



Research article

Policy implications of ESG-moderated credit risk on bank profitability

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Abstract: In this study, I evaluated the ESG-moderated impact of credit risk on bank profitability and then addressed the policy issues that arose. A case study of South Africa was appealing owing to its financial system's prominence in the African emerging markets. Methodologically, I employed the fixed effect model with careful attention to specification necessities. The analysis was based on 10 stock-exchange-listed commercial banks over 18 years (2006 to 2023). While prior research did well to study the respective effects of environmental, social, and governance (ESG) factors and credit risk on bank profitability, its shortcoming was overlooking their mutual impact. That is, how bank performance changes if credit risk is ESG-moderated. Accordingly, past findings could not explain whether ESG adoption in banking practice lessens credit risk, let alone elucidate the advantageous knock-on effects on the financial system. The current paper bridges this knowledge gap, and the results are insightful. First, I confirmed the economic intuition of a positive relationship between ESG factors and bank profitability. Second, the research outcomes concurred with the literature in part that credit risk and bank performance are inversely related, but take a step further to show that the association is nonlinear. Lastly, I discovered that ESG-compliant banks experience reduced credit risk compared to their ESG-indifferent counterparts. This finding has useful spillover effects in the economy through the fractional banking systems. To enhance ESG's effectiveness, decision-makers should strengthen policy initiatives that support ESG reporting standards, integration, international benchmarking, and regulatory harmonization.

Keywords: bank profitability; credit risk; ESG; financial sustainability; banking sector

JEL Codes: G24, O57, Z1

Abbreviations: ESG: Environment, Social, and Governance

1. Introduction

Principles of Responsible Investment Association (PRI) spearheaded by the United Nations Environment Programme Finance Initiative and United Nations Global Compact, has recently reported a surge in membership of 5300 composed of investors and business executives whose signatures affirm their commitment to financial sustainability practice. The PRI membership has assets under management valued at USD128.4 trillion (or 50% of global assets) in June 2024 (PRI Association, 2024a). This support for financial sustainability is expected to grow by up to 10% by 2027 (PRI Association, 2024b). The issue of financial sustainability has become increasingly important in modern society. Accordingly, academic research has kept pace by surveying the impacts linked to capital markets (Malhotra and Thakur, 2020), and the scrutiny has shifted toward the cryptocurrency market (Gopane, 2024).

However, despite its compelling economic rationale and the persuasive appeal of its triple-action implementation strategy rooted in ESG principles, sustainable finance has encountered significant setbacks in recent years, leading some academic commentators to ponder whether ESG is nearing a dead end (Cort and Esty, 2025). Key adverse developments include:

- *The anti-ESG laws* – To exemplify, the state of Texas (in America) passed legislation (Senate Bill 13) in 2021 to exclude state governmental agencies from doing business with corporations deemed to be *ESG-anti-fossil* industry.
- *The ESG corporate policy reversal*: Bowing to mounting political pressure, BlackRock, the world's largest asset manager, has scaled back its ESG commitment, prompting its delisting from Texas' State-prohibited investment list and leaving behind other large international companies like UBS Group, BNP Paribas, and HSBC.
- *Corporate green-hushing*: Some companies are observed to adopt ESG-friendly policies but shy away from disclosing such information to avoid political backlash like that which occurred to two American companies (Walmart and Target).
- *Regulatory policy shift*: The U.S. Securities and Exchange Commission (SEC) has removed ESG from its 2024 policy priorities and disbanded its ESG task force, reflecting a shift away from aggressive ESG enforcement.
- *Top banks abandon Net-Zero Alliance*: Six of the largest banks in the U.S, J.P. Morgan, Citigroup, Bank of America, Morgan Stanley, Wells Fargo, and Goldman Sachs (Heeb, 2025), have cancelled their membership in the Net-Zero Banking Alliance, tarnishing ESG's reputation, among other things.

The ESG downsides have culminated with the setback of the U.S.'s withdrawal from the Paris Agreement. Nevertheless, a balanced assessment of the ESG's trend of backlash indicates a global policy diversity (right- vs left-leaning) in socio-political environments. For example, unlike the current "America first" U.S administration, European institutions, Australian investors, and South African policymakers continue to support ESG, especially pension funds and asset management through legislation (Saraiva, 2022).

Regarding the financial system and its geographic dynamics, the South African banking sector has a significant dominance in Sub-Saharan Africa, as assessed by indicators from the International Monetary Fund (IMF) reports. The index for financial institution development depth averages 0.12, while South Africa has a higher ranking of 0.64. The banking market size, measured by bank assets as a percentage of GDP averages 41 in the African continent compared to 74 in South Africa. The ratio of bank deposits to GDP averages 43, while South Africa's is 60, which gauges the depth of the banking system. Even with the usual IMF data limitations considered, these comparisons are intuitive. Here, I aim to understand whether incorporating financial sustainability into banking operations moderates banks' financial vulnerabilities toward loan default (credit risk). The assessment starts with empirical evaluation and then proceeds to infer policy implications as well as their broad economic relevance. That is, I set out to address a critical research question in banking risk and ask the following question: What are the policy implications of environmental, social, and governance (ESG) moderated *credit risk* on bank profitability? Financial sustainability issues are commonly examined through the ESG index (Nerlinger, 2020; Narula et al., 2024). ESG adoption entails a business entity's sensitivity and responsibility toward *environmental* factors (like climate change or pollution), *social* factors (like human rights or worker relations), as well as *governance* factors (like tax ethics or regulatory integrity). In aggregate, the goal of the ESG framework is to promote economic efficiency and a sustainable global financial system necessary for long-term value creation goals.

In this study, I focus on two research streams. The first tract of research is populated by studies (Temba et al., 2024) investigating the relationship between credit risk and bank profitability, with a common but banal finding that loan default harms a bank's financial performance. Second, a parallel literature stream (Chiaramonte et al., 2021) examines the relationship between financial sustainability (ESG-compliance) and financial performance, which mostly finds positive associations (see reviews, Friede et al., 2015; Li et al., 2024) with a few mixed results (see review, Li et al., 2024). These twin literature dimensions provide a useful foundation for understanding the profit determination in the banking sector. However, a significant shortcoming in the cited lines of inquiry is that studying the individual effects of credit risk and ESG on bank profitability, often in separate papers, does not go far enough to tell the full story. Failure to integrate the negative effect of credit risk and the positive impact of ESG on bank profitability (mutual effect) is a significant research limitation. Such restricted empirical designs deny banking practitioners and policymakers an opportunity to learn about the moderating role of ESG on credit risk and the combined effect on bank profitability. I set out to close this knowledge gap and, more importantly, draw emerging policy implications. Another subtly related but more distinguishable research category is for researchers (like Wu and Xie 2024; Korzeb et al. 2025) who model banks' credit risk as a response variable regressed on ESG and other factors, with or without interactions. The goal of such a line of inquiry is to understand the determinants of bank default risk and how ESG improves the explanatory power of that model. In contrast, I answer the question of how ESG moderates the effect of credit risk on bank profitability, *ceteris paribus*.

The rest of the paper is organized as follows: In Section 2, I discuss the literature review. In Section 3, I present the econometric model, including data description. In Section 4, I report results along with the overall discussion. In Section 5, I conclude the study.

2. Literature review

The practice of ESG investing, in one form or another, has a long history going back to the early 1960s (King and Gish, 2015) and has generally transformed over time. The early sensitivities towards corporate citizenship provide traces of integrating social and environmental considerations into investment decisions driven by ethical considerations. Value systems linked to consumer products include tobacco production and the sale of materials offensive to faith-based organizations (Zairis et al., 2024). The twentieth century has seen the adoption of ESG criteria become the standard of financial sustainability, resulting in numerous ESG indices for financial market participants.

While the global significance of ESG factors has garnered global attention, the literature (Cantero-Saiz et al. 2025) illuminates the pronounced relevance of ESG principles in emerging markets, where increasing investor focus amplifies the need for transparent, sustainable finance. Drawing from economic rationale and compelling empirical evidence, I conjecture that financial sustainability, proxied by collective ESG factors (ESG index) can provide a moderating effect on bank credit risk, leading to improved profitability. It is unquestionable that some benefits of ESG practice extend to the company's community. The question that arises is: Why should a firm want to adopt ESG factors if it does not reap all the benefits? An answer to this rhetoric question provides a conceptual framework to evaluate empirical results.

2.1. ESG factors and financial performance nexus

There are numerous conceptual frameworks explaining the economic nexus of ESG and financial profitability (banks included), such as profit maximisation theory (Friedman, 1970; 2007), stakeholder theory (Freeman, 1984; Jensen, 2010), delegated stakeholder model (Bénabou and Tirole, 2010), reputation theory (Del Gesso and Lodhi, 2025), and legitimacy and signaling theory (Saini et al., 2023). To clarify the business case of ESG adoption, selected theoretical concepts are elaborated further. Democratic economies are replete with differing views on socioeconomic matters. For instance, some investors on one extreme, like fossil fuel entrepreneurs or short-term speculative investors, are conceivably less likely to be inspired by ESG's long-term potential benefits. Further, like-minded investors are known to oppose managers adopting ESG principles (see the recent American case, SIFMA, 2023). This constituency has come to be known as the *anti-ESG movement* in financial markets (Rau and Yu, 2024). Consequently, there is an ongoing debate about whether adopting ESG factors harms or helps commercial entities, including banks.

