spain, Sweden,	29	64.86	58.34	60.17	0.0222	$9.17b	6.03

	Switzerland, United Kingdom							
North America	Canada, United States	21	43.14	44.00	49.00	0.0350	$13.23b	6.62
South America	Brazil	3	74.33	89.00	77.67	0.0491	$7.75b	11.67
		95						

To complement the quantitative findings of this study, a qualitative content analysis was conducted on the publicly available sustainability and annual reports of two strategically selected banks: Industrial and Commercial Bank of China (ICBC), headquartered in Asia, and Barclays PLC, headquartered in Europe. These banks were selected based on their contrasting profiles in ESG performance, financial indicators, and credit ratings, which offer rich explanatory potential. The selection ensures geographic and regulatory diversity, as both banks operate within distinct regional ESG expectations. All insights are derived from publicly disclosed documents in accordance with ethical research standards.

3.3 Variables: Type and Measurement

Table 3. Variable type and measurements (n=95)

Variable	Type	Operationalization/Measurement	Scale/Coding
Credit Rating (CR)	Dependent	Credit rating converted to numeric: 1 (AAA) to 21 (D) (lower value = better rating)	Ordinal → numeric, reverse-coded in interpretation
ESG Score	Independent/ Moderator	Composite ESG scores	1–100 (higher = better ESG)
Asset Turnover (AT)	Independent	Revenue ÷ Total Assets (operational efficiency)	Continuous ratio
EBIT	Independent	Earnings before interest and taxes (profitability)	USD billions, continuous
ESG × AT	Interaction/ Moderation	Product of ESG and AT indicators (product-indicator approach in PLS-SEM)	Construct formed from product indicators
ESG × EBIT	Interaction/ Moderation	Product of ESG and EBIT indicators (product-indicator approach in PLS-SEM)	Construct formed from product indicators.

3.4 Operational Framework

The operational framework outlines how the conceptual relationships among ESG performance, asset turnover, EBIT, and credit ratings were translated into measurable constructs. It guided the selection of indicators, the development of hypotheses, and the structure of the statistical model.

Figure 2 presents the operational framework used in this study. The structural model was specified to use SmartPLS 4.0, with ESG dimensions modeled as reflective constructs and AT, EBIT, and credit rating treated as single-indicator variables.

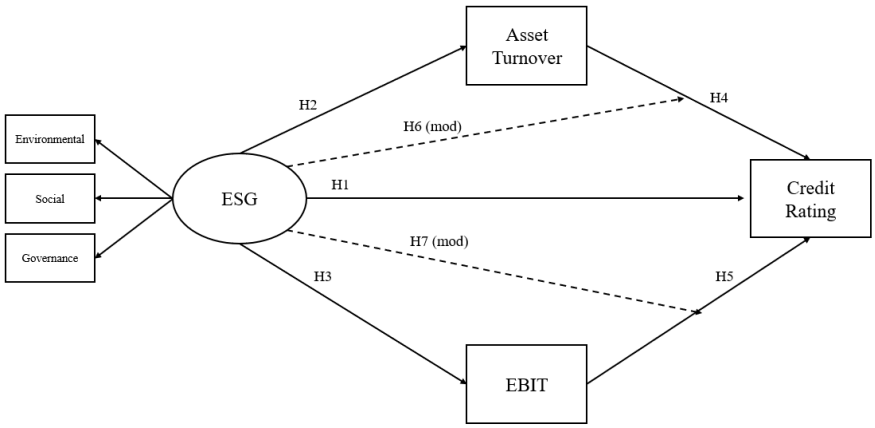

Figure 2. Operational Framework. Source: Author

3.5 Measurement Model and Model Fit

The model demonstrates strong reliability and convergent validity for the constructs used, consistent with established thresholds. The outer loadings for the ESG dimensions – Environmental (0.921), Social (0.941), and Governance (0.946) – exceed the recommended minimum of 0.708, indicating that each indicator is a strong representation of its latent construct (Hair et al., 2022). The composite reliability (CR) and Cronbach's alpha (α) for the ESG construct are 0.955 and 0.930, respectively, both surpassing the 0.70 threshold, which confirms internal consistency (Hair et al., 2019). The average variance extracted (AVE) is 0.876, well above the 0.50 benchmark, supporting convergent validity (Fornell & Larcker, 1981). For single-indicator constructs such as EBIT, Asset Turnover, and Credit Rating, perfect scores (1.0) across all reliability metrics are expected because a single observed variable measures them. These results affirm that the measurement model is statistically sound and suitable for structural equation modeling.

