ESG and Banks' Performance: Could Cyber Risk Be an Influence?[1]

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ABSTRACT

To understand ESG practice impacts on bank profitability, the study analyses cyber risk as a moderating factor within the Egyptian banking industry. The analysis involved quantitative data examination from 16 Egyptian banks between 2017 and 2023. The research analysed ESG's direct effects on ROA and GPM performance measures through regression analysis and used moderation analysis to understand how cyber risk affected this relationship. The study confirms that Environmental Social Governance implementations positively influence both Return on Assets (H1a) and Gross Profit Margin (H1b) results in bank profitability, thus validating the primary hypothesis (H1). The study shows that banking cyber risk creates a negative influence on the relationship between ESG initiatives and bank profitability (H2). Negative moderation of cyber risk affects the relationships between ESG initiatives and bank financial performance as measured by ROA (H2a) and GPM (H2b). Data from an emerging market adds new knowledge about ESG-profitability relations in banking through this research. New research insights become possible because this study introduces cyber risk as a moderating factor in ESG initiatives toward financial performance (ROA or GPM).

Keywords: *ESG; Bank profitability; Cyber risk; Return on Assets; Gross Profit Margin; Egyptian banking sector; Sustainability; Financial performance; Moderation analysis*

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1. INTRODUCTION

Corporate performance evaluation now depends heavily on the assessment of ESG criteria within financial markets worldwide (Landi and Sciarelli, 2019). The need for sustainable business practices leads financial institutions under regulatory pressure from investors and customers to implement ESG criteria in their operations worldwide. Banking performance measurement underwent a paradigm shift through this integrated approach, which now extends financial metrics into sustainability considerations that manage the risks alongside emerging business opportunities (Zioło et al. 2023).

The banking sector in emerging markets, especially Egypt, leads economic development through sustainable operations, although it needs to manage multiple challenges across sustainability factors (Radwan et al. 2023). The Egyptian banking sector underwent major changes in recent years thanks to digital transformation initiatives and regulatory reform programmes, which transformed the competitive market landscape (Abed et al. 2024). While Egyptian banks develop modernisation plans, they encounter rising cyber threats that demonstrate an overlap with sustainable business practices primarily through social and governance endpoints related to information security and business stability (Abdelraouf et al. 2024).

The research problem analyses how elements of ESG performance correlate with cybersecurity risk management together with overall bank performance in the Egyptian banking sector. Research about ESG performance effects on financial outcomes exists within developed markets, but studies about this relationship in Egyptian markets remain minimal, especially when evaluating cybersecurity as a link between ESG and economic performance. The expanding digital banking services in Egypt make this knowledge gap more significant because they will both heighten cyber vulnerabilities and present chances for better social responsibility and governance practices (Abdelraouf et al. 2025).

This study seeks to answer the following research questions:

To what extent does ESG performance influence the financial and operational outcomes of Egyptian banks?

Does cybersecurity moderate the relationship between ESG and bank performance?

The primary aim of this research is to develop an integrated framework that explains the interrelationships between ESG criteria, cybersecurity risk management, and bank performance indicators within Egypt's banking sector. By identifying these connections, the study intends to provide actionable insights

for banking executives, regulators, and policymakers seeking to strengthen both ESG implementation and cybersecurity governance.

This research is motivated by several compelling factors: First, Egypt's strategic position as a leading financial hub in the Middle East and North Africa region makes its banking sector an influential case study for other emerging markets (Abdelraouf and Muharram, 2024). Second, the accelerating digital transformation of Egyptian banking services creates an urgent need to understand cybersecurity implications within broader ESG frameworks. Third, evolving regulatory expectations regarding both ESG disclosure and cybersecurity compliance create practical challenges for banks that require evidence-based solutions (Belitskaya and Kharitonova, 2024).

The findings reveal a significant positive relationship between comprehensive ESG implementation and bank performance among Egyptian financial institutions. Furthermore, the study identifies cybersecurity risk as a mediator in this relationship.

These findings have important implications for banking strategy and regulation in Egypt and similar emerging markets. For bank executives, the results highlight the strategic importance of integrating cybersecurity considerations within broader ESG frameworks rather than treating them as separate domains. The study results demonstrate value for regulators who should develop regulations that fully recognise how ESG and cyber risks connect to each other. Financial investors can leverage this empirical study to validate their investment choices involving both ESG ratings and cybersecurity capabilities when rating bank performance.

The paper continues with the following structure:Section 2 delivers a review of research about ESG banking performance and cybersecurity threat management and their observable connection points. The third section of this work presents the methodology section. The empirical section appears in the fourth part of this study. The outcome effects for the study are analysed in Section 5.

