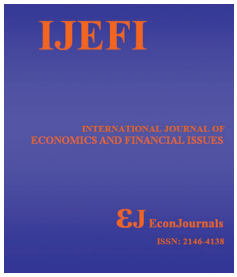

International Journal of Economics and Financial Issues

ISSN: 2146-4138

available at http: www.econjournals.com

International Journal of Economics and Financial Issues, 2025, 15(2), 309-326.

The Effects of ESG and Institutional Quality on Financial Stability: Evidence from GCC Banks

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Received: 10 November 2024 **Accepted:** 03 February 2025 **DOI:** https://doi.org/10.32479/ijefi.18152

ABSTRACT

The objective of this study is to explore the effect of Environmental, Social, and Governance (ESG) practices, and institutional quality on banks financial stability in the Gulf Cooperation Council (GCC) region for the period from 2010 to 2023. To achieve this, the study utilizes a Generalized Quantile Regression (GQR) on a sample of 33 GCC banks. The regression analysis assesses the influence of ESG measured by ESG score, and institutional quality, measured using an index of the average of six core aspects of governance "voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, and control of corruption" on banks financial stability. We measure financial stability using the Z-score and the Standard Deviation of Return on Assets (SDROA), we employ eight control variables in our analysis "Bank Size, Deposits, Solvency, Equity, Competition, ROE, Islamic banks, GDP, Inflation, and Oil Rents" Our findings reveal that ESG scores positively impact bank stability, while institutional quality has a negative effect. Our findings suggest key policy actions to regulators and policy maker to enhance bank stability.

Keywords: Banks, Environmental, Social, and Governance, Financial Stability, Institutional Quality, Standard Deviation of Return on Assets, Z-score
JEL Classifications: G21, Q56, G32, G38

1. INTRODUCTION

Banks are crucial to the functioning of the financial system, and their stability directly influences both the overall stability of the financial system and the broader development of the economy (Baum et al., 2021; Davies et al., 2010). Yen and Huy (2023) defined bank stability as *"The bank's effective operation and ability to respond well to internal and external influences, both now and in the future, especially the shocks of the economy, but still maintain the ability to pay for due debts, maintain normal operations."* Sustainability performance has been extensively studied and discussed in various ways, but there is a lack of a specific definition for this term. According to Büyüközkan and Karabulut (2018), sustainability performance refers to the measurement of an organization's overall performance, considering indicators such as policies, decisions, and actions that generate economic, social, and environmental outcomes. The United Nations' Sustainable Development Goals emphasize the importance of both private and public sectors' active participation, in addition to the existing pressures from Non-Governmental Organizations (NGOs) and shareholders (UN, 2015). Evaluating sustainability performance involves considering factors such as a company's sustainability practices, social concerns, ethical behavior, stakeholder management, and environmental issues. Specialized institutions have developed indices to provide information on the extent of firms' sustainability performance (Statman, 2006).

Corporate Sustainability has garnered significant attention (Shad et al., 2020), leading to a global expansion of research on sustainability evaluation and preservation (Islam et al., 2019).

Over the past decade, scholars have recognized the significance of sustainability reporting in the corporate sector and international organizations, resulting in global initiatives addressing this diverse issue (Kuzey and Uyar, 2017). Changes in the form of new reporting requirements have been introduced through various laws, regulations, standards, guidelines, and codes. It has become common practice for companies to disclose such information, both mandatory and voluntary (Frias-Aceituno et al., 2013). In the age of sustainable development, stakeholders demand that institutions increase awareness of their corporate responsibilities, including addressing global warming and human rights issues (Alam et al., 2019; Agnolucci and Arvanitopoulos, 2019; Shahbaz et al., 2020). The concept of Corporate Sustainability encompasses three key aspects—economic, social, and environmental—and aims to achieve perfection by integrating them (Zaid et al., 2020). These three aspects, also known as the Triple Bottom Line (TBL), require sustainable firms to address their operations transparently across all pillars of sustainability (Elkington, 1997). In the current dynamic world, Corporate Social Responsibility (CSR) has emerged as a field of study with fresh perspectives for companies to promote sustainable development (Lopez, 2020). Environmental, Social, and Governance (ESG) is a framework designed to evaluate the sustainability and societal impact of business activities across three key dimensions: Environmental, social, and corporate governance (Au et al., 2023). ESG concerns have moved beyond just ethical considerations and are now regarded as crucial to the economic landscape, influencing the overall stability of the economy (Menicucci and Paolucci, 2023).