According to Fornell and Larcker (1981), discriminant validity is established when the square root of the average variance extracted (AVE) for each construct (shown on the diagonal) is greater than its correlations with any other construct (off-diagonal values). In the model, the square root of AVE for ESG is 0.935, which exceeds its correlations with Asset Turnover (0.190), EBIT (0.232), and Credit Rating (0.203), indicating good discriminant validity. Similarly, the values for AT (1.000), EBIT (1.000), and CR (1.000) are all higher than their respective inter-construct correlations, which is expected for single-indicator constructs. The results confirm that each construct captures a unique aspect of the model and that multicollinearity is not a concern (Hair et al., 2022). Thus, the measurement model demonstrates strong discriminant validity, supporting the robustness of the structural relationships tested.

3.6 Overall Model Fit

Table 4 presents the model fit indices for both the estimated and saturated models, using three key metrics: the Standardized Root Mean Square Residual (SRMR), the squared Euclidean distance (dULS), and the geodesic distance (dG). The SRMR value for the estimated model is 0.050, which is well below the conservative threshold of 0.08 recommended by Hair et al. (2019), indicating a good fit between the observed and predicted correlations. Similarly, the dULS (0.052) and dG (0.058) values fall comfortably below their respective 99% confidence intervals (HI99), further supporting the model's adequacy. These results suggest that the structural model is well-specified and that the hypothesized relationships among ESG, financial indicators, and credit ratings are consistent with the empirical data. According to Hair et al. (2022), achieving low SRMR, dULS, and dG values is essential in PLS-SEM to confirm that the model is not misspecified. Therefore, the fit indices in Table 4 provide strong evidence of the model's robustness and its suitability for hypothesis testing.

Table 4. Test of model fit.

	Estimated Model		Saturated Model	
	Value	HI99	Value	HI99
SRMR	0.050	0.103	0.041	0.041
d_{ULS}	0.052	0.223	0.036	0.036
d_G	0.058	0.106	0.053	0.069

4. Results

Table 5, presented in this study, reveals considerable variability in ESG scores and financial indicators among the sampled global banks. The environmental performance (*SD=20.057, Min=9, Max=81*) exhibits a wide range, reflecting divergent approaches to climate strategy and emissions management. This variation is substantiated by the content analysis of ICBC and Barclays' reports. ICBC, while leading in green finance volume, reports high operational emissions due to its industrial exposure and scale. In contrast, Barclays demonstrates a more aggressive decarbonization strategy, including sourcing 100% renewable electricity and substantial investments in climate technologies. Similarly, the dispersion in social performance (*SD = 19.793; Min = 16; Max = 95*) aligns with regional differences in stakeholder engagement. ICBC emphasizes rural revitalization and pension finance, whereas Barclays focuses on community development, inclusive employment, and digital literacy initiatives. Governance performance (*SD=16.435, Min=23, Max=91*) exhibits moderate variability, attributable to structural differences in oversight frameworks. ICBC integrates ESG into Party-led governance systems, while Barclays prioritizes board independence, compliance culture, and ESG oversight mechanisms.

Table 5. Descriptive Statistics

	Obs	Mean	Std Dev	Min	Max
Environmental	95	50.000	20.057	9.000	81.000
Social	95	51.368	19.793	16.000	95.000
Governance	95	52.347	16.435	23.000	91.000
EBIT	95	10.916	12.271	-0.481	75.755
Asset Turnover	95	0.024	0.012	0.004	0.057
Credit Rating	95	6.726	2.059	4.000	15.000

The financial indicators further illustrate the heterogeneity of the sample. EBIT values (*SD=12.271, Min=-0.481, Max=75.755*) indicate substantial differences in profitability. ICBC's scale and state-backed lending model contribute to its high EBIT, while Barclays reports moderate profitability due to strategic investments in ESG and digital transformation. Asset turnover (*SD=0.012, Min=0.004, Max=0.057*) remains low and relatively stable, reflecting differences in operational models. Barclays' leaner, digitally driven operations yield higher turnover rates compared to ICBC's extensive asset base. Credit ratings are clustered around investment-grade levels (*SD = 2.059; Min = 4; Max = 15*), yet the reports suggest that ESG performance alone does not determine creditworthiness. Factors such as sovereign backing, governance quality, and strategic alignment play critical roles in shaping credit profiles.

Table 6 reveals important insights into the structural model. Credit Rating, as the primary dependent variable, is moderately explained by the model ($R^2 = 0.315$), with ESG and Asset Turnover contributing small to medium effect sizes, respectively. The interaction between ESG and AT also shows a medium effect, highlighting the importance of moderation in the model. EBIT and ESG × EBIT, however, have negligible effects on Credit Rating, suggesting limited direct or interactive influence. For the other dependent variables, AT and EBIT, ESG accounts for only a small portion of their variance, indicating that ESG alone does not strongly predict operational or profitability metrics. All VIF values are well below the critical threshold of 5, confirming that multicollinearity is not a concern and that the predictors are sufficiently independent for reliable interpretation.