2. LITERATURE REVIEW

2.1 ESG

Corporate responsibility and sustainable performance assessment now utilise environmental, social and governance as their core framework, which previously operated on the business sidelines (Epstein, 2018). ESG became a prominent concept after the UN PRI launched in 2006 as a structured assessment method for non-financial business performance (Wielechowski and Krasuski, 2024). Companies use the environmental dimension to convey their natural ecosystem

effects through their climate change participation and their resource usage patterns as well as their pollution methods and waste disposal strategies (Anzolin and Lebdioui, 2021). The social aspect of ESG aims to evaluate employee and customer relationships in addition to supplier and community interactions, which includes assessments of labour practices and diversity and inclusion alongside human rights and data privacy standards as well as product accountability. Corporate leadership structures are combined with executive compensation practices to create the governance dimension, which integrates audit procedures and shareholder rights while requiring transparent reporting (Baid and Jayaraman, 2022).

The assessment methodologies for ESG evaluation have become substantially varied since rating organisations MSCI, Sustainalytics and Bloomberg established their individual measuring systems (Larcker et al. 2022). Organisations face different obstacles and potential benefits regarding ESG adoption while operating in emerging markets when compared with developed economies (Singhania and Saini, 2023). ESG disclosure regulations within jurisdictions remain under development, which produces disparities in information that make cross-metric comparisons challenging. Regions confronting urgent developmental challenges will commonly put social and governance issues above environmental concerns because of cultural and socioeconomic factors. The MENA region shows governance factors generate the most robust performance relationship, which social indicators follow, while environmental variables result in diverse outcomes. Specific market environments require distinct ESG research approaches because variations emerge in different regions (Singhania et al. 2023).

2.2 Bank's performance

Standard bank performance evaluation uses financial data to measure profitability alongside operational efficiency together with risk management abilities (Harb et al. 2023). Standard measures for bank assessment include Return on Assets (ROA), Return on Equity (ROE), Gross Profit Margin (GPM), and Cost-to-Income Ratio (CIR), as well as capital adequacy and liquidity ratios defined by Basel III regulations. Quantitative data points give stakeholders standard evaluation benchmarks for measuring financial stability and operational efficiency across different institutions throughout different periods (Ma et al. 2022). The 2008 global financial crisis made stakeholders recognise the shortcomings of traditional banking performance metrics because these metrics failed to measure sustainable risks and broader social impacts of banking operations. The reconsideration of bank performance analysis produced a new definition of bank evaluation that combines financial results with additional non-financial aspects (Sharma and Kumar, 2024).

The evaluation of bank performance in modern times combines market-based metrics that consist of stock price performance with market-to-book ratios and credit default swap spreads in addition to traditional accounting measures (Ewens et al. 2025). Market-based metrics present insights from investors about company performance through their perceptions as well as expectations, which may envision the future better than accounting numbers alone (Adams, 2024). The demand for operational performance indicators, which measure customer satisfaction and digital adoption rates alongside innovation capability and employee engagement, has increased because these metrics demonstrate long-term business success in present-day competitive technology-dominated industries. The assessment of sustainable performance today extends to bank activity that promotes financial inclusion and community development in addition to environmental focus and profit metrics (Hanaysha and Alzoubi, 2022).

Performance assessment of the Egyptian banking sector needs to consider particular market elements which affect both outcomes and interpretation of results. The banking sector in Egypt continues evolving under the Central Bank of Egypt, which has implemented major changes to bolster financial stability along with inclusion processes. Different competitive pressures emerge from the current market structure, which combines state-owned enterprises with private domestic and international banks. Matters of macroeconomic volatility, which include currency movements and inflation threats, and structural economic reforms contribute external variables to impact operational metrics regardless of management skills. The specific operating conditions in the Egyptian banking sector require thorough assessment when conducting performance analysis while making comparisons across institutions (Hilal and Tantawy, 2022).

2.3 Cyber Risk

Cyber risk evolves as a complex danger scope that shifted from its technical roots into an essential business threat, which brings substantial monetary impact alongside operational problems and reputational consequences (Bahmanova and Lace, 2024). The banking sector faces heightened exposure risks because it has a critical position in financial infrastructure and operates sensitive customer data and increasing digitalisation of banking services. The average financial cost for bank cyber incidents reached $5.9 million per incident as per IBM's Cost of a Data Breach Report (2023), and this total does not include regulatory fines and remediation costs together with litigation expenses and diminished customer trust (Metibemu, 2025).

The field of cyber risk governance evolved from focusing mainly on technical aspects into an enterprise risk management operation which functions within operational risk management frameworks (Judijanto et al. 2023). Internationally established banking regulators implemented individual requirements for cybersecurity risk management by means of the TIBER-EU framework developed by the European Central Bank together with the Cybersecurity Assessment Tool established by the FFIEC and the principles for effective cyber resilience created by BIS (Haupt, 2024).

These regulatory systems focus on making boards responsible for risk management while requiring periodic risk evaluations and incident response improvement measures and external verification of control systems. Financial institutions that lead the industry now use Three Lines of Defence models to assign cyber risk management responsibilities among business operations and risk management functions and independent audit activities so they can create multiple layers of subject-matter expertise (Pecina et al. 2022).