Political science and economic studies indicate a positive correlation between institutional quality and economic development (Uddin et al., 2020). Institutional quality refers to the attributes and performance of institutions in achieving their objectives and responsibilities. It is typically assessed through various indicators that capture aspects of the social, economic, and political environment. Commonly used indicators include Rule of Law, Government Effectiveness, Regulatory Quality, Control of Corruption, Voice and Accountability, and Political Stability (Khan et al., 2022; Khan et al., 2023; Esquinas and Soriano, 2023; Kırşanlı, 2023; Barra and Falcone, 2024). Strong and efficient regulatory governance and oversight increases the competence of the financial system, this leads to enhanced stability of the financial sector subsequently (Sikarwar and Sharma, 2020). According to Dias (2021), the regulatory reforms are anticipated to reduce the risk taking of banks, restrain their likelihood of failure, and increase the trustworthiness of the financial system. Pham et al. (2020) argued that effective governance plays a major role in risk reduction, achieving capital adequacy, and enhancing overall performance. The Gulf Cooperation Council (GCC), established in 1981, is a regional political and economic union comprising six member states: Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates (UAE) (Low and Salazar, 2011; Legrenzi, 2011). The GCC has achieved notable progress in economic integration, including the formation of a Customs Union and a Common Market, with ambitions for a Monetary Union (Low and Salazar, 2011). The region's substantial oil and gas reserves are central to its economic strategies and play a significant role in global energy markets (Low and Salazar, 2011; Mohite, 2014).

By reviewing literature, we noticed a scarcity in the research exploring the direct effect of ESG performance and institutional quality on the financial stability of GCC banks. A study by Athari (2024) explored the association between ESG scores and bank financial stability. However, our paper contains a greater number of control variables to examine this relationship, it employs a different measure of bank financial stability as dependent variable which is the standard deviation of Return On Assets (SDROA), we employ a different methodology which is the Generalized Quantile Regression (GQR), and our results are different from those of Athari (2024). This paper aims to achieve two objectives: first, to explore the relationship between Environmental, Social, and Governance (ESG) practices and the financial stability of GCC banks; and second, to examine the relationship between institutional quality and the financial stability of banks in the GCC region. To this end and to cover the gap in literature, we raise our research question:

What is the effect of ESG and institutional quality on the financial stability of GCC banks?

Studying the effect of ESG and institutional quality on banks financial stability is both important and timely, the integration of ESG practices and the enhancement of institutional quality are pivotal for the financial sector's stability and performance. Current research underscores the positive correlation between these factors and financial outcomes (Whelan et al., 2022; Pinheiro et al., 2023; Handoyo and Anas, 2024). The significance of the GCC region stems from its inclusion of some of the world's fastest-growing economies, driven by strategic investments across diverse sectors, including finance (Hanieh, 2018). Additionally, GCC states hold a vital position on the global stage, contributing actively to the reform of international financial systems (Alharthi, 2019). Therefore, this thesis provides a valuable contribution to the banking literature by addressing the crucial issue of bank stability, a cornerstone of economic stability, within the rapidly expanding economies of the GCC region.

This paper makes significant and valuable contributions to the existing body of literature. Its originality lies in examining the impact of two contemporary factors, "ESG and institutional quality," on a critical determinant of economic growth and stability: bank financial stability. A stable banking sector is fundamental to the seamless functioning of other economic sectors, offering vital support to businesses, households, and investors (Korneev et al., 2023). Conversely, instability in the banking sector can lead to economic downturns and crises (Vovchenko, 2021). Thus, identifying the factors that undermine bank stability is of utmost importance.

2. LITERATURE REVIEW

2.1. ESG

Research suggests that higher ESG scores, both overall and in specific sub-pillars, are linked to lower bank fragility during periods of financial distress (Chiaramonte et al., 2022; Gupta and Kashiramka, 2024). Moreover, strong ESG performance has been shown to significantly lower the ratio of non-performing loans,