Table 6. Effect Size, Variance Explained, and Inner Collinearity

Endogenous	Exogenous	f^2	Effect	R^2	Strength	VIF
CR	ESG	0.113	Small	0.315	Moderate	1.155
	AT	0.158	Medium			1.097
	EBIT	0.003	Negligible			2.864
	ESG x AT	0.223	Medium			1.020
	ESG x EBIT	0.007	Negligible			2.689
AT	ESG	0.036	Small	0.035	Weak	1.000
EBIT	ESG	0.054	Small	0.051	Weak	1.000

Table 7 presents a negative and significant coefficient for ESG on Credit Rating ($\beta = –0.299$, $t = 3.172$, $p = .002$), indicating that higher ESG performance is associated with better credit ratings. Given that credit ratings are

reverse-coded (1 = highest, 21 = lowest), a negative coefficient indicates a movement toward lower values, i.e., an improvement in creditworthiness. This finding aligns with prior research suggesting that ESG performance enhances institutional credibility and reduces perceived risk (Kim & Li, 2021; Devalle et al., 2023). Similarly, the negative and significant effect of ESG on EBIT ($\beta = -0.227$, $t = 2.615$, $p = .009$) suggests that higher ESG performance may be associated with lower reported profitability, potentially due to the upfront costs of sustainability initiatives. This supports the argument by Henkel et al. (2024) that traditional EBIT may understate the long-term value of ESG investments. Interestingly, AT has a positive and significant effect on Credit Rating ($\beta = 0.344$, $t = 2.920$, $p = .004$). However, because higher numerical values indicate worse credit ratings, this positive coefficient implies that greater operational efficiency is associated with weaker credit ratings – an unexpected result. This may indicate that banks with higher AT ratios pursue more aggressive asset utilization strategies, which rating agencies may perceive as riskier. In contrast, ESG does not significantly influence AT ($\beta = 0.187$, $t = 1.697$, $p = .090$), *and EBIT does not significantly affect Credit Rating* ($\beta = -0.074$, $t = 0.530$, $p = .596$), *suggesting that these paths are not statistically significant*. Overall, the results support hypotheses H1, H3, and H4, while H2 and H5 are not supported.

Table 7. PLS Path Coefficients and Moderation Analysis

Hypothesis	Path	β	*M*	*SD*	*t*	*p*
H1 (Significant)	ESG -> CR	-0.299	-0.292	0.094	3.172	0.002
H2 (Not significant)	ESG -> AT	0.187	0.189	0.110	1.697	0.090
H3 (Significant)	ESG -> EBIT	-0.227	-0.221	0.087	2.615	0.009
H4 (Significant)	AT -> CR	0.344	0.336	0.118	2.920	0.004
H5 (Not significant)	EBIT -> CR	-0.074	-0.051	0.139	0.530	0.596
H6 (Significant)	ESG x AT -> CR	0.370	0.375	0.087	4.230	0.000
H7 (Not significant)	ESG x EBIT -> CR	0.104	0.121	0.128	0.811	0.418

The path analysis results reveal nuanced relationships among ESG performance, financial indicators, and credit ratings, further illuminated by qualitative insights from the sustainability and annual reports of ICBC and Barclays. The significant negative path between ESG scores and credit ratings (reverse-coded) suggests that stronger ESG performance is associated with better creditworthiness. This finding aligns with the strategic framing observed in both banks' disclosures, where ESG is positioned as a tool for risk mitigation and reputational enhancement. Barclays emphasizes ESG integration into governance and stakeholder engagement, while ICBC embeds ESG into its enterprise risk management system. Although this result is consistent with several studies (e.g., Brogi et al., 2022; Michalski & Low, 2021), it contrasts with findings from Kim & Li (2021), who report a negative impact of environmental scores on credit ratings, suggesting that ESG effects may vary by pillar and context.

The non-significant path between ESG and asset turnover supports the notion that ESG initiatives, while strategically important, may not directly enhance operational efficiency. This is reflected in ICBC's emphasis on green finance and inclusive lending, which are long-term strategic investments rather than drivers of short-term asset productivity. The literature offers limited direct evidence on this relationship. However, asset turnover is often treated as a control variable (e.g., Chodnicka-Jaworska, 2021), thereby reinforcing the interpretation that ESG's influence on efficiency is at best indirect.

The significant negative path from ESG to EBIT further supports the trade-off hypothesis, whereby ESG investments—such as compliance, innovation, and sustainability reporting—may reduce short-term profitability. This is evident in both ICBC and Barclays' reports, which detail substantial resource allocation toward ESG initiatives. This finding is consistent with studies such as Billio & Giacomelli (2022) and Bonacorsi et al. (2022), which highlight the cost implications of ESG integration, particularly in capital expenditure and operational adjustments.