Emerging cyber risk trends present novel challenges for banking institutions in Egypt and globally. First, the threat actor landscape has expanded beyond individual hackers to include sophisticated criminal organisations, nation-state actors, and hacktivists with varying motivations and capabilities (Cele and Kwenda, 2025). Second, attack vectors have diversified to include supply chain compromises, advanced persistent threats (APTs), and social engineering tactics that target human vulnerabilities rather than technical weaknesses (Tan et al. 2025). Third, the acceleration of digital transformation initiatives—particularly in response to COVID-19—has expanded the attack surface through increased adoption of cloud services, application programming interfaces (APIs), mobile banking platforms, and remote work arrangements. These evolving dimensions of cyber risk require banks to develop adaptive security strategies that balance innovation objectives with robust risk management practices (Karim, 2024).

2.4 ESG and Banks' Performance

Scholarly interest in the ESG performance and bank financial outcome relationship has produced detailed findings about sustainability impacts on institutional success. According to Cornett et al. (2016), which studied U.S. commercial banks, banks with higher ESG ratings proved to have better loan portfolio quality along with reduced funding expenses, thus indicating sustainability practices promote effective risk management and stakeholder trust. According to Miralles-Quirós et al. (2019), investors demonstrate positive reactions toward listed banks that declare ESG initiatives within European markets. Dorfleitner et al. (2020) identified that ESG criteria relations with bank success became intricate because governance elements produce performance

advantages over pure environmental or social elements. Also, these benefits take longer time periods to manifest.

Multiple explanation frameworks describe how ESG factors connect to bank performance through distinct transmission channels in the banking industry. According to the risk mitigation perspective, strong ESG practices shield financial institutions from operational weaknesses and reputational harm and regulatory complications, thereby reducing cost of capital and market instability during volatile times (Jo and Na, 2012). Organisations that possess ESG capabilities use them as valuable resources to gain competitive advantages by building better stakeholder partnerships and organisational learning and innovation potential (Surroca et al. 2010). Through ESG integration banks succeed in balancing stakeholder interests such as depositors, borrowers and employees, regulators and communities based on the stakeholder theory perspective, which leads to improved long-term value creation by increasing legitimacy and lowering conflicts (Aguilera-Caracuel et al. 2015). The multidimensional analysis shows that ESG performance generates bank results through distinct operating channels instead of one single direct connection.

Studies dedicated to emerging market research identified multiple complications between ESG performance and its impact on bank results. Buallay and Al-Ajmi (2020) determined in his research on Gulf Cooperation Council banks that governance elements had stronger positive relationships to financial performance than developed market banks because emerging markets value transparency and institutional accountability as governance pillars develop. Social responsibility activities in Egyptian banking support operational efficiency metrics according to Metwally et al. (2016) but yield inconsistent effects on profitability measures. The study by Arayssi and Jizi (2024) uncovered that regional cultural values and institutional quality create significant moderation effects for ESG outcomes in MENA banking sectors, where robust regulatory frameworks and stakeholder sustainability focus produce superior positive results. The study shows that ESG influences in banking need to be evaluated by considering cultural traits and institutional factors in various banking systems.

2.5 Cyber Risk and ESG

The relation between cybersecurity risk management and ESG performance stands as an active research domain which creates substantial effects for banking institutions. All three dimensions of ESG find conceptual connection with cyber risk because it impacts governance through oversight structures and accountability mechanisms while affecting social aspects through data privacy protections and trust preservation and environmental elements through digital

infrastructure sustainability and security operation carbon footprint. Helfaya et al. (2023) reviewed public sector companies to reveal businesses with better ESG scores maintained limited stock price drops alongside shorter recovery periods than firms scoring low in ESG standards. Drempetic et al. (2020) researched the financial sector to show how assessment metrics of organisation quality yield positive outcomes in determining cyber maturity at organisations. The discovery shows that both ESG governance systems and cyber risk management methods deliver productive performance outcomes.

The inclusion of cyber risk factors in ESG assessment frameworks happens because investors treat cybersecurity as an essential sustainability element. The major ESG rating providers now analyse cyber risk governance indicators through assessments of board expertise and incident disclosure practices and third-party risk management and privacy protection measures (Cortez and Dekker, 2022). The Sustainability Accounting Standards Board (SASB) provides banking institutions with specific data security disclosure metrics to report data breach incidents and identification approaches along with risk descriptions (Hales, 2021). Cyber risk and ESG reporting standards create dilemmas and chances that help banks integrate sustainability functions with security management without maintaining separate domains (Abramova, 2024).

Research indicates that proper cyber risk management implements strong ESG performance through its enabling functions and acts as one of the measurable outcomes. According to Ige et al. (2024), sustainable governance systems enable better cybersecurity management, but successful cyber risk practices enhance stakeholder trust and institutional resilience along with social and governance targets. The World Economic Forum (2020) indicates banks which lead in ESG and cybersecurity adopt similar organisational features through proactive risk-orientated systems combined with transparent communication processes linked to governance frameworks which unify security initiatives into broader sustainability objectives. As digital transformation accelerates throughout the banking sector, the strategic alignment between cybersecurity capabilities and ESG performance will likely become increasingly critical for maintaining stakeholder trust and operational resilience in an environment characterised by evolving threats and heightened sustainability expectations (Schwab and Zahidi, 2020).