thereby increasing financial stability (Tóth et al., 2021). Banks with high ESG disclosure levels have been found to exhibit higher financial stability, with ESG disclosures positively influencing the stabilizing effect of liquidity creation (Gupta and Kashiramka, 2024). Additionally, during the COVID-19 pandemic, banks with robust environmental and social activities showed increased financial stability, highlighting the positive effect of ESG efforts during challenging periods (Li et al., 2023). Higher ESG scores have been associated with lower operational risk in the banking sector, emphasizing the importance of risk management strategies and bank policies that align with ESG principles (Galletta et al., 2023). Moreover, ESG activities have been linked to a decrease in a firm's debt structure, resulting in more optimal leverage ratios and reduced information asymmetry (Asimakopoulos et al., 2023). The European Union has addressed the link between ESG and the banking sector by proposing sustainable banking regulations, which include changes to capital requirements and improvements in disclosure and risk management practices (de Sá, 2022). Improved ESG performance can help in mitigating liquidity risk in banks by lowering non-performing loans and enhancing overall financial performance (Liu and Xie, 2024). Higher ESG disclosure scores are associated with lower risks for commercial banks and improved accounting and market performance (Gangwani and Kashiramka, 2024). Although there is considerable evidence supporting the positive impact of ESG on bank stability, some studies have also pointed out potential trade-offs, such as a decrease in bank value despite reduced risk-taking behavior (Di Tommaso and Thornton, 2020). Also, it is crucial to recognize that not all aspects of ESG positively impact bank performance. For example, the environmental performance of banks in certain regions has been shown to negatively affect financial indicators (Dragomir et al., 2022).

Most GCC nations, with the exception of the UAE, score poorly on environmental aspects, highlighting major challenges such as high carbon and methane emissions, poor air quality, and limited clean water resources (Sadriwala et al., 2024; Sharma et al., 2022). In the GCC, ESG disclosure negatively impacts bank performance, aligning with the agency problem, where managers cut long-term ESG-related expenditures to enhance short-term profits (Al-Khouri and Basith, 2022). The relationship between combined sovereign ESG and banking sector stability in GCC economies is non-linear and follows an inverted U-shape, indicating that a balanced approach is necessary when investing to achieve sustainability goals (Athari, 2024). Aligned with stakeholder theory, Bouattour et al. (2024) investigate the impact of ESG performance on bank stability, revealing a positive relationship consistent with the theory. The study indicates that higher ESG scores enhance bank stability by addressing and aligning with stakeholder interests. Do et al. (2024) explore the effect of ESG implementation on bank stability in ASEAN countries through the lens of signaling and stakeholder theories. Their findings suggest that ESG practices strengthen bank sustainability by addressing stakeholder expectations and mitigating risks. Furthermore, consistent with stakeholder theory, Tóth et al. (2021) examine the relationship between ESG performance and financial stability in European banks. The study concludes that robust ESG performance, aligned with stakeholder interests, significantly lowers the ratio of non-performing loans, thereby improving financial stability. Menicucci and Paolucci (2023) examine the connection between ESG dimensions and bank performance, applying Agency Theory to explore the dynamics between management actions and shareholder interests. Their study provides empirical evidence on how ESG factors can impact financial outcomes in the banking sector. Aligning with the Efficient Market Hypothesis, Cao et al. (2019) examine the impact of the growing trend of ESG investing on stock market efficiency, with a focus on mispricing and the role of ESG-neutral arbitrageurs in correcting price inefficiencies. Their findings indicate that ESG preferences can affect market efficiency, which may, in turn, influence financial stability. Moreover, Ji et al. (2023) investigate the efficiency of Chinese banks by integrating ESG-related indicators into a two-stage slacks-based measure (SBM) within the exogenous variable DEA model. The study reveals that incorporating ESG factors can influence bank efficiency, potentially impacting their stability.

Based on the above, our first hypothesis was developed:

Hypothesis 1: There's a positive association between ESG score and financial stability of banks in GCC.

2.2. Institutional Quality

Institutional quality plays a critical role in a country's economy. Countries with weak legal systems and poor governance or institutional frameworks may experience weaker banks due to issues like corruption, inadequate law enforcement, and ineffective regulation (Porta et al., 1998; Levine, 1998). The rule of law in addition to the absence of corruption promotes both stability and accountability in the financial sector. A higher institutional quality within the financial system results in more effective financial liberalization (Chinn and Ito, 2006). Anginer et al. (2014) stated that countries with strong institutional quality can promote effective supervision. Demirgüç-Kunt and Detragiache (1998) found that financial fragility is positively associated with weaker institutions, particularly in areas concerning the rule of law, corruption levels, and contract enforcement. Ashraf (2017) found that political institutions, as a component of institutional quality, significantly influence bank risk-taking. Klomp and de Haan (2014) highlighted the importance of institutional quality during financial crises. Countries with high institutional quality are better equipped to formulate policies that address adverse shocks more effectively than those with lower institutional quality.