The positive path from asset turnover to credit rating (reverse-coded) suggests that leaner operations may be perceived as riskier by rating agencies, especially when aggressive asset utilization is involved. Barclays' higher turnover reflects its digital banking model, while ICBC's lower turnover aligns with its conservative lending practices. This interpretation adds nuance to the existing literature, which generally supports asset turnover as a positive predictor of creditworthiness (e.g., Devalle et al., 2023) but rarely considers its risk-signaling implications.

The non-significant path from EBIT to credit rating underscores that profitability alone may not be a decisive factor in credit assessments. ICBC's strong EBIT does not necessarily translate to superior ratings, likely due to sovereign backing and systemic factors. Similarly, Barclays' moderate EBIT is offset by its robust ESG

disclosures. This finding aligns with Devalle et al. (2017) and Kousa (2023), who report weak or inconsistent effects of EBIT on credit ratings, suggesting that ESG and governance factors increasingly complement traditional financial metrics in credit risk evaluation.

The interaction between ESG and Asset Turnover has a positive and significant effect on Credit Rating ($\beta = 0.370, t = 4.230, p < .001$). However, since Credit Ratings are reverse-coded (1 = highest, 21 = lowest), a positive coefficient indicates a movement toward lower credit ratings, or worsening creditworthiness. This suggests that while operational efficiency (AT) is generally beneficial, its positive interaction with ESG may paradoxically be associated with weaker credit ratings when ESG performance is high. This counterintuitive result may reflect the complexity of how rating agencies interpret ESG-enhanced efficiency, which they may view as indicative of aggressive growth strategies that carry higher risk (Henkel et al., 2024).

This finding challenges the assumption that ESG always amplifies financial strengths and aligns with the cautionary perspective of Bonacorsi et al. (2022), who noted that ESG-related investments can impose short-term financial burdens. It also suggests that the signaling effect of ESG (Spence, 1973) may not uniformly enhance all financial metrics in the eyes of credit rating agencies.

In contrast, the interaction between ESG and EBIT does not have a significant effect on Credit Rating ($\beta = 0.104, t = 0.811, p = .418$), implying that ESG does not meaningfully moderate the relationship between profitability and credit rating. This supports the argument by Henkel et al. (2024) that traditional EBIT may fail to capture the long-term value of ESG investments, and that Sustainable EBIT (SEBIT) may be a more appropriate metric for evaluating profitability in ESG-integrated models. Hence, the results support hypothesis H6 with caution, given the reverse coding of the dependent variable, but do not support hypothesis H7.

The moderation analysis reveals that ESG performance significantly interacts with asset turnover in predicting credit ratings, but not with EBIT. The significant ESG × AT interaction suggests that high ESG performance may buffer the influence of operational efficiency on creditworthiness. This is consistent with ICBC's integration of ESG into risk systems and Barclays' emphasis on ESG as a reputational signal, both of which may reduce the marginal value of asset turnover in credit assessments. This finding is supported by studies such as Hentilä (2022) and Bonacorsi et al. (2022), which show that ESG disclosure can moderate the effects of financial indicators on credit ratings. In contrast, the non-significant ESG × EBIT interaction implies that ESG does not amplify or diminish the effect of short-term profitability on credit ratings. This aligns with the strategic framing of ESG in both banks' reports and with literature suggesting that ESG influences long-term financial stability rather than immediate earnings (e.g., Billio & Giacomelli, 2022; Devalle et al., 2017). These results underscore the importance of considering temporal and strategic dimensions when evaluating the interplay between sustainability and financial performance in credit risk models.

5. Conclusion

Global banks are increasingly recognizing that strong ESG performance is not merely a reputational asset but also a financial asset. This study shows that banks with higher ESG scores tend to secure better credit ratings, reflecting greater trust from rating agencies and investors. However, the findings also reveal a trade-off: while ESG initiatives enhance long-term credibility, they may temporarily reduce profitability, as evidenced by lower EBIT. Moreover, the relationship between operational efficiency and credit ratings becomes more complex when ESG is considered, suggesting that high ESG performance can alter how efficiency is interpreted in risk assessments. For global banks, this means ESG is no longer a peripheral concern but a strategic lever that must be carefully aligned with financial and operational goals.