The research problem focuses on understanding how ESG (Environmental, Social, and Governance) performance correlates with cybersecurity risk management and overall bank performance within the Egyptian banking sector, an area underexplored in emerging markets. While existing studies have examined ESG's impact on financial outcomes in developed markets, there is a

significant knowledge gap regarding this relationship in Egypt, particularly when considering cybersecurity as a moderating factor. The rapid digital transformation of Egyptian banking services amplifies cyber vulnerabilities, which may intersect with ESG practices, especially in social and governance dimensions like data privacy and business stability. This study addresses the lack of empirical research on how cyber risks influence the ESG-profitability nexus, aiming to provide clarity on these interrelationships to inform banking strategies and regulatory frameworks in an emerging market context.

Therefore, the following hypothesis was made:

H1: *ESG has a significant effect on banks' profitability.*

H1a: *ESG has a significant effect on ROA of s' profitability.*

H1b: *ESG has a significant effect on GPM of s' profitability.*

H2: *Cyber risk moderates the relationship between ESG and banks' profitability.*

H2a: *Cyber risk moderates the relationship between ESG and ROA of banks' profitability.*

H2b: *Cyber risk moderates the relationship between ESG and GPM of banks' profitability.*

2.6 Conceptual Model

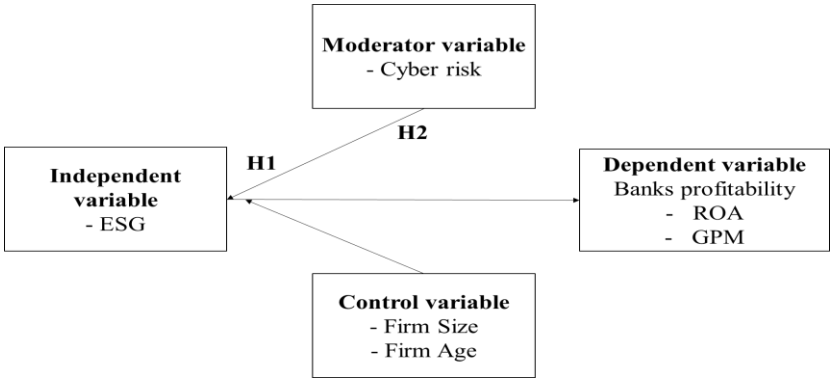

Figure (1.1) demonstrates how proposed relationships exist between liquidity

Source: Developed by the author

The conceptual research model in this diagram evaluates the correlation between ESG (Environmental, Social, and Governance) practices and bank profitability while considering cyber risk as a controlling factor. The model depicts two main theoretical constructs through H1, which confirms that ESG (independent variable) generates direct effects on bank profitability (dependent variable) evaluated by using ROA (Return on Assets) and GPM (Gross Profit Margin), as

well as H2, showing cyber risk moderates this demonstrated relationship. The model features additional control elements, including firm age combined with firm size, because these elements could potentially alter the main relationship of investigation (Abramova, 2024).

Multiple theoretical theories exist to explain how these proposed variables interact. Banks implementing stronger ESG practices as per stakeholder theory develop higher levels of stakeholder engagement, which creates superior reputation and customer loyalty that results in improved financial outcomes. The resource-based view theory demonstrates how ESG initiatives enable banks to foster distinct valuable assets which produce competitive advantage together with increased profitability results (Esposito et al. 2025).

Risk management theory could explain the effect of cyber risk management on the relationship between ESG initiatives and financial performance for banks. Financial institutions can optimise their ESG portfolios through strong cyber risk management capabilities because security risks destroy stakeholder confidence together with eliminating ESG benefits. The lack of proper cyber risk management prevents banks from obtaining valid recognition of their ESG investments due to "greenwashing" risks that diminish profit-related ESG advantages (Shah et al. 2025).

Banks make decisions regarding ESG acceptance alongside cyber risk control according to institutional requirements, which subsequently affects their financial outcome. This topic gains additional importance because of rising regulatory scrutiny on both areas. The theory of agency explains the bank performance effects of managing ESG goals together with cyber risk management through better aligning management interests and control variables such as firm size and age (Menicucci, 2025).

3. METHODS

The research makes use of secondary data points collected from annual reports spanning from 2017 through 2023. The research obtained more reliable findings by incorporating website data from financial institutions into its data collection process. The data used for this study derives from secondary resources with particular focus on historical documentation. Records for data collection emanated from the annual reports of Egypt's 16 banks.