According to the literature, the main argument of the anti-ESG school rests heavily on the neo-classical business view (Friedman, 1970; 2007), that firms exist solely to maximize profit. Therefore, financial sustainability opponents maintain that ESG factors are unnecessary value-destroying activities for the actual business owners (shareholders) and amount to managers spending someone else's money (Friedman, 1970). Thus, the anti-ESG school believes that as long as firms comply with all applicable laws, they are not obliged to *give back* to society. On the contrary, ESG proponents dismiss the pure profit maximization theory for failing to capture all practical business realities. The thrust of their rebuttal is that a business is a member of society, and as a good corporate citizen, the value-add of forward-looking obliges it to care for its environment. This reasoning is supported by the *behavioral economics theory*, which incorporates societal values in economic analysis. In particular, behavioral economists incorporate fairness into the firm's profit-seeking model (Kahneman et al.,

1986). To recapitulate, the anti-ESG school predicts a negative relationship between ESG adoption and financial performance (Tanjung, 2023), while ESG proponents anticipate a positive association. The rationale that ESG practice benefits financial performance is anchored in recent theoretical modeling (Friede et al., 2015; Xue, 2023) and compelling empirical evidence (see reviews, Friede et al., 2015; Saini et al., 2023). In addition, researchers (Agnese et al., 2024; Galletta and Mazzù, 2023; Gangwani and Kashiramka, 2024; Manta et al., 2025) examining the bilateral relationship between bank risk and ESG uncover supportive results, providing another layer of corroborative evidence. ESG-compliant banks are deemed to have a long-run commercial outlook (sustainable banking), which aligns well with the expanded profit maximization view just explained. Overall, ESG principles have increasingly become important to investors, customers, and other stakeholders (Ahmad et al., 2021).

The stakeholder theory provides a more direct economic reasoning for ESG integration in business goals. The theory is generally viewed as an established economic rationale, which stipulates that the firm is responsible to all its stakeholders or people “who are affected by corporate activities and consist of owners, management, employees, customers, suppliers, the local communities, and others” (Salzmann, 2013). For instance, the perceived undesirable corporate behavior (like bad employee relations or questionable business ethics) may increase reputation risk. Conversely, ESG practice aligns well with good corporate citizenship, which is deemed more likely to attract like-minded stakeholders (investors, workers, and borrowers), leading to improved long-term performance (Beurden and Gössling, 2008; Chiaramonte et al., 2021). Other researchers affirm this line of reasoning more confidently that ESG-blended entities stand to increase unique brand loyalty and attract quality creditworthy borrowers with less likelihood of default (Rodgers et al., 2013; Vargas, 2017).

The overwhelming majority of empirical evidence suggests that a positive relationship between ESG and financial performance is intuitive. For example, Khoury et al. (2023) examined the MENAT countries (Middle East, North Africa, Turkey), Shakil et al. (2019) evaluated 93 emerging market banks, Buallay (2019) studied 235 European banks, while Buallay et al. (2021) focused on banks in developed nations. All these cross-country studies confirm an overall significant positive association between ESG and bank profitability. Nevertheless, there are minority studies in the literature (like Koapaha, 2023) that find negative or inconclusive results.

2.2. Credit risk and bank profitability

The underlying theoretical framework that links credit risk with bank profitability is a fractional banking system that depends on credit creation multipliers to generate interest revenue for banks. The credit creation process is a framework in which commercial banks create loans (lending capacity) that are way more than the lump sum of money received from cash deposits. Although excessive credit creation may induce an undesirable increase in the inflation rate, generally, bank loans provide the necessary purchasing capacity for consumers and are an essential source of business financing that eventually benefits the economy. Therefore, the more loans the bank can offer within the constraints of capital requirement regulations and credit risk, the more profit it can make. The uncertainty that some bank-issued loans may default or become bad debts is a significant problem for bank profitability, generally known as credit risk. In the literature, this banking credit risk is typically proxied by bad-performing loans in the banks' financial statements, which is also employed in the current study.

Therefore, a negative association between credit risk and bank profitability is in line with economic intuition and adequately confirmed in the literature (Munangi and Sibindi, 2020).

The literature (Sinişin and Socol, 2020) concurs that bank profitability may be defined by how well assets are utilized and other existing resources to increase income or value. Accordingly, there are several alternatives in which a researcher may proxy bank profitability, including economic value added, market valuation, return on assets, or return on equity (ROE), among others. I settle for the latter as it is one of the most tested proxies; it is more transparent for shareholder monitoring, and more usefully, it enables effective comparison with prior studies.

2.3. *The ESG-moderated effect of credit risk on bank profitability*

Consistent with ESG's compelling intuition, a systematic literature review by Friede et al. (2015) examined 2000 empirical studies on the relationship between ESG factors and bank profitability and concluded that "a large majority of studies report positive findings". While my research question is uncommon, there is a small set of closest studies. Bhatia and Mahendru (2023) explored the benefit of moderating banks' default risk by interacting credit risk with technical efficiency and found favorable results. Boudriga et al. (2009) examined the interaction of proxies for democracy, corruption, and regulation with institutional supervision to observe the effect on credit risk and found mixed but promising results. It is important to note that while the positive association of ESG and bank profitability is persuasive, both sides of the debate (anti-ESG and ESG proponents) provide well-reasoned arguments. Consequently, empirical analysis is necessary to discover evidence and add to the literature.

2.4. *Study hypothesis*

In the substream literature of financial sustainability, most researchers (except minority results) find that ESG compliance benefits business profitability. This result will be verified in the first Hypothesis (H1), which has a bearing on the core research objective.

Based on economic intuition and synthesis of prior works, it is conceivable to find an inverse relationship between credit risk and bank profitability. A subtle literature shortcoming, which will be corrected in the current work, is that researchers rarely distinguish the gravity of credit risk effect at lower and higher levels of loan default, now addressed in the second Hypothesis (H2). My primary goal of this study is to investigate whether ESG compliance lessens credit risk, leading to higher bank profitability. This empirical question is tested in the third Hypothesis (H3).

- First Hypothesis [H1]: *ESG compliance positively affects bank profitability in South Africa.* A test of H1 is based on whether the coefficient of the ESG index (β_5) within the regression model (Equation 2) is positive and statistically significant.
- Second Hypothesis [H2]: *The degree of credit risk effect on bank profitability varies according to default magnitude from low to high.* H2 will be upheld if the variable for credit risk satisfies a polynomial of second or higher degree within the regression model (Equation 1). I test H2 by evaluating whether the coefficients of α_1 , α_2 and α_3 in Equation (1) are statistically significant.
- Third Hypothesis [H3]: *Bank Profitability benefits from the moderating role of ESG practice on credit risk.* The test of H3 is based on the statistical significance of at least one coefficient (β_2 , β_3 , β_4) of ESG and credit risk interactions in the regression model (Equation 2).

To recapitulate, the literature review section outlines the economic theories that link ESG to bank financial performance and, in the process, explains the debate of the two schools (opponents and proponents) of ESG interpretation. The key takeaway from the literature is that while overwhelming evidence supports ESG practice, the minority view is reasonably argued and sustained, necessitating empirical evaluation as outlined in the hypotheses above. These hypotheses are tested using a fixed effect model and dataset on the South African banking sector, which are detailed next.

3. Methodology

3.1. Motivation of the empirical design

The empirical framework of the moderator variable is an established statistical technique (see reviews, Dixon-Fowler et al., 2013; Gairola and Dey, 2023). Although the *moderator effect* incorporates interaction, equating it solely with regressor interaction is significantly inaccurate. Definition: If a third variable (ESG) affects the relationship between the first (credit risk) and the second variable (bank profitability), then the third variable (ESG) is called a moderator (Cohen et al., 2013). That is, a “moderator is a qualitative (like sex, race, class) or quantitative (like level of reward) variable that affects the direction and/or strength of the relation between an independent or predictor variable and a dependent or criterion variable” (Baron and Kenny, 1986). The current study heeds the advice of modelling theory (Li, 2018) regarding moderation variables, cautioning against disregarding nonlinearity in the regressors in empirical modelling. The current research inquires whether ESG compliance, as a moderator, lessens the effect of credit risk on bank profitability. This question is evaluated within the paradigms of a panel data model.

The panel data model is appealing for the current study owing to its advantages. This model is a combination of cross-sectional and time series data; as such, it helps to increase sample size, which is particularly beneficial for limited panels like the current study’s modest bank population. Further, the panel data model is parsimonious, but a significant improvement in pooled ordinary least squares is well-established in the literature with similar applications. While advanced models are not deemed necessary for this study, the closest candidate is the Generalized Method of Moments (GMM), which could be helpful if endogeneity is a problem or if the model involves endogenous regressors. In this study, flagged modeling issues are not a concern, and a panel data model is sufficient.