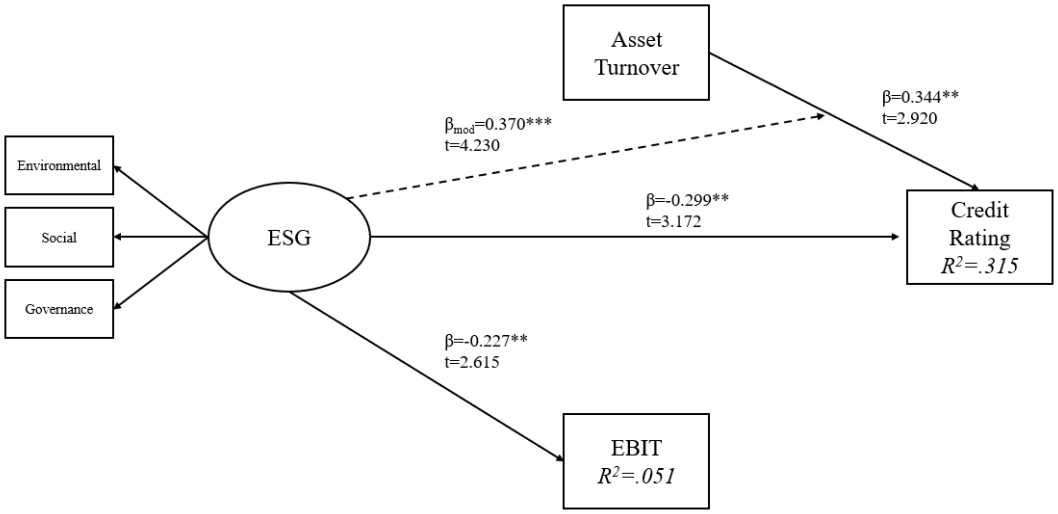

Figure 3. Final Model: Sustainability-Integrated Credit Rating Model for Global Banks. $^{**}p<.01$, $^{***}p<.001$. Source: Author

Figure 3 presents the final empirically tested model, Sustainability-Integrated Credit Rating Model for Global Banks, which encapsulates the direct and moderating effects of ESG performance, asset turnover, and EBIT on credit ratings. Although the R^2 value for EBIT is only 0.051, its inclusion in the final model is theoretically justified, as profitability is inherently influenced by a wide range of factors beyond ESG – such as market conditions, regulatory environments, and firm-specific strategies – making a low explanatory power from ESG alone both expected and consistent with prior research (Henkel et al., 2024; Kim & Li, 2021).

ESG as a Direct Predictor of Credit Ratings. For global banks operating in an increasingly transparent and risk-sensitive financial environment, ESG performance has become a core driver of creditworthiness. Rating agencies no longer evaluate institutions solely on traditional financial metrics; they increasingly incorporate ESG factors into their assessments. Banks with firm ESG profiles are viewed as more resilient, better governed, and less exposed to reputational, regulatory, and environmental risks. This translates into higher credit ratings, which, in turn, lowers the cost of capital and improves access to funding.

The direct link between ESG scores and credit ratings reflects a shift in how risk is perceived. A bank that demonstrates robust environmental policies, sound governance structures, and strong social responsibility is seen as better positioned to navigate long-term challenges – from climate-related disruptions to stakeholder scrutiny. These institutions signal stability and forward-thinking leadership, qualities that rating agencies increasingly reward.

ESG's Influence on Financial Indicators. While ESG performance is increasingly recognized as a driver of institutional credibility, its impact on core financial indicators such as profitability and operational efficiency presents a more complex picture for global banks. On one hand, ESG investments – such as climate risk mitigation, governance reforms, and social responsibility programs – can enhance long-term resilience and stakeholder trust. However, these initiatives often require substantial upfront costs, which may temporarily strain profitability metrics such as EBIT. For banks, this means that ESG-driven strategies may not immediately translate into higher earnings, but they contribute to a more stable and risk-aware operating environment.

Operational efficiency, measured through asset turnover, also interacts with ESG in nuanced ways. Banks that excel in ESG may already be perceived as low-risk institutions, thereby reducing the marginal impact of efficiency gains on credit ratings. In other words, once a bank demonstrates strong ESG credentials, additional improvements in asset utilization may not significantly shift how rating agencies assess its creditworthiness. This suggests that ESG performance can reshape the financial narrative – where sustainability signals strength, and traditional metrics like EBIT and asset turnover must be interpreted in light of broader strategic priorities.

Financial Indicators and Credit Ratings. In the credit evaluation of global banks, financial indicators such as asset turnover and EBIT continue to play a central role. However, their influence is evolving in light of broader strategic priorities. Asset turnover, which reflects how efficiently a bank uses its assets to generate revenue, is traditionally regarded as an indicator of operational strength. However, in today's risk-sensitive environment, high asset turnover may also signal aggressive growth strategies or lean asset structures, raising concerns about long-term stability. Credit rating agencies are increasingly looking beyond raw efficiency and asking whether such performance is sustainable and aligned with prudent risk management.

Similarly, EBIT – an indicator of core profitability – remains a key measure of a bank's ability to service debt and absorb shocks. However, as banks invest more heavily in ESG initiatives, short-term EBIT figures may not fully capture the strategic value of those investments. For example, expenditures on climate risk mitigation, governance reforms, or social programs may reduce immediate earnings but strengthen the institution's long-term resilience and stakeholder trust. Rating agencies are beginning to recognize this shift, placing greater emphasis on the quality and sustainability of earnings rather than their magnitude alone.