3.1 Sampling Technique

Sharma (2017) explains that under census methodology all members of the entire population undergo assessment because this research method provides total coverage of population entities. The applications of this approach span the entire

population structure because selection biases disappear simultaneously with the delivery of complete analysis information. Every population unit included by census methodology eliminates the requirement for probability calculations because it incorporates the entire population. According to Cochran (1963), the appropriate Cochran sample technique rule is as follows:

$$n = \frac{z^2 \times p \times (1-p)}{e^2} = \frac{(1.65)^2 \times (0.5)(0.5)}{0.1^2} \approx 68.0625 \approx 68 \quad (1)$$

Therefore, the sample needs to exceed 68 respondents to obtain a margin of error of 0.1.

The research analyzed 16 banks, which operate within the Egyptian market. A research study led an evaluation of Egyptian banks as its primary research subject. Research conducted selection among banks based on three fundamental conditions for financial reporting during 2017 to 2023, which included maintaining required ESG disclosure standards and providing access to cyber risk and financial performance data. The evaluation used financial report information from 16 banks spanning seven years which included ESG metrics as the independent variable, cyber risk as the moderating variable, alongside firm size and firm age as control variables, and ROA alongside GPM as dependent variables for bank profitability.

The data analysis using STATA version 17 revealed that the fixed effects model provided more suitable results than the random model according to the results of the Hausman test. The analysis drew its data from the financial statements of the banks. Through this extensive analytical approach, researchers evaluated profitability effects directly caused by ESG practices in banks and how this relationship is moderated by cyber risk factors. The study achieved accurate performance evaluation of Egyptian banks' responses to ESG and cyber risk factors through comprehensive data selection and statistical analysis.

Independent variable:

i) **ESG**

- ESG index listed from EGX

ii) **Cyber Risk**

- Checklist from annual report based on the following Keywords

• "Cyber-attack, cyber security, cybercrime, cyber risk, hacking, swift attack, internet hacking or crimes) by Thach et al. (2021); Alber and Nabil (2016)

Dependent variable:

- ROA

$$\frac{\text{Net income}}{\text{Total assets}} \quad (5)$$

- GPM

$$\frac{\textbf{Gross income}}{\textbf{Income received from sales of goods or services}} \quad (6)$$

In this study the, the following control variables are adopted by the study:

i) **Firm Size**

- Natural Log to total assets

ii) **Firm Age**

- Natural Log to Firms years since establishment

To test the research hypotheses, the researcher identifies the following empirical models:

$$ROA = \beta_0 + \beta_1 ESG + \beta_2 CR + \beta_3 FS + \beta_4 FA + \varepsilon_i \quad (8)$$

$$GPM = \beta_0 + \beta_1 ESG + \beta_2 CR + \beta_3 FS + \beta_4 FA + \varepsilon_i \quad (9)$$

This analysis based on equations (8) and (9) explores the relationship between bank profitability measured through ROA and GPM and ESG practices (ESG) together with cyber risk (CR), firm size (FS) and firm age (FA) for control. The equations outline the relationships between variables together with their influence on bank profit generation levels. The research findings establish a direct link between ESG metrics and bank profitability through specific firm attribute analysis and cyber risk operates as a moderation variable. The study analyzes 16 Egyptian banks from 2017 to 2023 by running both fixed and random effects on the panel dataset. The banking industry demands suitable management of both company-specific diversity and temporal financial observations since ESG implementation and cyber risk management stand vital for operational success.

Our study finds the fixed effects model most suitable because the Hausman test determines this method produces the best results while analyzing our research data. The fixed-effects approach stands as an ideal solution for our panel analysis because it captures persistent factors of heterogeneity which remain active across banks throughout time. The implemented method controls for long-term company traits which enables reliable estimation of the relations between ESG

metrics and profit performance metrics, as well as how cyber risk moderates this relationship. An analysis of firm-specific effects and time-based changes using the implemented approach validates our research estimates for examining ESG, cyber risk, and profitability relationships in the Egyptian banking industry.

4. RESULTS

4.1 Descriptive Statistics

Table 1: Descriptive Statistics for the variables in phenomenon

Variable	Observations	Mean	Std. Dev.	Min	Max
ESG	112	709.6186	81.2724	581.41	844.36
Cyber Risk	112	.355372	.1861061	0	1.2
ROA	112	.0154524	.0100077	.0012368	.0542072
ROE	112	.443749	.2200114	.0357019	1.230364

Source: STATA V.17 OUTPUT

Analysis of key variables in this study becomes more understandable when reviewing the data presented in Table 1. The data reveals that Egyptian banks maintain an average ESG score of 709.62 on what appears to be a scale up to 850 but demonstrate moderate dispersion (SD=81.27) as well as significant variability from 581.41 to 844.36 which suggests the majority of banks have substantial ESG practices in place yet have remaining improvement potential. Institutional cybersecurity vulnerability levels exhibit significant variation across the sample because their Cyber Risk metrics range between 0 to 1.2 with a mean of 0.355 while showing substantial standard deviation of 0.186. The financial data shows banking institutions maintain average profitability at ROA level of 0.015 and ROE level of 0.444 but significant differences between individual banks (ROA: 0.001-0.054; ROE: 0.036-1.23) likely result from distinct business models and operational efficiency and market strategy.