3.2. Econometric model

The panel data modeling follows a systematic specification framework. The econometrics of panel data requires a researcher to choose an appropriate model among pooled ordinary least squares (POLS), fixed effects (FE), random effects (RE), FE with period effects (PE), or FE with only cross-section effects (CE). In this study, this process evolves as follows: First, to choose a qualifying model in POLS vs FE/RE, the Breusch-Pagan test rejects POLS (see Table A1, Row 1 in Appendix). Second, the Hausman test chooses FE in the FE vs RE selection decision (see Table A1, Row 2 in the Appendix). Third, to determine whether the first-order or second-order stationarity test is applicable, the Breusch-Pagan test (see Table A1, Row 3 in the Appendix) confirms no cross-sectional dependence among panels. Therefore, the first-order stationarity tests, Levin-Lin-Chu and Breitung validate the stationarity of all series used in the study (see Table A2, Appendix). Last, to determine whether the appropriate model is FE with PE or FE

with only CE, the decision is based on the econometric procedure of the Schwarz Criterion (SC), which compares the number of panels (N) and period (T). In this regard, if $N < T$, the Cross-Section Effects model should be preferred. In the current project, $N < T$ because the study period spans 2006 to 2023 (18 years), and the number of cross-sectional units is six and 10. Therefore, according to the SC criterion, FE with only CE is the most suitable model in the current study. The final model is presented in Equation (1) and expanded in Equation (2).

Model without moderation:

$$\tilde{y}_{it} = \alpha_0 + \alpha_1 x_{it} + \alpha_2 x_{it}^2 + \alpha_3 x_{it}^3 + \tilde{\delta} \tilde{q}_{it} + \tilde{\theta} z_{it} + \tilde{\mu}_i + \tilde{\varepsilon}_{it} \quad (1)$$

Model with ESG moderation:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_1 x_2 + \beta_3 x_1^2 x_2 + \beta_4 x_1^3 x_2 + \beta_5 x_2 + \delta q + \theta z + \mu + \varepsilon \quad (2)$$

Both Equations (1) and (2) are the presentation of a *fixed effect* panel data model to evaluate the relationship between credit risk (x_1) and bank profitability (y). In Equation (2), subscripts (i and t) are disregarded for simplicity. Equation (1) is the baseline model, which is updated to the setup of Equation (2) after integrating the moderating variable ($x_2 = ESG$). The tilde ($\sim$) in Equation (1) serves to distinguish the two models. It is important to reiterate that Equations (1) and (2) are not a system of equations but are estimated separately. The rest of the variables are explained next. The respondent, y_{it} represents the financial performance of the bank i at time t . Thus, subscripts i and t are panel and time indices, respectively. The covariates, q and z tabulate firm- and macro-level regressors, respectively, while α , β , δ , and θ are parameters to be estimated. The terms, μ , and ε are cross-sectional effects and aggregate errors, respectively. Both errors are assumed to have zero mean and are independently and identically distributed (iid). All variables outlined above are defined elaborately in Table 1, while Table A4 in the appendix summarizes the rest of the variables' information, including derivations and ratios.

Table 1. Definition of variables.

Parameter / Variable	Definition
$\alpha, \beta, \delta, \theta$	Parameters to be estimated.
Y	Return on equity (ROE)
x_1	Bad-performing loans (BPL)
x_2	Environmental, social, and governance (ESG)
Firm-level variables:	
q	- Capital adequacy ratio (CAR) - Loan-to-deposit ratio (LDR)
Macro-level variables:	
z	- Inflation (INF) - Exchange rate (EXC) Industry: - Market power (MPR)
μ	Cross-sectional effects
ε	Error term.
i	Index for banks in the sample
t	The time index in years

Source: Author's analysis.

Literature guidance was followed in determining the variables to include in the empirical model. The necessary data cleaning, selection criteria, and the overall sample design are explained later in the data section. Before presenting the regression results, it is important to clarify each variable's meaning and economic significance (expected coefficient signs).

3.3. Variable explanation

3.3.1. Return on Equity (ROE)

The response variable in Equations (1) and (2) is ROE, which proxies bank profitability. ROE is quantified by the net profit ratio to the total shareholders' equity. Shareholders' equity is the difference between total assets and debt, meaning that ROE captures return on net assets. ROE is a common metric of financial performance (Saini et al. 2023) and is an appropriate method for this study since it measures corporate profitability and the extent to which this financial performance is generated efficiently. It is important to use a bank profitability measure based on its merit than purely following literature trends. For example, some response variables disregard leverage (like Return on Asset) or are not broad enough (like Net Interest Margin) to incorporate sensitivity to diverse profit drivers, including efficiency. There are several advantages of preferring ROE over other alternatives as a measure of bank profitability. First, ROE captures profitability from the perspective of financial markets (shareholders), making it more suitable for the banking sector. Second, given that banks are highly leveraged, ROE accounts for how well capital is deployed in the economy. Based on its formulation, ROE standardizes profitability across banks of different sizes. Since banks operate with varying leverage and credit risk levels, ROE naturally incorporates the risk-return trade-off.

3.3.2. Bad performing loans (BPL)

Bad performing loans (BPLs), sometimes described as non-performing loans, are a proxy for credit risk. The BPL measures the number of loan defaults from bank borrowers. Since loan interest is receivable by commercial banks as their primary revenue, the higher the BPL magnitude, the lower their accounting profitability. Past studies (Fadun and Silwimba, 2023) have reliably demonstrated that there is an inverse linear relationship between BPL and banks' financial performance. That is, in Equation (1) $\alpha_1 < 0$, which should be corroborated in the current study. However, this study expects higher levels of BPL to impact profitability differently (based on α_2 and α_3).

3.3.3. Environment, Social and Governance (ESG) factors

Intuitively, my approach is that ESG metrics capture how business entities manage environmental impact, social responsibilities, and governance practices to ensure ethical operations and sustainable growth while preserving long-term value for stakeholders and future generations. In this sense, I conjecture that ESG increases or enhances bank value and its sustainability. I expect a positive relationship between ESG and banks' performance because ESG-compliant banks will likely attract like-minded clients. This thinking is consistent with the literature finding that the presence of ESG investors in a company provides a positive impact on financial performance (Chen and Xie, 2022). That is, in Equation (2), the regression output should yield $\beta_5 > 0$.

3.3.4. Capital adequacy ratio (CAR)

A higher CAR indicates a bank's increased ability to manage risks, absorb potential losses, and maintain capital structure with reduced financial distress. Therefore, CAR contributes to maintaining risk absorption and improving financial stability. This implies that well-capitalized banks may be better equipped to perform well even in adverse market conditions. Also, other important factors that make CAR a relevant control variable are its function as a regulatory constraint based on the Basel III framework, as well as its effect on banks' lending decisions, risk appetite, and profitability. Consequently, I anticipate a positive correlation between CAR and bank profitability.

3.3.5. Loan-to-deposit ratio (LDR)

The loan-to-deposit ratio (LDR) measures how much bank deposits are used for lending, resulting in a direct effect on ROE. A high LDR may indicate that a bank is strongly expanding its loan book, which may increase interest income, *ceteris paribus*. An increase in LDR suggests effective utilization of deposits for lending purposes, potentially resulting in higher net interest margins and improved financial performance. Banks achieving higher LDR typically demonstrate enhanced profitability (Felle and Santioso, 2024). This study anticipates that LDR is positively correlated with financial performance.

3.3.6. Market power (MPR)

A high market power ratio indicates that a bank effectively uses its assets to create substantial market value, reflecting strong market influence and possibly greater pricing power (Moudud-Ul-Huq, 2021). This means the bank will be perceived as more efficient, profitable, and stable in attracting expanding business. It is important to include MPR in the model to control for market sentiment, competitiveness, or size-related distortions arising from the ratio of market capitalization to total assets. Market capitalization reflects investor perception of a bank's future earnings potential, stability, and risk management, while total assets represent the actual size of the bank. In this regard, MPR may gauge how much market value is generated per unit of assets. A positive association between MPR and bank profitability is expected in the regression output.

3.3.7. Exchange rate (EXC)

The exchange rate (EXC) fluctuations affect the banks' profitability through changes in interest income, fee income, and operating expenses. The strength of the effect depends on the specific transmission channels and bank characteristics. Therefore, EXC is a useful variable to control for macroeconomy-related impacts on bank profitability. While EXC has a direct relevance to bank transactions, it also captures macroeconomic knock-on effects. A favorable exchange rate should benefit banks, and conversely. Consequently, the exchange rate coefficient may be negative or positive.

3.3.8. Inflation rate (INF)

The inflation rate measures the rate at which the general level of prices for goods and services is rising or decreasing. Moderate inflation rate reflects a growing economy where nominal incomes and

asset values increase. A positive impact between INF and bank profitability is plausible in a low inflation rate environment, but a negative sign is also possible for an uncontrollable rising inflation rate. This is because an excessively high inflation rate reduces asset value and decreases the purchasing power.