Moderating Role of ESG. As ESG performance becomes a central pillar of institutional strategy, its influence extends beyond direct impact – it also reshapes how traditional financial indicators are interpreted in credit assessments. For global banks, this means that ESG does not merely add value; it also alters how rating agencies assess other aspects of financial performance.

Take operational efficiency, for example. A bank with high asset turnover is typically regarded as effectively managing its resources. However, when that same bank also has strong ESG credentials, the efficiency signal may be interpreted differently. Rating agencies might view the combination as a sign of aggressive growth or risk-taking, especially if ESG efforts already convey stability and resilience. In this context, ESG can dilute the value added by efficiency by signaling that the institution has already addressed key risk factors through sustainability practices.

Similarly, ESG can influence how profitability is weighed. While strong earnings are always important, rating agencies may place less emphasis on short-term profitability if a bank demonstrates long-term value creation through ESG investments. This shift reflects a broader trend: credit ratings are increasingly shaped by the extent to which financial performance aligns with responsible governance, environmental stewardship, and social impact.

This study provides robust empirical evidence that ESG performance plays a critical role in shaping the creditworthiness of the world's largest banks. By positioning ESG as the central construct and integrating it with traditional financial indicators such as asset turnover and EBIT, the research offers a multidimensional view of how sustainability and financial performance jointly influence credit ratings. The findings confirm that ESG has a significant direct effect on credit ratings and a moderating effect on the relationship between operational efficiency and creditworthiness. Although the influence of EBIT was less significant, the study underscores the growing importance of non-financial metrics in credit evaluation frameworks.

5.1 Managerial Implications

The findings of this study offer several practical insights for executives, sustainability officers, and credit risk managers:

1. ESG as a Strategic Lever for Creditworthiness: The significant direct effect of ESG performance on credit ratings underscores the importance of integrating ESG into core business strategy. Managers should not treat ESG as a compliance obligation or a reputational tool alone, but as a strategic asset that can enhance creditworthiness and reduce the cost of capital.
2. A Complex Interaction of ESG and Operational Efficiency: The significant moderating effect of ESG on the relationship between asset turnover and credit ratings suggests that high ESG performance may weaken the beneficial effect of asset turnover on credit ratings. This implies that when ESG scores are already substantial, additional gains in operational efficiency may not further improve credit ratings and could even be perceived as risk-enhancing if they signal aggressive asset utilization. Managers should therefore carefully align ESG initiatives with operational strategies, ensuring that efficiency improvements are not pursued at the expense of perceived stability or sustainability. Rather than assuming a purely additive effect, executives should recognize that the value of operational efficiency may be context-dependent, particularly in institutions that already demonstrate strong ESG credentials.
3. ESG Investment Requires Long-Term Perspective: The findings imply that ESG investments may not yield immediate financial returns but can enhance long-term resilience and stakeholder trust. Executives should communicate this long-term value proposition to shareholders and boards to justify sustained ESG spending.

5.2 Theoretical Implications

In addition to the empirical validation, the study contributes to theoretical advancement by integrating seven foundational frameworks – Triple Bottom Line, Stakeholder Theory, Legitimacy Theory, Resource-Based View, Sustainable Performance Accounting, Signaling Theory, and ESG – into a unified conceptual model. This integration not only enhances the research's explanatory power but also bridges the gap between sustainability and financial risk assessment.

This study makes a moderate to substantial contribution to the body of knowledge on ESG-finance integration by empirically validating ESG performance as a key determinant of credit ratings in the global banking sector. Through a well-structured operational and final model, the research demonstrates that ESG not only directly influences creditworthiness but also significantly moderates the relationship between operational efficiency and credit ratings. Although the effects of profitability (EBIT) were less pronounced, the findings reinforce the financial materiality of ESG, particularly with respect to operational performance.

5.3 Recommendations

Future research should extend the analysis across multiple fiscal years to capture the evolving impact of ESG strategies on financial performance and credit ratings. A longitudinal approach would help assess how sustained ESG investments affect profitability, efficiency, and risk perception, particularly as regulatory standards and investor expectations continue to evolve. Additionally, expanding the sample to include mid-sized and regional banks could reveal sector-specific dynamics and provide a more inclusive view of ESG integration across the banking industry.

It would also be valuable to broaden the range of financial variables beyond EBIT and asset turnover. Including metrics such as return on equity (ROE), cost-to-income ratio, liquidity ratios, and leverage could offer deeper insights into how ESG interacts with different dimensions of financial health. Moreover, disaggregating ESG into its individual pillars – environmental, social, and governance – may uncover which components are most influential in shaping credit ratings. This expanded scope would support more targeted strategies for banks aiming to align sustainability with financial performance and risk management.