Table 2: Pearson correlation coefficients for the variables in phenomenon

Variable	ROA	GPM	ESG	Cyber risk
ROA	1.000			
GPM	0.355	1.000		
ESG	0.254	0.330	1.000	
Cyber risk	0.443	0.454	-0.684	1.000

Source: Stata V.17 Output

Pearson correlation coefficient acts as a measure to evaluate both the magnitude and direction of linear variable relationships. The Pearson correlation coefficient evaluation discovers crucial results, which demonstrate both direct and indirect relationships between independent and dependent variables. At a 95% confidence level, there is a significant moderate positive relationship between ROA and GPM. In addition, there is a significant weak positive relationship between ROA and ESG. Finally, there is a significant moderate positive relationship between ROA and Cyber risk.

Table 3: Stationarity test of the variables in phenomenon

	Test statistic	P-value	Decision
Cyber risk	-3.5153	0.0002	Stationary
ROA	-2.9101	0.0018	Stationary
GPM	-4.3607	0.0000	Stationary
ESG	-1.7662	0.0387	Stationary

Source: Stata V.17 Output

The Levin-Lin-Chu test results in Table 3 validate the stationary nature of the essential variables used in the research for proper time series analysis. The lower section of the table states that all variables reach stationarity at the standard 0.05 alpha level yet variable strength varies substantially between elements. GPM demonstrates extremely strong stationarity compared to other variables (-4.3607, p=0.0000) yet ROA (-2.9101, p=0.0018) manifests moderate stationarity properties. The most pronounced stationarity characteristics belong to cyber risk (-3.5153, p=0.0002). The p-value (0.0387) of ESG (-1.7662) stands as the least stationary variable within the dataset because it resides closest to the significance threshold compared to other variables. The findings regarding stationarity strength may influence interpretation of subsequent analytic results especially for ESG but the research as a whole can utilize standard regression techniques since all variables maintain stationary patterns.

4.2 Panel Data (FGLS)

Table 4: Model 1and 2 of ROA and GPM

	Random effect Model			
ROA	**Coefficient**	**Std.**	**t**	**P>|t|**
Cyber risk as moderator	-.0068733	.0027007	-2.55	0.015
Cyber risk	-.0599488	.0149719	-4.00	0.000
ESG	1.343189	.2575528	5.22	0.000
Firm Size	.0000242	.0002366	0.10	0.919

	Random effect Model			
ROA	**Coefficient**	**Std.**	**t**	**P>|t|**
Firm Age	.0138037	.1054861	0.13	0.896
_cons	.0310373	.0125269	2.48	0.015
GPM	**Coefficient**	**Std.**	**t**	**P>|t|**
Cyber risk as moderator	-.0596526	.0152098	-3.92	0.000
Cyber risk	-.211315	.0557913	-3.79	0.000
ESG	1.33417	.2677539	4.98	0.000
Firm Size	6.39e-06	7.26e-06	0.88	0.381
Firm Age	.029716	.0126297	2.35	0.020
_cons	.0281821	.0129799	2.17	0.032

Source: stata v.17 output

Research findings presented in Table 4 show that cyber risk intensity affects the relationship between ESG and financial performance measures (ROA and GPM). Results show that the relationship between ESG and Return on Assets (ROA) is stronger when cyber risk is low ($p = 0.015$). Additionally, both cyber risk ($p < 0.001$) and ESG ($p < 0.001$) have direct separate effects on ROA. The positive link between ESG and financial measures remains strong while cyber risk generates a double negative effect through direct impact ($p < 0.001$) and stronger moderate effect ($p < 0.001$) in both cases for GPM and ROA financial measures. The results show firm size being insignificant to both measures but firm age shows significance toward GPM (at $p = 0.020$). Results from the analysis show ESG initiatives positively influence financial performance yet cyber risk exposure reduces this effect because organizations should implement cyber risk management to maximize outcomes.

4.3 Discussion

This study validates how links between ESG performance effect cyber risk exposure, so influencing financial results in banking sector environments. Better financial results evaluated using ROA and GPM result from ESG initiatives until banks face substantial cyber risks where these associations become noticeably weaker. Existing studies have already demonstrated that financial performance in banks becomes stronger through ESG investments (Cornett et al., 2016; Miralles-Quirós et al., 2019).

The analysis confirms multiple theoretical frameworks regarding ESG impact on bank performance through strong positive coefficients of ESG in both ROA (1.343189, $p < 0.001$) and GPM (1.33417, $p < 0.001$). Banks achieve improved

financial outcomes through ESG practice implementation because these measures act as risk management tools which enhance operational stability and reputation qualities (Jo and Na, 2012). Organizations using ESG capabilities as valuable resources demonstrate support for the resource-based view explained by Surroca et al. (2010) through their capability to create competitive advantages by developing better stakeholder relationships and innovation potential.