Chen et al. (2015) found a positive relationship between bank risk-taking behavior and corruption. Their study shows that the higher the level of corruption in a country, the greater the risk banks tend to take. Park (2012) found that non-performing loans tend to be higher in countries with elevated levels of corruption. A higher level of corruption undermines banks' lending and investment decisions, ultimately destabilizing the entire banking sector (Barry et al., 2016; Toader et al., 2018). Factors such as corruption, property rights, and political stability affect a country's financial development (Uddin et al., 2017). Voghouei et al. (2011) stated that institutional quality and political stability drive the growth of the financial sector. High institutional quality, encompassing factors such as governance, rule of law, and corruption control,

typically enhances bank stability. Numerous studies support this, indicating that improved institutional environments lower transaction costs and mitigate asymmetric information, resulting in more stable banking systems (Muizzuddin et al., 2021; Yen and Huy, 2023; Bektas et al., 2022; Tran et al., 2023; Nguyen, 2023; Sain and Kashiramka, 2023; Hoang et al., 2024; Ofoeda et al., 2024). The advantages of institutional quality for bank stability become more pronounced when it exceeds specific thresholds. Countries with higher levels of institutional quality experience greater enhancements in bank stability (Hou and Wang, 2016; Ha and Nguyen, 2023). On the other hand, some studies revealed negative impact of institutional quality or some of its components on financial stability, Ha and Nguyen (2023) state that while factors such as corruption control, political stability, and government efficiency positively contribute to bank stability, regulatory quality has a negative effect. This suggests that certain regulatory frameworks may inadvertently destabilize banks.

Bermpei et al. (2018) suggest that strong creditor rights and rule of law—key elements of institutional quality—can weaken the beneficial impacts of private monitoring and capital regulation on bank stability. This implies that overly stringent institutional frameworks may obstruct effective bank regulation. Nguyen (2023) states that high institutional quality can diminish the positive effects of market concentration on bank stability, indicating a complex relationship in which institutional quality may sometimes counterbalance other stabilizing factors. Canh et al. (2021) found that higher institutional quality reduces banking system risk, though this effect is less pronounced in well-capitalized and highly profitable banking systems. This suggests that the advantages of strong institutional quality may not be evenly distributed across different banking environments. Fazio et al. (2018) reported that in countries with low institutional quality, inflation targeting is negatively associated with bank stability, emphasizing that weak institutional frameworks can amplify the destabilizing effects of certain monetary policies. Uddin et al. (2020) found that voice and accountability which is a component of institutional quality has a negative effect on risk-taking in banks. In the GCC, the relationship between corruption and economic growth in the GCC has yielded mixed findings, with some studies highlighting a negative correlation (Al-Naser and Hamdan, 2021; Mujalli et al., 2024). Al-Naser and Hamdan (2021) observed that while control of corruption and rule of law have a positive but statistically insignificant impact on economic growth in the GCC, government effectiveness and regulatory quality exhibit a positive and statistically significant effect. In contrast, Mujalli et al. (2024) found that institutional quality negatively influences GDP. Aligned with the concentration-stability theory, Nguyen (2023) examines the impact of market concentration and institutional quality on bank stability in developing countries. The study suggests that robust institutional frameworks can alleviate the negative effects of market concentration on bank stability.

Given the above mixed findings, our second hypothesis was developed:

Hypothesis 2: There's a positive association between institutional quality and financial stability of banks in GCC.

3. DATA AND METHODOLOGY

The sample for this study includes 33 banks from the six GCC countries: Saudi Arabia, the United Arab Emirates, Kuwait, Qatar, Bahrain, and Oman. These banks were selected based on the availability of relevant data. In the beginning, 227 banks, which is the total number of banks in GCC, were selected. After excluding savings banks, investment banks, finance companies, and banks with no relevant data, the sample ended with 33 banks including 12 Islamic banks and 21 conventional banks, with a total of 272 observations. The period from 2010 to 2023 is pivotal for studying bank stability in the GCC as it captures the aftermath of the 2008 global financial crisis and the subsequent recovery phase. During this time, GCC banks experienced significant regulatory reforms, economic diversification efforts, and varying oil price fluctuations, all of which tested their resilience. This period also includes major regional and global events, such as the Arab Spring and the COVID-19 pandemic, which further influenced the stability of financial institutions. Analyzing this timeframe provides critical insights into how GCC banks adapted to external shocks and structural changes, shaping their long-term stability.