Acknowledgements

The author would like to thank Dr. Ronald Pastrana and Dr. Michael Pasco of San Beda University for their valuable insights throughout the development of this research; their expertise was instrumental in shaping the paper's direction and depth.

References

Agosto, A., Cerchiello, P., & Giudici, P. (2023). Bayesian learning models to measure the relative impact of ESG factors on credit ratings. *International Journal of Data Science and Analytics*, 1–12. https://doi.org/10.1007/s41060-023-00405-9

Agosto, A., Cerchiello, P., & Giudici, P. (2023). SAFE AI models to measure the impact of ESG factors on credit ratings. *Research Square*, 1–17. https://doi.org/10.21203/rs.3.rs-2424870/v1

Agosto, A., Giudici, P., & Tanda, A. (2023). How to Combine ESG Scores? A Proposal Based on Credit Rating Prediction. *Corporate Social Responsibility and Environmental Management, 30*, 3222–3230. https://doi.org/doi:10.1002/csr.2548

Aslan, A., Poppe, L., & Posch, P. (2021). Are Sustainable Companies More Likely to Default? Evidence from the Dynamics between Credit and ESG Ratings. *sustainability, 13*(8568), 1 - 16. Retrieved from https://doi.org/10.3390/su13158568

Barclays PLC. (2024). *Annual Report 2024.* Retrieved from https://home.barclays/sustainability/esg-resource-hub/reporting-and-disclosures/

Barney, J. B. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 99–120. Retrieved from https://doi.org/10.1177/014920639101700108

Billio, M., & Giacomelli, A. (2022). ESG adjusted credit rating: the indirect approach. 1–42. Retrieved from https://www.bancaditalia.it/pubblicazioni/altri-atti-convegni/2022-climate-change-risk/5.-ESG-adjusted-credit-rating-the-indirect-approach.pdf

Bonacorsi, L., Cerasi, V., Galfrascoli, P., & Manera, M. (2022). ESG Factors and Firms' Credit Risk. *Fondazione Eni Enrico Mattei*, 1–47. http://dx.doi.org/10.2139/ssrn.4289397

Brogi, M., Lagasio, V., & Porretta, P. (2022). Be good to be wise: Environmental, Social, and Be good to be wise: Environmental, Social, and risk mitigation factor. *Journal of International Financial Management & Accounting*, 522–547. http://dx.doi.org/doi:10.1111/jifm.12156

RevCarè, R., & Weber, O. (2023). Sustainable finance: Banks, sustainability, and corporate financial performance. *Sustainable Finance and Financial Crime*, 41 - 61. https://doi.org/10.1007/978-3-031-28752-7_3

Chodnicka-Jaworska, P. (2021). ESG as a Measure of Credit Ratings. *Risks*, 1-26. Retrieved from https://doi.org/10.3390/risks9120226

Chodnicka-Jaworska, P. (2022). Environmental, Social, and Governance Impact on Energy Sector Default Risk—Long-Term Issuer Credit Ratings Perspective. *Frontiers in Energy Research, 10*, 1-19. http://dx.doi.org/doi:10.3389/fenrg.2022.817679

Cornée, S., Cozarenco, A., & Szafarz, A. (2023). The Changing Role of Banks in the Financial System: Social Versus Conventional Banks. *Sustainable Finance and ESG: Risk, Management, Regulations, and Implications for Financial Institutions*, 1–25. https://doi.org/10.1007/978-3-031-24283-0_1

Creswell, J. W., & Creswell, J. D. (2023). *Research design: Qualitative, quantitative, and mixed methods approaches (6th ed.).* London: SAGE Publications.

Cubas-Díaz, M., & Sedano, M. Á. (2018). Do Credit Ratings Take into Account the Sustainability Performance of Companies? *Sustainability*, 1-25. doi: https://doi.org/10.3390/su10114272

Devalle, A., Fiandrino, S., & Cantino, V. (2017). The Linkage between ESG Performance and Credit Ratings: A Firm-Level Perspective Analysis. *International Journal of Business and Management, Vol. 12, No. 9; 2017*(ISSN 1833-3850 E-ISSN 1833-8119), 53–65. doi: https://doi.org/10.5539/ijbm.v12n9p53

Eisend, M., & Kuss, A. (2019). Hypotheses and Models for Theory Testing. *Research Methodology in Marketing*, 151–171. https://doi.org/10.1007/978-3-030-10794-9_7

Elkington, J. (1994). Cannibals with Forks: The Triple Bottom Line of 21st Century Business. John Wiley & Sons, Inc. *Environment Quality and Management*, 1-15

European Banking Authority. (2021). *EBA Report on Management and Supervision of ESG Risks for Credit Institutions and Investment Firms EBA/REP/2021/18.* Retrieved from https://www.eba.europa.eu/publications-and-media/press-releases/eba-publishes-its-report-management-and-supervision-esg-risks

Fornell, C. & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research, 18*(1), 39–50. https://doi.org/10.1177/002224378101800104

Freeman, R. E. (1984). Strategic management: A stakeholder approach. Boston, MA: Pitman.