3.4. Data characteristics

The empirical investigation focuses on South African commercial banks registered by the South African Reserve Bank (SARB), which lists 35 banks. To satisfy the data design for the model, all banks included in the sample are subjected to a set of selection criteria, that a bank is: (a) a local South African bank, (b) listed on the Johannesburg Stock Exchange (JSE), (c) a member of ESG index or ESG compliant, (d) actively in business from 2006 to 2023 inclusive, and (e) financial statements are available on the same database for all banks selected. After the five-point screening, the final panel data available for the study are six banks: ABSA, Capitec, First Rand, Investec, Nedbank, and Standard Bank, examined over 18 years (2006 to 2023). Effectively, these top six banks represent a large share of commercial banking activity in South Africa. These top six banks have a collective total assets value of USD400 billion, which amounts to 90% of the total banking sector assets. The study uses annual data sourced from the OSIRIS database by Bureau van Dijk, Moody's Analytics Company. Table 2 presents a summary of descriptive statistics for the regression variables. These statistics provide an overview approximation of the dataset's central tendency, variability, and range. ROE on equity averages 1.34 (or 23% before logs) with a variability of 0.15 and a range of 0.8 (or 6% before logs) across all banks from 2006 to 2023.

The proxy for ESG measure is the *S&P South Africa Domestic Shareholder Weighted (DSW) Capped Scored and Screened Index* (S&P Dow Jones Indices, 2024a, 2024b). The index is confined to the Johannesburg Stock Exchange-listed companies (including banks), and it applies a scoring and screening methodology to select constituents. The index is constructed as follows:

- *Scoring*: Companies are ranked within each Global Industry Classification Standard (GICS) and grouped based on their ESG scores.
- *Screening*: Companies that fall within the bottom 15% of ESG scores in their industry group are excluded from the index.
- *Weighting*: The remaining companies are weighted based on their float-adjusted market capitalization, subject to a cap of 10% per issuer group to ensure diversification.
- *Rebalancing* frequency of rebalancing the ESG index is once per year.

The S&P Global ESG Scores are derived using the S&P Global Corporate Sustainability Assessment (CSA). The CSA applies a double materiality approach, which ensures that a sustainability issue is material if it presents a significant impact on society or the environment and a significant impact on a company's value drivers, competitive position, and long-term shareholder value creation. S&P Global Index sources information via financial statements, questionnaires, and mathematical equations for carbon emission metrics. Each ESG dimension (E, S, and G) is surveyed on no less than 10 sustainability issues.

Table 2. Summary descriptive statistics.

Variable	Obs	Short Name	Mean	Std dev.	Min	Max
Return on equity	108	ROE	1.340	0.154	0.800	1.620
Bad performance loans	108	BPL	0.566	0.313	−0.570	1.320
Environmental, Social, Governance	108	ESG	0.039	0.022	0.004	0.095
Capital adequacy ratio	108	CAR	1.151	0.058	0.990	1.290
Loan-to-deposit ratio	108	LDR	1.859	0.080	1.650	2.120
Market power	108	MPR	3.092	0.237	2.430	3.690
Financial Crisis	108	FCR	0.056	0.230	0.000	1.000
Exchange rate	108	EXC	1.048	0.145	0.820	1.260
Inflation rate	108	INF	0.761	0.101	0.580	0.980

Source: Author's computation. All numbers are in logs except ESG.

3.5. Data preparation and model validation

The crucial modelling stage to achieve stable model fitness is implemented through the following validation procedures: Multicollinearity diagnosis, variance inflation factors (VIF), heteroscedasticity, autocorrelation diagnosis, and normality test. Multicollinearity means regressors are correlated, resulting in imprecise coefficients and failing to capture the true model relationships. Since all the VIF values are below the 10% threshold, the diagnosis has a satisfactory conclusion that multicollinearity is not a problem in the model (see Table A3 in the Appendix). *Heteroskedasticity* occurs when variances are not constant across observations, leading to unreliable results. The residual inspection based on the Likelihood Ratio test shows that the models fail the heteroscedasticity condition (see Table A1, Row 4 in the Appendix). To control heteroscedasticity and autocorrelation problems, I follow the panel data modeling recommendation to use generalized least square (GLS) weights with cross-sectional seemingly unrelated regression (SUR) when $T > 2N$. This condition is satisfied in this study based on the period (T) of 18 years and six or 10 entities (N). Another model validation inspection involves the normality test. The panel data model estimation assumes that error terms are normally distributed. The Jarque-Bera residual test shows that the normality condition is not violated (see Table A1, Row 5 in the Appendix).

4. Results

4.1. Empirical results and interpretation

Table 3 presents regression results for the effect of credit risk on bank profitability before including ESG moderation (Equation 1). Table 4 replicates the results after applying ESG moderation on credit risk (Equation 2). Both tables show that all regressors are statistically significant (except one) at conventional levels. Accordingly, the F-statistic test for the overall model fitness is satisfactory. Both models have adequate explanatory power, judged by R^2 , which ranges from 60% to 75%. It is also edifying to note that all control variables consistently maintained expected signs in Tables 3 and 4. The variables with a negative impact on ROE are capital adequacy ratio, loan-to-deposit ratio, financial crisis, and exchange rate. In contrast, a positive impact comes from the inflation rate and market power. To achieve the empirical objective of this study, the results are interpreted in light of the three hypotheses explained earlier.

4.1.1. Results of the baseline model (without ESG moderation)

Looking at Equation (1), the variable for credit risk (x_1) is proxied by bad-performing loans (BPL) in the regression output (Table 3). Although the results show that the linear term of BPL is insignificant, its square and cubic terms are statistically significant at traditional levels. The results say that, based on the coefficient of BPL (linear term) at a lower level, the impact of credit risk is non-existent. The negative and statistical significance of BPL-squared reveal that credit risk is problematic at a higher level. Based on the positive and statistical significance of BPL-cubed, the results show that while high credit risk is hurtful to banks, there is a higher threshold at which BPL turns beneficial to banks. This could mean that banks have some innovative strategies for salvaging some reasonable value out of bad debts, such as debtor factoring (selling the BPL list to specialist debt collectors). Since both BPL-square and BPL-cubed are significant, the second hypothesis, H2, is confirmed.

Table 3. Regression results before ESG moderation (Equation 1).

Variable Name	Short names	Coeff.	Std. Error	Pvalue	
Constant	C	2.714	0.364	0.000	***
Bad performance loans	BPL	0.046	0.052	0.377	
Interaction	$(BPL)^2$	-0.359	0.124	0.005	***
Interaction	$(BPL)^3$	0.162	0.090	0.074	*
Capital adequacy ratio	CAR	-0.997	0.177	0.000	***
Loan-to-deposit ratio	LDR	-0.366	0.145	0.013	***
Market power	MPR	0.196	0.057	0.001	***
Financial crisis	FCR	-0.296	0.031	0.000	***
Exchange rate	EXC	-0.248	0.063	0.000	***
Inflation rate	INF	0.254	0.076	0.001	***
Cross-sectional effects	CE	yes	yes	yes	
F-statistic		30		0.000	***
Adjusted R-squared		0.62			

Source: Authors' computation. Statistical Significance: ***1%, **5%, *10%

4.1.2. Results of the model with ESG moderation

Based on the positive and statistically significant coefficient of the ESG index (β_5) in Table 4, the results provide confirmatory evidence to uphold H1. Indeed, the favorable result of H1 is useful in this study, but the core result focuses on evaluating the combined effect of ESG and credit risk (H3). The moderation role of *ESG* is measured by the partial derivative of ROE (y) with respect to credit risk (x_1) in the primary model (Equation 2), resulting in Equation (3):

$$\frac{\partial y}{\partial x_1} = \beta_1 + \beta_2 x_2 + 2\beta_3 x_1 x_2 + 3\beta_4 x_1^2 x_2 \quad (3)$$

Equation (3) shows that the effect of ESG-moderated credit risk is a quadratic function. Traditionally, to quantify the impact of ESG moderation, researchers (like Doku et al., 2023) use the regression output and averages from the summary descriptive statistics to evaluate and produce one number in

Equation (3). However, in this study, the author deems it more intuitive to present a graphical visualization of results plotting the predictive margins of expected profitability changes before and after ESG moderation, explained in Figure 1. Before visualizing the results, it is useful to elaborate on the statistical insignificance of $BPL \times ESG$. The lack of significance is partly due to the nonlinear relationship that emerged from the empirical model (Equations 1 and 2). Also, this may reflect the case that at lower levels of BPL, the benefits of ESG cannot be confirmed.

Table 4. Regression results with ESG moderation (Equation 2).

Variable Name	Short names	Coeff.	Std. Error	Pvalue	
Constant	C	0.346	0.000	0.000	***
Bad performance loans	BPL	0.140	0.077	0.071	*
Interaction	$BPL \times ESG$	-3.790	2.690	0.162	
Interaction	$(BPL)^2 \times ESG$	-7.000	3.210	0.032	**
Interaction	$(BPL)^3 \times ESG$	4.090	2.030	0.047	**
Environmental, social, & governance	ESG	3.890	1.420	0.007	***
Capital adequacy ratio	CAR	-1.040	0.166	0.000	***
Loan-to-deposit ratio	LDR	-0.331	0.137	0.019	**
Market power	MPR	0.190	0.054	0.001	***
Financial crisis	FCR	-0.306	0.029	0.000	***
Exchange rate	EXC	-0.249	0.061	0.000	***
Inflation rate	INF	0.229	0.071	0.002	***
Cross-sectional effects	CE	yes	yes	yes	
F-statistic		30.55		0.000	***
Adjusted R-squared		0.75			

Source: Author's computation. Statistical Significance: *** 1%, ** 5%, *10%.