To analyze the relationship between financial stability and credit growth rates, the study employs generalized quantile regression (GQR) as the primary estimation method. This approach enhances the accuracy and reliability of the analysis, as quantile regression is robust to outliers and non-normal distributions, making it a preferred method in financial and econometric research (Koenker and Bassett, 1978). The choice of GQR was driven by several key factors: First, its capacity to model quantiles of the dependent variable, offering a comprehensive view of the entire distribution rather than just focusing on the mean (Koenker and Hallock, 2001). Second, its robustness to outliers in the dependent variable, as it minimizes an asymmetric loss function, making it particularly useful for datasets with heavy-tailed or skewed distributions (Hao and Naiman, 2007). Third, its flexibility in handling non-normal errors, since many traditional regression methods assume normality, which may not be realistic for real-world data—GQR, in contrast, doesn't rely on such assumptions (Chernozhukov and Hansen, 2005). Fourth, its value in policy and decision-making, as it provides deeper insights into inequalities and distributional effects by examining predictors across various quantiles, which is essential for policy formulation (Machado and Silva, 2005). Lastly, GQR enhances interpretability by estimating effects at different quantiles, often resulting in more realistic and meaningful models, especially when the mean response does not adequately represent the data such as in skewed or multi-modal distributions (Machado and Silva, 2005).

3.1. Measures of Financial Stability

We use two distinct risk-exposure indicators as proxies to measure bank stability in relation to our dependent variable: The Z-score and Standard Deviation of Return On Assets (SDROA).

3.1.1. Z-score

In the literature, the Z-score is the most commonly used proxy to assess banks' financial stability, as it represents the inverse likelihood of a bank's insolvency (Laeven and Levine, 2009; Bai

and Elyasiani, 2013; Berger et al., 2014; Fu et al., 2014; Fernández et al., 2016; Almamy et al., 2016; Albaity et al., 2019). The Z-score is calculated using asset returns, their volatility, and the leverage ratio, as shown below:

$$Z - score = \frac{ROA_{it} + E_{it}/TA_{it}}{SDAROA_{it}}$$

Where ROA_{it} and $SDAROA_{it}$ denotes the return on assets ratio and its standard deviation, (E_{it}/TA_{it}) represents the equity-to-total assets ratio. the Z-score reflects the number of standard deviations by which a bank's returns would have to fall below the mean before its equity is exhausted (Boyd and Runkle, 1993; Beck et al., 2013; Kabir and Worthington, 2017). A higher Z-score indicates reduced bank risk, signaling greater financial stability.

3.1.2. Standard deviation of return on assets (SDROA)

Following Saif-Alyousfi et al. (2020) and Dalwai and Singh (2022), this paper evaluates bank risk-taking and stability using the Standard Deviation of Return on Assets (SDROA). Soedarmono et al. (2013) utilized SDROA as a measure of bank risk-taking as well.

3.1.3. Measures of ESG

In this paper we examine the impact of ESG performances on the bank financial stability among GCC banks using the ESG score. ESG score has been widely used by literature (Alsayegh et al., 2020; Di Tommaso and Thornton, 2020; Thomas et al., 2021; Alazzani et al., 2021; Gracia and Siregar, 2021; Izcan and Bektas, 2022; Chiaramonte et al., 2022; Dragomir et al., 2022; Sharma et al., 2022; Anand et al., 2023; Rupamanjari and Sandeep, 2023; Galletta et al., 2023; Li et al., 2023; Liu and Xie, 2024; Dwibedi et al., 2024; Gupta and Kashiramka, 2024; Mallek et al., 2024) According to Bloomberg's proprietary calculation, the ESG score (ranging from 0 to 100) was derived from 120 quantitative and qualitative indicators across environmental, social, and governance dimensions (Wong et al., 2021).