Cyber risk has a significant negative effect which reduces the relationship between ESG practices and financial performance measures based on ROA (coefficient = -0.0068733, p = 0.015) and GPM (coefficient = -0.0596526, p < 0.001). Relevant research by Helfaya et al. (2023) reveals that enterprises showing better ESG performance report reduced stock declines together with faster market rebound during cyber disasters. Studies of bank financial data show that financial success from ESG projects is lower for FSRs.

GPM demonstrates a more powerful negative relationship with cyber risk compared to ROA which indicates that these incidents specifically affect how well organizations generate revenue and maintain customer relationships. The data supports how cyber risk causes damage to ESG social aspects by protecting data privacy as well as maintaining trust.

The study findings generate novel understanding about variables which control the analysis. The research established two main findings based on firm size and age. First firm size demonstrated no meaningful effects on the variables. Secondly, firm age demonstrated a significant impact on GPM (coefficient = 0.029716, p = 0.020) yet not on ROA. Established banks benefit from loyal customers and positive market reputation through higher profitability margins although it does not directly impact their total asset utilization.

The research findings strongly suit developing nations including Egypt because prior investigation within this country has demonstrated a broken connection between ESG measures and performance. The emerging market financial performance and governance relationship reported by Buallay and Al-Ajmi (2020) becomes harder to maintain when the level of cybersecurity remains inadequate concludes our analysis.

Strategic cybersecurity implementation with ESG performance measures works to improve security barriers within banking institutions because modern operations require operational stability and trust systems. World Economic Forum (2020) revealed that banks which perform well in ESG and cybersecurity implementation have already established risk-focused proactive processes with open communication channels.

Cyber risk factors emerge with powerful negative effects during social responsibility evaluations which justifies the current integration of cybersecurity into ESG evaluation models (Cortez and Dekker, 2022). Stakeholders find sufficient grounds to view cybersecurity as a vital sustainability factor since poor cyber risk management erases potential financial benefits derived from solid ESG practices.

The analysis pushes knowledge growth about the joint impact between ESG elements and cyber threats on bank financial performance. The study shows that ESG projects produce financial gains but effective cyber risk procedures determine their outcome. To maximize their financial benefits from ESG programs banking institutions require developing thorough cybersecurity measures as unified framework elements within their broad sustainability approach and risk management systems.

5. CONCLUSION

Research conducted by this investigation shows ESG measurements share various interdependencies with cybersecurity policies which impact profit performance in Egyptian banks. ESG practices show a significant positive relationship with improved ROA and GPM financial measures as indicated by the economic data from 112 examined Egyptian banks. The study demonstrates that efficient cyber risk management plays an active role which strengthens the connections between ESG practices and bank profitability. Research findings help emerging markets create sustainability knowledge by establishing that cybersecurity solutions must function within full ESG assessment systems.

The research aimed to develop an integrated framework to examine the interrelationships between ESG criteria, cybersecurity risk management, and bank performance indicators within Egypt's banking sector, specifically analyzing how ESG practices influence bank profitability (measured by ROA and GPM) and whether cyber risk moderates this relationship. The study's results successfully validated this objective, confirming a significant positive relationship between ESG implementation and bank profitability, with ESG positively affecting both ROA (H1a) and GPM (H1b). Additionally, cyber risk was found to negatively moderate this relationship, weakening the positive impact of ESG on ROA (H2a) and GPM (H2b), thus supporting the hypotheses (H1 and H2). By providing empirical evidence from 16 Egyptian banks over 2017–2023, the study achieved its aim of offering actionable insights into the interplay of ESG, cyber risk, and financial performance, contributing valuable knowledge for banking executives, regulators, and policymakers in emerging markets.

5.1 Academic Implications

- **Expands Geographical Scope of ESG Research**:
  - Extends ESG-performance studies to the Middle Eastern and North African emerging market, specifically Egypt.
  - Validates positive ESG-profitability links in Egypt, supporting the universal applicability of sustainability practices across diverse economic systems, aligning with findings from developed markets.
- **Highlights Contextual Analysis in Profitability Metrics**:
  - Demonstrates varying strengths of ESG impacts on profitability metrics (ROA and GPM).
  - Emphasizes the need for context-specific research methods to account for unique market conditions, avoiding uniform assumptions across financial metrics and institutional settings.
- **Fills Research Gap in ESG and Cybersecurity Integration**:
  - Provides empirical evidence on the interplay between ESG performance and cybersecurity, previously studied as separate domains.
  - Confirms cyber risk as a moderating factor, showing it both enhances risk management and acts as an outcome of robust ESG practices.
- **Advances Theoretical Understanding**:
  - Enhances knowledge of transmission mechanisms linking ESG to financial performance, identifying cybersecurity as a critical intermediary variable.
  - Advocates for future ESG banking models to integrate risk governance, particularly cybersecurity, rather than treating it as a distinct research area.
- **Innovates Methodological Approaches**:
  - Combines ESG and cybersecurity metrics in a unified evaluation framework, offering deeper insights than standalone or dual-indicator assessments.
  - Employs stationarity testing to validate time-series analysis, ensuring reliable measurement of variables without complex transformations.
- **Supports Future Research**:
  - Provides a methodological blueprint for studying non-financial (ESG, cybersecurity) and financial performance dynamics in banking.
  - Delivers actionable insights for academics to explore integrated sustainability and risk management frameworks in diverse banking contexts.