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2022). A primer on partial least squares structural equation modeling (PLS-SEM). SAGE Publications, 1–39. https://www.researchgate.net/publication/354331182_A_Primer_on_Partial_Least_Squares_Structural_Equation_Modeling_PLS-SEM

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*, 1 - 24. doi:10.1108/EBR-11-2018-0203

Henkel, K., Lay-Kumar, J., & Hib, C. (2024). From EBIT to SEBIT (Sustainable EBIT): Sustainable Performance Accounting (SPA) using the Example of CO2 Accounting. *Journal of Modern Accounting and Auditing*. Retrieved from David Publishing: doi: 10.17265/1548-6583/2024.02.002

Hentilä, D. (2022). Impact of ESG disclosure on Credit Ratings in the Nordics. *Department of Finance and Economics, Hanken School of Economics*, 1 - 58.

Industrial and Commercial Bank of China Limited. (2024). *2024 Annual Report.* Retrieved from https://v.icbc.com.cn/userfiles/Resources/ICBCLTD/download/2025/Announcement20250425_1.pdf

Industrial and Commercial Bank of China Limited. (2024). *Sustainability Report 2024.* Retrieved from https://v.icbc.com.cn/userfiles/resources/icbcltd/download/2025/esg2024en.pdf

Jang, G. Y., Kang, H. G., Lee, J. Y., & Bae, K. (2020). ESG Scores and the Credit Market. *sustainability, 12*(3456), 1 - 13. doi:10.3390/su12083456

Kim, S., & Li, Z. (. (2021). Understanding the Impact of ESG Practices in Corporate Finance. *Sustainability*, 1 - 16. Retrieved from https://doi.org/10.3390/su13073746

Kim, Y., & Kim, S.-I. (2022). Environmental Risk and Credit Ratings, and the Moderating Effect of Market Competition. *International Journal of Environmental Research and Public Health*, 1–17. Retrieved from https://doi.org/10.3390/ijerph19095341

Kousa, M. (2023). The Effect of ESG Factors on Corporate Credit Rating (Master's thesis, Aalto University School of Business). *Aalto University School of Business*, 1–59. Retrieved from https://aaltodoc.aalto.fi/server/api/core/bitstreams/e8c2dbd4-4a92-4dc4-8eb3-68e6c0a5f171/content

Michalski, L., & Low, R. K. (2021). Corporate Credit Rating Feature Importance: Does ESG Matter? *SSRN*, 1-81. http://dx.doi.org/10.2139/ssrn.3788037

Ringle, C. M., Wende, S., & Becker, J.-M. (2024). *SmartPLS 4. Bönningstedt: SmartPLS.* Retrieved from https://www.smartpls.com

S&P Global. (2023). General Criteria: Environmental, Social, And Governance Principles In Credit Ratings. *S&P*. Retrieved from https://disclosure.spglobal.com/ratings/en/regulatory/article/-/view/sourceId/12085396

S&P Global. (2024). What is an S&P Global ESG Score? *S&P*. Retrieved from https://www.spglobal.com/esg/solutions/data-intelligence-esg-scores#:~:text=The%20S%26P%20Global%20ESG%20Score%20measures%20a%20company%E2%80%99s,via%20the%20S%26P%20Global%20Corporate%20Sustainability%20Assessment%20%28CSA%29.

Spence, M. (1973). Job market signaling. *The Quarterly Journal of Economics, 87*(3), 355–374. https://doi.org/10.2307/1882010

Suchman, M. C. (1995). Managing legitimacy: Strategic and institutional approaches. *Academy of Management Review, 20*(3), 571–610. https://doi.org/10.2307/258788

United Nations. (2004). *Who Cares Wins: Connecting Financial Markets to a Changing World*. United Nations. Retrieved from https://documents1.worldbank.org/curated/en/280911488968799581/pdf/113237-WP-WhoCaresWins-2004.pdf

Vaios, G.-S. (2022). *ESG ratings and credit ratings* (Master's thesis, University of Piraeus, Department of Banking and Financial Management). University of Piraeus Institutional Repository. Retrieved from https://dione.lib.unipi.gr/xmlui/bitstream/handle/unipi/14295/Galerakis-Stergiou_2002.pdf?sequence=1&isAllowed=y

Wu, X. (2023). The Impact of ESG Ratings on Trade Credit Financing. *SHS Web of Conferences, FEMS, 169*, 1–7. https://doi.org/10.1051/shsconf/202316901068

Zanin, L. (2021). Estimating the effects of ESG scores on corporate credit ratings using multivariate ordinal logit regression. *Prometeia*, 1–20. Retrieved from https://ssrn.com/abstract=3932137