3.1.4. Measures of institutional quality

The World Bank's Worldwide Governance Indicators (WGI) are used to assess a country's institutional quality. WGI compiles perspectives on governance from a wide range of enterprises, citizens, and experts. It captures six core aspects of governance, these aspects are: voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, and control of corruption. The WGI aggregates data from 30 different sources and is updated annually (World Bank, 2024). Voice and accountability capture the extent to which citizens can choose their government, express opinions, enjoy freedom of association, and access free media. Political stability and absence of violence assess the likelihood of a stable government and the absence of violence or terrorism within a country. Government effectiveness measures the public services quality, the formulation and implementation of policies, in addition how free these processes are from political influence. Regulatory quality reflects a government's ability to develop and enforce sound regulatory policies to promote private sector development. The rule of law measures confidence in legal institutions and the extent to which individuals comply with laws, including contract enforcement, property rights, crime levels, and the effectiveness of law enforcement. Lastly, control of corruption gauges the extent of corruption in a country. Each of these institutional quality indicators ranges from approximately −2.5 (weak) to 2.5 (strong) governance performance (World Bank, 2024). Similar to previous research by Herrera-Echeverri et al. (2014) and Yen and Huy (2023), this study employs the average index from the six listed indexes to mitigate dependency on common factors. The use of mean values aligns with methodologies in numerous prior studies, including those by McMullen et al. (2008) and Wennekers et al. (2005).

3.1.5. Control variables

3.1.5.1. Bank size

This paper includes bank size as a control variable. Following Berger et al. (2005), we measure size using the logarithm of total assets. Some studies suggest that larger banks tend to take less risk, as evidenced by a negative relationship between bank size and non-performing loan growth in European banks, attributed to enhanced organizational efficiency under supranational supervision (Farnè and Vouldis, 2021). Conversely, other research indicates that larger banks may engage in more risk-taking, particularly through increased leverage, as seen in financial institutions from 2002 to 2012. This risk-taking behavior is more pronounced in investment banks compared to commercial banks (Bhagat et al., 2015). According to Adusei (2015), larger banks in the rural banking industry in Ghana show increased stability, suggesting that size contributes positively to bank stability. Similarly, in the banking sector of Pakistan, larger banks exhibit greater stability when measured through risk-adjusted metrics (Ali and Puah, 2018). However, larger banks can also contribute to systemic risk, as they are more exposed to such risks compared to smaller banks (Mazumder and Piccotti, 2023). Additionally, larger banks in major Asian countries tend to have lower capital adequacy and liquidity ratios, which can undermine stability (Kim et al., 2016). In GCC, Altaee et al. (2013) found no statistically significant relationship between bank size and financial stability in the GCC banks.

3.1.5.2. Deposits

Consistent with Albaity et al. (2022) and Bertay et al. (2015), this study employs the ratio of lagged bank deposits to total liabilities as a control variable. Al Shimmery (2019) found a positive association between bank deposits and banks financial stability as an increase in deposits contributes to greater financial stability in the Iraqi banking sector. Similarly, Kusi et al. (2022) stated that the number of branches in the bank increase the positive impact of deposits on stability of that bank, indicating that deposits play a crucial role in maintaining stability, the study suggest that beyond a certain number of branches, the positive impact of deposits on stability diminishes, suggesting a threshold effect. The mix of deposit and non-deposit funding also affects stability. Hou and Wang (2016) suggested that the proportion of deposits taken by non-state-owned banks in China positively impacts stability, highlighting the role of institutional quality in moderating the effects of deposits on stability. The design of deposit insurance

schemes (DIS) can influence bank stability. More protective DIS can prevent panic among depositors and restore stability during crises, although high levels of coverage may decrease stability due to moral hazard (Chiaramonte et al., 2020). However, Dietrich and Wanzenried (2011) found that annual deposit growth did not have a significant effect on the profitability of banks in Switzerland. In contrast, Nafula (2003) suggests that customer deposits negatively impact bank earnings due to the opportunity cost involved.