5.2 Practical implications

- **Guidance for Bank Executives and Board Members**:
  - Allocate strategic resources to enhance ESG (Environmental, Social, Governance) practices, as empirical evidence confirms a positive link to profitability (ROA and GPM).
  - Prioritize robust cybersecurity governance, as cyber risk moderates ESG benefits, ensuring maximum financial returns only with effective cyber risk management.
  - Integrate sustainability and digital resilience into a unified strategy, avoiding siloed management of ESG and cybersecurity initiatives.
- **Recommendations for Regulatory Authorities**:
  - Develop unified policy frameworks combining ESG disclosure guidelines with cyber resilience standards to enhance security and sustainability governance.
  - Establish a single reporting system for ESG and cyber risk metrics to streamline compliance and support comprehensive risk assessments.
  - Incorporate ESG and cyber risk assessments as supplementary indicators of bank stability, recognizing their proven impact on profitability.
- **Benefits for the Egyptian Financial Ecosystem**:
  - Provides actionable insights for stakeholders, reinforcing the financial benefits of sustainability initiatives over cost concerns.
  - Promotes a cohesive approach to managing non-financial factors (ESG and cyber risk) to strengthen bank performance and operational resilience.

Investors together with market analysts need to evaluate long-term bank value creation by examining ESG performance while studying institutions' ability to manage cyber risks during their evaluations of Egyptian banking institutions. Financial analysis which omits ESG factors hinders the ability to detect vital variables that will impact future profits and risk protection needs. The evaluation process in investment decision-making frameworks needs to assess how banks integrate their cybersecurity activities into their ESG frameworks since these institutions show improved financial outcomes in markets based on sustainability and digitalization. There are multiple financial indicators investors need to use for sustainability investment assessment since the diverging profitability connections indicate investors should not base their decisions on one measure only.

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تأثير الحوكمة البيئية والاجتماعية وحوكمة الشركات على أداء البنوك: هل يمكن للمخاطر السيبرانية أن تكون مؤثرة؟

د. ياسين شريف نظمي السيد

ملخص البحث باللغة العربية

لفهم تأثير الممارسات البيئية والاجتماعية وحوكمة الشركات على ربحية البنوك، تحلل الدراسة المخاطر السيبرانية كعامل معتدل في الصناعة المصرفية المصرية. شمل التحليل فحص البيانات الكمية من 16 بنكًا مصريًا في الفترة من 2017 إلى 2023. حلل البحث التأثيرات المباشرة للحوكمة البيئية والاجتماعية وحوكمة الشركات على مقاييس الأداء الخاصة بالعائد على الأصول ومقاييس الأداء العام من خلال تحليل الانحدار واستخدم تحليل الاعتدال لفهم كيفية تأثير المخاطر السيبرانية على هذه العلاقة. تؤكد الدراسة أن تطبيقات الحوكمة البيئية والاجتماعية وحوكمة الشركات تؤثر إيجابًا على كل من العائد على الأصول (H1a) وهامش الربح الإجمالي (H1b) في ربحية البنوك، وبالتالي التحقق من صحة الفرضية الأساسية .(H1) أظهرت الدراسة أن المخاطر السيبرانية المصرفية تؤثر تأثيرًا سلبيًا على العلاقة بين مبادرات الحوكمة البيئية والاجتماعية وحوكمة الشركات وربحية البنوك .(H2) يؤثر الاعتدال السلبي للمخاطر السيبرانية على العلاقة بين مبادرات الحوكمة البيئية والاجتماعية والمؤسسية وحوكمة الشركات والأداء المالي للبنوك كما تم قياسه بالعائد على الأصول (H2a)والأرباح الرأسمالية .(H2b) تضيف البيانات المستمدة من سوق ناشئة معرفة جديدة حول العلاقات بين الحوكمة البيئية والاجتماعية والمؤسسية وحوكمة الشركات والربحية في القطاع المصرفي من خلال هذا البحث. وتصبح الرؤى البحثية الجديدة ممكنة لأن هذه الدراسة تقدم المخاطر السيبرانية كعامل معتدل في مبادرات الحوكمة البيئية والاجتماعية والمؤسسية والحوكمة تجاه الأداء المالي (العائد على الأصول أو إجمالي الأرباح والخسائر).

الكلمات الدالة: الحوكمة البيئية والاجتماعية وحوكمة الشركات؛ ربحية البنوك؛ المخاطر السيبرانية؛ العائد على الأصول؛ هامش الربح الإجمالي؛ القطاع المصرفي المصري؛ الاستدامة؛ الأداء المالي؛ تحليل الوساطة

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