Figure 1 plots the average marginal effects of BPL on the ROE predictions before [Panel (a)] and after [Panel (b)] ESG moderation. The graphs in both panels have a convex quadratic curvature and have a common scale on the horizontal axis measuring credit risk changes (in logs of BPL) from 0 to 1. The vertical axis captures the BPL marginal effects. That is, measuring how much ROE is expected to change in response to a one-unit change in BPL while holding other variables constant (continuous variables at their averages and zero-one indicators at their baseline levels). A one-unit change in BPL corresponds to a tenfold increase in the value of BPL, which represents a log-transformed ratio of defaulted loans to total loans as detailed in Table A4. Figure 1 summarizes the regression output in Table 3 (with *Panel a*) and Table 4 (with *Panel b*), and isolates the core results of the study that ESG moderation lessens the problem of BPL. Thus, I ask the following question: How does the empirical analysis reach this conclusion? We inspect the two graphs by comparing three elements: Downward slopes (left portion of each graph), flat slopes or turning points (bottom of each graph), and upward slopes (right portion of each graph). In both panels, the downward slopes indicate that as BPL increases, ROE decreases, meaning default risk harms bank profitability. However, the negative effect is prolonged for Panel (a), running from BPL of 0.1 up to a deeper turning point of (0.8, -0.2), meaning an increased negative effect on profitability. In contrast, although under ESG moderation in Panel (b), the risk still affects profitability negatively, the effect lasts for a shorter range of 0.1 to 0.6 with a less

deepened turning point of around (0.6, -0.15), which amounts to a lower adverse impact on profitability. Upward slopes indicate that an increase in BPL is associated with an increase in ROE. With a delayed turning point for Panel (a) and its slower rebound, it means that the positive effect on ROE is higher under Panel (b). Overall, the message of Figure 1 is that the ESG moderation of credit risk helps to lessen the negative impact of problem loans, leading to an improvement in bank profitability. This result supports the third hypothesis, H3.

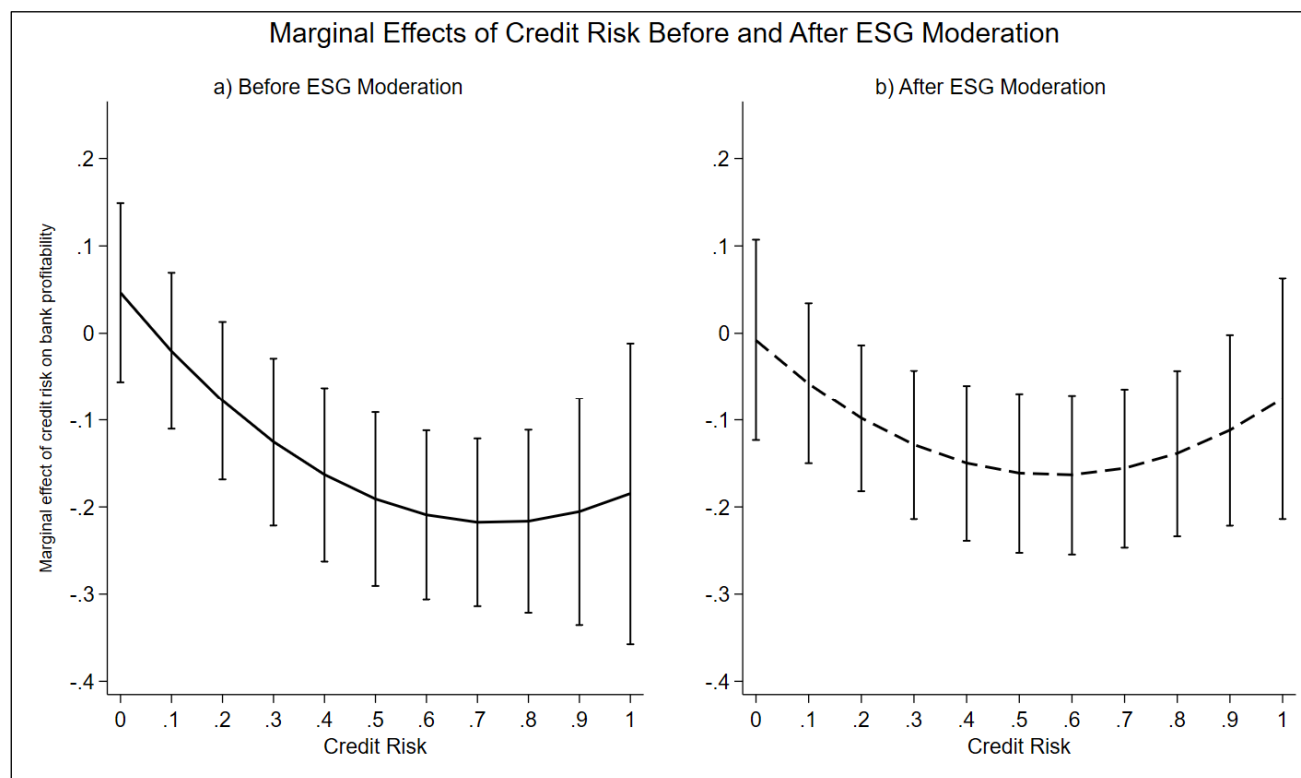


Figure 1. Baseline case: Marginal effects of default risk on bank profitability predictions before and after ESG moderation. The vertical capped lines are the 95% confidence intervals. *Source:* Author's visualization.

4.2. Robustness evaluation

The results in Tables 3 and 4 were generated based on the restricted sample satisfying the selection criteria explained in Section 3.5. To examine the robustness of the results, I relax the sample restrictions of (b) through (d) and allow banks that are not stock exchange listed, do not have ESG scores, or were not in business for the full duration of the study. This results in the expanded observations of 180 composed of 10 banks for 18 years. The additional four banks are Sasfin, RMB Holdings, Mercantile Holdings, and Finbond. Tables A5 and A6 in the appendix replicate the results of Tables 3 and 4, respectively, and are visualized in Figure 2. A comparison of the two sets of results reveals consistent research outcomes, by and large. The graphical illustration provides an intuitive interpretation. Contrasting *Panel a* and *Panel b*, the dotted line shows a quicker turning and less deepened curvature, indicating that ESG moderation lowers the effect of default risk and improves bank profitability. This observation is similar to Figure 1, indicating that the results are reasonably robust.

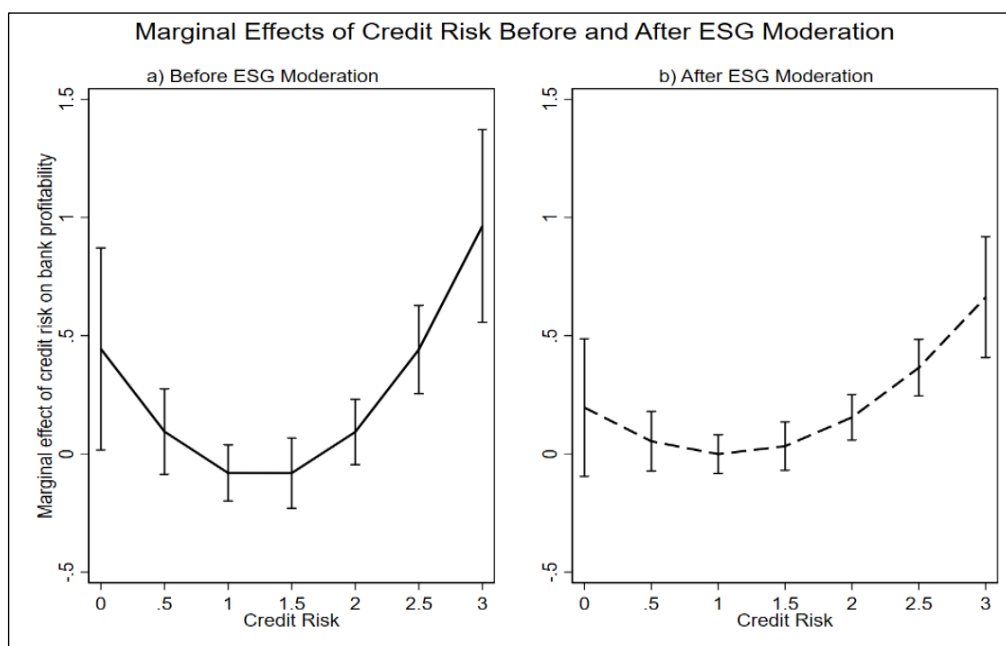


Figure 2. Expanded Sample: Marginal effects of default risk on bank profitability predictions before and after ESG moderation. The vertical capped lines are the 95% confidence intervals. **Source:** Author's visualization.

Another useful opportunity to evaluate the stability of the findings is to examine the effect of ESG moderation before and after 2015, a time from which developments in financial sustainability practice began to take off in the banking industry. To do this empirical extension, an indicator variable is assigned, taking the value of zero before 2015 and a value of one after 2015. This serves to observe if the marginal effects are similar in both periods. The results are captured in Figure 3. Across both panels, the relationship is U-shaped, confirming the nonlinearity behavior of credit risk in relation to bank profitability. Both graphs show minimal effect at mid-risk levels and an increase at both low and high ends. Prior to ESG moderation (Panel a), marginal effects were substantially higher, particularly in the Pre-2025 period, suggesting a stronger sensitivity of profitability to credit risk. After ESG moderation (Panel b), the overall marginal effects are reduced, and the difference between Pre- and Post-2015 is narrower. This supports the hypothesis that ESG practices act as a moderating force, dampening the impact of credit risk on profitability. The attenuation in the Post-2015 period is particularly noteworthy, potentially reflecting improved risk management or regulatory responses aligned with ESG frameworks.

The last inspection of results robustness is to scrutinize how the different credit risk ranges (low to high) are appropriate for varying thresholds of ESG moderation. In view of the earlier discussion, it is evident that the nonlinear polynomial interaction model (Equations 1 and 2) provides a flexible estimation of how default risk (BPL) affects bank profitability (ROE) across its range and how that relationship is moderated by ESG. To make this more intuitive, I compute predicted values of profitability across low, medium, and high levels of ESG. Figure 4 reports the marginal effect of BPL (default risk) on the bank profitability, evaluated at continuous levels of BPL from low (0.5) to high (2.5), and across low (0.05), medium (0.10), and high (0.15) levels of the ESG score. The effect of BPL is consistently negative at low and medium ESG levels, with diminishing magnitude as ESG increases, indicating a visible moderating role of ESG on the relationship between default risk and

banks' financial performance. The results confirm the aggregate pattern observed in the baseline model (Figure 1) along with other replications (Figures 2 and 3), providing viable evidence to conclude that the findings are robust.

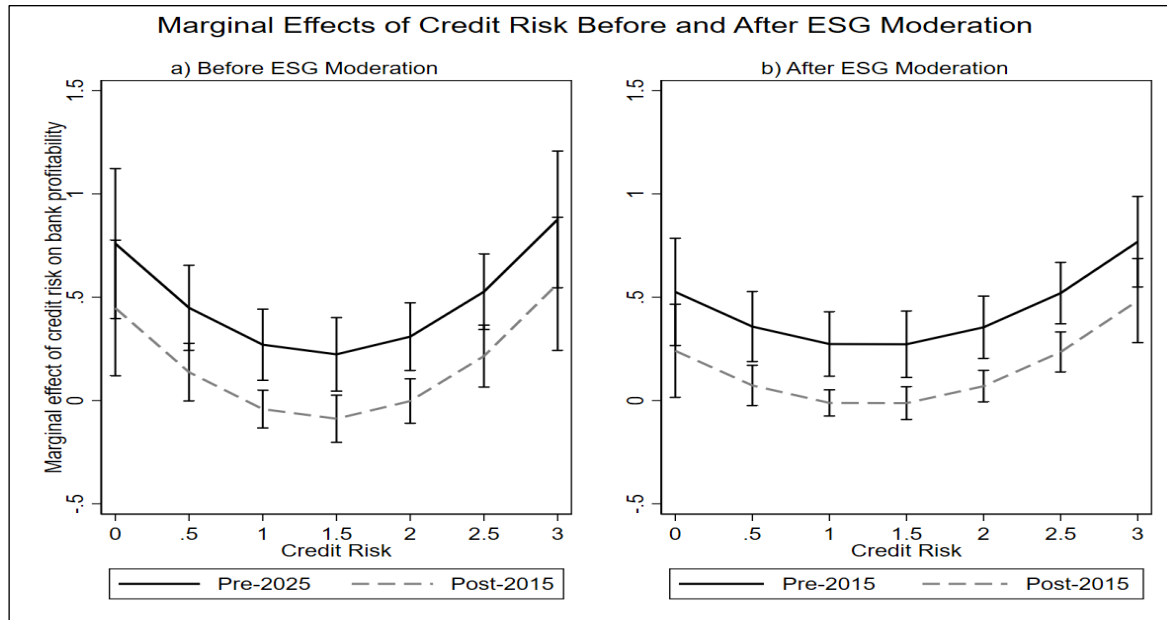


Figure 3: Expanded sample (Pre-2015 and Post-2015): Marginal effects of default risk on bank profitability predictions, before and after ESG moderation. The vertical capped lines are the 95% confidence intervals. *Source:* Author's visualization.

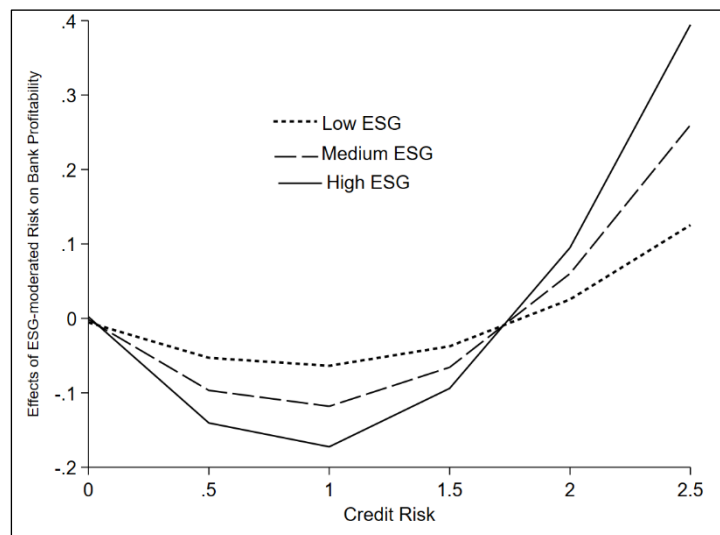


Figure 4. Expanded sample: Marginal effects of default risk on bank profitability predictions evaluated across low, medium, and high values of ESG. *Source:* Author's visualization.

4.3. Discussion of results

My primary question is whether ESG moderation of credit risk lessens the problem of bad loans, leading to improved bank profitability. The first two hypotheses (H1 and H2) anchor the core research goal. The goal of H1 is to ascertain the nature of the association between ESG practice and bank profitability, and it is accordingly confirmed in the results in line with most literature findings (Friede et al., 2015; Saini et al., 2023). Through H2, the study confirms the literature that credit risk is negatively correlated to bank profitability (Munangi and Sibindi, 2020; Lawrence et al., 2020; Temba et al., 2024), but going a step further, this paper shows that the usual linear relationship is inadequate to satisfy the appropriate model design of an order-three polynomial. The resulting partial derivative of ROE with respect to credit risk yields a quadratic function. This functional form is important since it helps to show that under normal practical operation, the BPL effect is not open-ended but worsens to a certain level, after which a positive rebound is observed. This means that banks have some innovative way to salvage value from extremely bad debts beyond certain thresholds, probably debtor factoring, insurance, or hedging like credit default swaps.

The empirical objective of this study is evaluated in H3, revealing that an ESG-moderated credit risk improves bank profitability. While a literature search for similar investigations returns blank, a few research dimensions are closest to the current study. The first literature category is for studies that interact credit risk (or its proxy) with other variables (not ESG) with a view of achieving similar results of risk reduction and profitability improvement (Chen and Xie, 2022; Bhatia and Mahendru, 2023). The second literature dimension models credit risk as a dependent variable and then identifies determinants (including interactions) of credit risk by searching for risk-reducing covariates (Bhatia and Mahendru, 2023, Wu and Xie, 2024; Shang et al., 2025). The current study confirms and coincides with the stated research parallels of improving bank profitability via lessening credit risk. However, I expand the solution space by integrating financial sustainability into the model. This generates awareness among banks of the extended benefits of ESG compliance.

Additionally, I examine how the effect of risk on bank profitability changes over different ranges of risk measures across varying categories of ESG strengths (low, medium, and high). The results show that the benefit of ESG is present across all levels of risk, but increases more as banks' ESG scores improve. This finding complements Cantero-Saiz et al. (2025), who looked at a cross-country study and observed that as a country's score of sustainability improves, the positive effect of ESG on bank profitability is also strengthened. This implies that for ESG benefits to be optimized, a sustainable-finance-friendly environment must prevail at the country level, particularly for developing countries.

Several theoretical motivations that link bank profitability, ESG, and credit risk were discussed earlier, and now it is time to evaluate the implications of the results. The credit creation concept in a fractional banking system benefits credit expansion and is aligned with the intermediation theory. This is an important function of the banking sector in the economy, as it transfers funds from savers to borrowers, thereby promoting economic activity. While it is self-evident that unchecked credit expansion has economic drawbacks, a lesson from the current study is that integrating financial sustainability with credit expansion eases the constraint (credit risk) and benefits bank profitability. Another significant economic theory bearing on this study concerns the fundamental business objective.

While the traditional neoclassical foundation of profit maximization remains a valuable baseline model, it is often *weaponized* by the anti-ESG school to discredit the sustainability economics. In contrast, this study report new insightful results: There is value in ESG compliance to achieve financial

sustainability and benefiting the banking system by lessening credit risk and improving profitability, leading to positive spillover effects in the economy. A question that may arise is: If one business is operated solely on neoclassical profit maximization, will it outperform the modern ESG-compliant business? The latter wins according to the literature that evaluates a nexus of financial performance with ESG practice (Friede et al., 2015; Senadheera et al., 2022), and this study supports this finding. The results imply that economic theorists should re-examine the business objective function (consistent with Alexander, 2007), while bank practitioners and policymakers should support ESG adoption to maximize economic benefit, as corroborated by ESG theorists (Friedman et al., 2021; Xue, 2023). In particular, to enhance ESG's effectiveness, decision-makers should strengthen policy initiatives that support ESG reporting standards, integration, international benchmarking, and regulatory harmonization.

5. Conclusions

The study yields three important findings regarding the individual and combined effects of credit risk and ESG on bank profitability. First, the study confirms that loan default has detrimental effects on bank profitability, as evidenced by its significant negative relationship with credit default risk. The study goes a step further to show that credit risk, proxied by bad-performing loans, has a polynomial relation with bank profitability. This allows me to demonstrate through graphical explanation the predictive margins of return on equity (a proxy for bank profitability) that, in practice, credit risk does not harm banks open-endedly, but has a threshold of worst-case scenario after which banks salvage some generous benefit (positive correlation). I interpret this as banks redeeming bad debt revenues from innovative hedging strategies like debt factoring contracts, insurance cover, or credit default swap derivatives. Second, the study confirms a positive association between ESG practice and bank profitability, and this result makes the next result more intuitive. The last finding is that ESG-moderated credit risk leads to improved bank profitability. With expanded sample observations of 180, three robustness evaluation approaches were applied, and all yielded satisfactory outcomes. Given that the literature search reveals no similar empirical investigation, this study paves a new path for further related research. The restricted sample size limited the study to fewer variables. Future studies can replicate this study with larger bank samples. This will help clarify whether the polynomial relationship of credit risk with bank profitability is data specific and whether the benefit of ESG moderation on credit risk can be widely confirmed.

Use of AI tools declaration

The author declares that they have not used Artificial Intelligence (AI) tools in the creation of this article.

Conflict of interest

The author declares no conflicts of interest in this paper.

References

- Agnese P, Arduino FR, Cerciello, M (2024) Does board knowledge matter for ESG performance in the European banking industry? *CSR Environ Manag* 31: 4454–4468. <https://doi.org/10.1002/csr.2811>

- Ahmad N, Mobarek A, Roni NN (2021) Revisiting the Impact of ESG on Financial Performance of FTSE350 UK Firms: Static and Dynamic Panel Data Analysis. *Cogent Bus Manag* 8: 190–500. <https://doi.org/10.1080/23311975.2021.1900500>
- Alexander J (2007) Environmental Sustainability versus Profit Maximization: Overcoming Systemic Constraints on Implementing Normatively Preferable. *J Bus Ethics* 76: 155–162. <https://doi.org/10.1007/s10551-006-9264-5>
- Baron RM, Kenny DA (1986) The Moderator- Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic, and Statistical Considerations. *J Pers Soc Psychol* 51: 1173. <https://doi.org/10.1037/0022-3514.51.6.1173>
- Bénabou R, Tirole J (2010) Individual and Corporate Social Responsibility. *Economica* 77: 1–19. <https://doi.org/10.1111/j.1468-0335.2009.00843.x>
- Beurden P, Gössling T (2008) The Worth of Values: A Literature Review on the Relation between Corporate Social and Financial Performance. *J Bus Ethics* 82: 407–424. <https://doi.org/10.1111/j.1468-0335.2009.00843.x>
- Bhatia A, Mahendru M (2023) Credit Risk Management, Technical Efficiency, and Financial Performance of Indian Banking Sector: A Mediation Analysis. *IUP J Bank Manag* 22: 5–23. <https://doi.org/10.32479/ijefi.12968>
- Boudriga A, Taktak NB, Jellouli S (2009) Banking Supervision and Nonperforming Loans: A Cross-country Analysis. *J Financ Econ Policy* 1: 286–318. <https://doi.org/10.1108/17576380911050043>
- Buallay A (2019) Is Sustainability Reporting (ESG) Associated with Performance? Evidence from the European Banking Sector. *Manag Environ Qual* 30: 98–115. <https://doi.org/10.1108/MEQ-12-2017-0149>
- Buallay A, Fadel SM, Alajmi J, et al. (2021) Sustainability Reporting and Bank Performance after Financial Crisis: Evidence from Developed and Developing Countries. *Compet Rev* 31: 747–770. <https://doi.org/10.1108/CR-04-2019-0040>
- Cantero-Saiz M, Sanfilippo-Azofra S, Torre-Olmo B, et al. (2025) ESG and bank profitability: the moderating role of country sustainability in developing and developed economies. *Green Financ* 7: 288–331. <https://doi.org/10.3934/GF.2025011>
- Chen Z, Xie G (2022) ESG Disclosure and Financial Performance: Moderating Role of ESG Investors. *Int Rev Financ Anal* 83: 102291. <https://doi.org/10.1016/j.irfa.2022.102291>
- Chiaramonte L, Dreassi A, Girardone C, et al. (2021) Do ESG Strategies Enhance Bank Stability during Financial Turmoil? Evidence from Europe. *Eur J Finance* 28: 1173–1211. <https://doi.org/10.1080/1351847X.2021.1964556>
- Cohen J, Cohen P, West SG, et al. (2013) *Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences*, Routledge: New York. <https://doi.org/10.4324/9780203774441>
- Cort T, Esty D (2025) Is net-zero banking dead? Yale School of the Environment. January 13. Available from: <https://environment.yale.edu/news/article/net-zero-banking-dead>. (Accessed on 1 June 2025.)
- Del Gesso C, Lodhi RN (2025) Theories underlying environmental, social and governance (ESG) disclosure: a systematic review of accounting studies. *J Acc Lit* 47: 433–461. <https://doi.org/10.1108/JAL-08-2023-0143>
- Dixon-Fowler HR, Slater DJ, Johnson JL, et al. (2013) Beyond “Does It Pay to Be Green?” A Meta-Analysis of Moderators of the CEP- CFP Relationship. *J Bus Ethics* 112: 353–366. <https://doi.org/10.1007/s10551-012-1268-8>

- Doku JN, Iddrisu K, Bortey DNAS, et al. (2023) Impact of digital financial technology on financial inclusion in Sub-Saharan Africa: The moderation role of institutional quality. *Afr Financ J* 25: 31–45. https://hdl.handle.net/10520/ejc-finj_v25_n2_a3
- Fadun OS, Silwimba P (2023) Does Credit Risk Management Impact the Financial Performance of Commercial Banks? *Int J Bus Ecosyst Strategy* 5: 55–66. <https://doi.org/10.36096/ijbes.v5i2.415>
- Felle AR, Santioso L (2024) The Effect of Credit Risk and Bank-Specific Factors on Financial Performance of Banks Listed in Indonesia Stock Exchange. *Int J Appl Econ Bus* 2: 3392–3403. <https://doi.org/10.24912/ijaeb.v2i2.3392-3403>
- Freeman R (1984) *Strategic Management: A Stakeholder Approach*, Boston: Pitman.
- Friede G, Busch T, Bassen A (2015) ESG and Financial Performance: Aggregated Evidence from More than (2000) Empirical Studies. *J Sustain Finance Invest* 5: 210–233. <https://doi.org/10.1080/20430795.2015.1118917>
- Friedman HL, Heinle MS, Luneva I (2021) A Theoretical Framework for ESG Reporting to Investors. University of Pennsylvania. *SSRN Working Paper* (28 Sept.) <https://doi.org/10.2139/ssrn.3932689>
- Friedman M (1970) The Social Responsibility of Business Is to Increase Its Profits. *New York Times Magazine*, 17 September 1970. Available from: <https://www.nytimes.com/1970/09/13/archives/a-friedman-doctrine-the-social-responsibility-of-business-is-to.html>. (Accessed on 1 June 2025.)
- Friedman M (2007) The Social Responsibility of Business Is to Increase Its Profits, In: *Corporate Ethics and Corporate Governance*, edited by W.C. Zimmerli, M. Holzinger, and K. Richter, 173–178, Berlin Heidelberg: Springer. https://doi.org/10.1007/978-3-540-70818-6_14
- Gairola G, Dey K (2023) Moderators of Pricing and Willingness to Pay for Parametric Weather Risk Mitigants in Agriculture: An Integrative Review, Conceptual Framework, and Research Agenda *Cogent Econ Financ* 11: 2254579. <https://doi.org/10.1080/23322039.2023.2254579>
- Galletta S, Mazzù S (2023) ESG controversies and bank risk-taking. *Bus Strat Environ* 32: 274–288. <https://doi.org/10.1002/bse.3129>
- Gangwani M, Kashiramka S (2024) Does ESG performance impact value and risk-taking by commercial banks? Evidence from emerging market economies. *Bus Strat Environ* 33: 7562–7589. <https://doi.org/10.1002/bse.3882>
- Gopane TJ (2024) Bitcoin is an environmental disaster. Is the indictment distorted? *J Telecommun Digit Econ* 12: 595–611. <https://doi.org/10.18080/jtde.v12n1.888>
- Heeb, G (2025) Big banks flee climate coalition formed to reduce carbon emissions. *Wall Street J Market and Finance, Banking January 2*
- Jensen M. C (2010) Value Maximization, Stakeholder Theory, and the Corporate Objective Function. *J Appl Corp Finance* 22: 32–42. <https://doi.org/10.1111/j.1745-6622.2010.00259.x>
- Kahneman D, Knetsch JL, Thaler R (1986) Fairness as a Constraint on Profit Seeking: Entitlements in the Market. *Am Econ Rev* 76: 728–741. <https://doi.org/10.1017/CBO9780511803475.019>
- Khoury E, Nasrallah E, Alareeni NB (2023) ESG and Financial Performance of Banks in the MENAT Region: Concavity Convexity Patterns. *J Sustain Financ Invest Investment* 13: 406–430. <https://doi.org/10.1080/20430795.2021.1929807>
- King L, Gish E (2015) Marketizing Social Change: Social Shareholder Activism and Responsible Investing. *Sociol Perspect* 58: 711–730. <https://doi.org/10.1177/0731121415576799>
- Koapaha HP (2023) The Impact of Net Interest Income and ESG on Bank Performance. *Indones J Bus Anal* 3: 503–512. <https://doi.org/10.55927/ijba.v3i2.3961>

- Korzeb Z, Karkowska R, Matysek-Jędrych A, et al. (2025) How do ESG challenges affect default risk? An empirical analysis from the global banking sector perspective. *Stud Econ Financ* 42: 89–114. <https://doi.org/10.1108/SEF-09-2023-0540>
- Lawrence B, Doorasamy M, Sarpong P (2020) The Impact of Credit Risk on Performance: A Case of South African Commercial Banks. *Glob Bus Rev* 25: 151–164. <https://doi.org/10.1177/0972150920969927>
- Li JCH (2018) Curvilinear Moderation—A More Complete Examination of Moderation Effects in Behavioral Sciences. *Front Appl Math Stat* 4: 1–11. <https://doi.org/10.3389/fams.2018.00007>
- Li X, Saat MM, Khatib SF, et al. (2024) Sustainable Development and Firm Value: How ESG Performance Shapes Corporate Success—a Systematic Literature Review. *Bus Strategy Dev* 7: 1–22. <https://doi.org/10.1002/bsd2.70026>
- Malhotra G, Thakur KS (2020) Evolution of green finance: A bibliometric approach. *Gedrag Organ Rev* 33: 583–594. <https://doi.org/10.37896/GOR33.02>
- Manta F, Boscia V, Conca L (2025) The impact of bank riskiness on the quality of ESG disclosure: empirical evidence from European banks. *Bus Strat and the Environ* 34: 4206–4226. <https://doi.org/10.1002/bse.4193>
- Moudud-Ul-Huq S (2021) Does Bank Competition Matter for Performance and Risk-Taking? Empirical Evidence from BRICS Countries. *Int J Emerg Mark* 16: 409–447. <https://doi.org/10.1108/IJOEM-03-2019-0197>
- Munangi E, Sibindi AB (2020) An Empirical Analysis of the Impact of Credit Risk on the Financial Performance of South African Banks. *Acad Account Financ Stud J* 24: 1–15.
- Narula R, Rao P, Kumar S, et al. (2024) ESG Investing & Firm Performance: Retrospections of Past & Reflections of Future. *Corp Soc Responsib Environ Manag* 32: 1096–1121. <https://doi.org/10.1002/csr.2982>
- Nerlinger M (2020) Will the DAX 50 ESG Establish the Standard for German Sustainable Investments? A Sustainability and Financial Performance Analysis. *Credit Cap Mark* 4: 461–491. <https://doi.org/10.3790/ccm.53.4.461>
- PRI Association (2024a) PRI Quarterly Report - June 2024. United Nations Environment Programme Finance Initiative and United Nations Global Compact. PRI Association, 25 Camperdown Street, London, United Kingdom. PRI Association.
- PRI Association (2024b) Strategy Plan 2024-2027. Report by United Nations Environment Programme Finance Initiative and United Nations Global Compact. PRI Association.
- Rau PR, Yu T (2024) A Survey on ESG: Investors, Institutions and Firms. *China Finance Rev Int* 14: 3–33. <https://doi.org/10.1108/CFRI-12-2022-0260>
- Rodgers W, Choy HL, Guiral A (2013) Do Investors Value a Firms Commitment to Social Activities? *J Bus Ethics* 114: 607–623. <https://doi.org/10.1007/s10551-013-1707-1>
- Saini M, Aggarwal V, Dhingra B, et al. (2023) ESG and Financial Variables: A Systematic Review. *Int J Law Manag*: 663–682. <https://doi.org/10.1108/IJLMA-02-2023-0033>
- Salzmann AJ (2013) The Integration of Sustainability into the Theory and Practice of Finance: An Overview of the State of the Art and Outline of Future Developments. *J Bus Econ*: 555–576. <https://doi.org/10.1007/s11573-013-0667-3>
- Saraiva R (2022) ESG factors in pensions funds regulations: why, how far have they gone, and what is the potential for improvement? *Revista Direito Financeiro Mercados de Capitais (RDFMC)* 3: 763–794. https://doi.org/10.1007/978-3-031-49460-4_1

- Senadheera SS, Gregory R, Rinklebe J, et al. (2022) The Development of Research on Environmental, Social, and Governance (ESG): A Bibliometric Analysis *Sustain Environ* 8: 1–15. <https://doi.org/10.1080/27658511.2022.2125869>
- Shang Y, Xiao Z, Nasim A, et al. (2025) Influence of ESG on corporate debt default risk: An analysis of the dual risk scenarios. *J Int Money Financ* 151: 103248. <https://doi.org/10.1016/j.jimonfin.2024.103248>
- Shakil, Mahmood MH, Tasnia N, et al. (2019) Do environmental, social and governance performance affect the financial performance of banks? A cross-country study of emerging market banks. *Manag Environ Qual* 30: 1331–1344. <https://doi.org/10.1108/MEQ-08-2018-0155>
- SIFMA (2023) *Securities Industry and Financial Markets Association (SIFMA) V. Ashcroft 1- 43. U.S. Western District Court of Missouri Central Division*. Available from: <https://www.sifma.org/wp-content/uploads/2023/08/SIFMA-Complaint-Filed-in-the-U.S.-District-Court-for-the-State-of-Missouri.pdf>. (Accessed on 1 June 2025).
- Sinițin N, Socol A (2020) Determinants of banking profitability through ROA and ROE: A panel data approach. *Ovidius Univ Ann: Econ Sci Ser* 20: 1037–1043. Available from: <https://doaj.org/article/06475017df5f4475b9a32fb4491f9a66>. (Accessed on 1 June 2025).
- S&P Dow Jones Indices (2024a) S&P South Africa Composite Indices methodology, S&P Global. Available from: <https://www.spglobal.com/spdji/en/indices/sustainability/sp-south-africa-domestic-shareholder-weighted-dsw-capped-scored-screened-index/#data>. (Accessed 5 June 2025).
- S&P Dow Jones Indices (2024b) S&P South Africa Composite Indices online database, S&P Global. Available from: www.spglobal.com/spdji/en/documents/methodologies/methodology-sp-south-africa-composite-indices.pdf. (Accessed 5 June 2025)
- Tanjung M (2023) Cost of Capital and Firm Performance of ESG Companies: What Can We Infer from COVID-19 Pandemic? *Account Manag Policy J* 14: 1242–1267. <https://doi.org/10.1108/SAMPJ-07-2022-0396>
- Temba GI, Kasoga PS, Keregero CM (2024) Impact of the Quality of Credit Risk Management Practices on Financial Performance of Commercial Banks in Tanzania. *SN Bus Econ* 4: 1–29. <https://doi.org/10.1007/s43546-024-00636-3>
- Vargas M (2017) In Defense of E. Merrick Dodd: Corporate Social Responsibility in Modern Corporate Law and Investment Strategy. *Bus Lawyer* 73: 337. <https://www.jstor.org/stable/27171094>
- Xue H (2023) ESG Disclosure, Market Forces, and Investment Efficiency. Duke University, *SSRN Working Paper*. <https://doi.org/10.2139/ssrn.4344253>
- Wu M, Xie D (2024) The impact of ESG performance on the credit risk of listed companies in Shanghai and Shenzhen stock exchanges. *Green Financ* 6: 199–218. <https://doi.org/10.3934/GF.2024008>
- Zairis G, Liargovas P, Apostolopoulos N (2024) Sustainable Finance and ESG Importance: A Systematic Literature Review and Research Agenda. *Sustainability* 16: 1–13. <https://doi.org/10.3390/su16072878>



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