3.1.5.3. Solvency

Solvency is a critical determinant of bank stability, influenced by funding costs, liquidity and credit risks, market concentration, regulatory capital, and profitability. Solvency reflects a company's financial health and stability over both the short and long term (Yenni et al., 2021) and is closely tied to the financial strength and stability of financial institutions (Dauda and Hamid, 2016). This study assesses bank solvency by examining the total liabilities-to-total assets ratio for each bank-year in the sample. Effective management of these factors is essential for maintaining bank stability. Arnould et al. (2022) found a significant negative relationship between bank solvency and funding costs, such as senior bond yields and deposit rates. This relationship is non-linear and convex, indicating that beyond a certain solvency threshold, the effect on funding costs can change. Liquidity and credit risks are crucial in determining a bank's solvency and stability. Poor liquidity and high non-performing loans (NPLs) can reduce a bank's ability to act as a financial intermediary, thereby affecting its solvency (Oino, 2021; Bandyopadhyay and Saxena, 2023). Increased regulatory capital requirements positively influence bank solvency, ensuring that banks remain solvent and capable of absorbing shocks during economic downturns (Pakhchanyan et al., 2018; Oino, 2021). Bank profitability, particularly the net interest margin, is directly related to solvency. A profitable bank can maintain solvency even with lower equity capital, highlighting the importance of profitability in banking operations (Marinković, 2009). Factors such as credit concentration can moderate the relationship between liquidity creation and solvency risk, as seen in the comparative analysis of Islamic and conventional banks (Akram and Hushmat, 2024).

3.1.5.4. Equity

Equity plays a crucial role in enhancing bank stability by providing a buffer against losses, reducing risk-taking incentives, and improving market performance through better monitoring and investment decisions. This study incorporates the equity growth adjusted by the GDP deflator (EQ) as a control variable, consistent with its use in Bertay et al. (2015), Albaity et al. (2022), and Mallek et al. (2024). Regulatory frameworks that increase capital requirements further support this stability by ensuring banks have sufficient equity to absorb potential losses. Toader (2015) suggested that increasing core capital (equity) requirements, as mandated by regulatory frameworks like Basel III, enhances bank stability by improving loss-absorbing capacity and reducing average funding costs. This is because equity is more expensive than debt but provides a stronger buffer against losses. Higher bank capital reduces the incentives for risk shifting, thereby enhancing stability. This is because increased capital buffers mitigate the risks associated with bankruptcy and financial distress (Peleg-Lazar and Raviv, 2017). According to Limpaphayom and Polwitoon (2004), bank equity ownership positively affects market performance, suggesting that equity-based relationships can enhance stability through better monitoring and investment decisions. Islamic banks with equity financing structures tend to be more stable compared to those without such structures. This stability is particularly evident during financial crises, where banks with medium levels of equity financing exhibit the highest stability (Othman et al., 2023).

3.1.5.5. Competition

The competition-stability hypothesis posits that increased competition leads to greater stability by reducing the risk-taking behavior of banks. This is supported by findings in rural banks and Vietnamese banks, where heightened competition correlates positively with stability (Yudiaatmaja et al., 2022; Thanh Le et al., 2024). Conversely, the competition-fragility hypothesis suggests that increased competition can lead to higher risk-taking and reduced stability, as seen in European and East Asian banks (Phan et al., 2019; López-Penabad et al., 2021; Ferreira, 2023). Several studies indicate a non-linear (U-shaped) correlation between competition and bank stability. For instance, in GCC and The Middle East and North Africa (MENA) regions, increased competition initially reduces stability but beyond a certain point, it enhances stability (González et al., 2017; Albaity et al., 2021). This suggests that moderate competition is optimal for stability (Zhanbolatova et al., 2018; Cuestas et al., 2020). The impact of competition on stability also depends on bank-specific factors. For example, mutual savings banks with higher business risk benefit from increased competition, while commercial banks may experience a trade-off between interest effects and risk-shifting (Jeon and Lim, 2013). Additionally, Islamic banks exhibit less stability compared to conventional banks under competitive conditions (Albaity et al., 2021; Ernaningsih et al., 2023). The stability effects of competition are influenced by the overall stability of the banking system in a country. In less stable banking systems, increased competition tends to increase risk-taking, whereas in more stable systems, competition has a neutral or stabilizing effect (López-Penabad et al., 2021). Effective regulation and supervision are crucial to balance competition and stability. Policymakers should aim for moderate competition and implement measures to limit excessive risk-taking, especially in less stable banking environments (Ghazouani and Basty, 2023). According to Risfandy et al. (2020), institutional quality has a significant effect on bank stability as it influences the association between competition and banks financial stability. This study uses the concentration ratio (CON) as a measure of competition. Concentration is a key factor that can significantly influence bank stability in the banking sector and is widely employed in the structural approach (Yuanita, 2019). The concentration ratio ranges from 0 to 100, with higher values typically indicating lower competition and lower values reflecting higher competition (Hsieh et al., 2019).

3.1.5.6. ROE

Effective asset quality management, including higher provisioning for impaired assets, is linked to improved bank stability and resilience. Banks that actively manage their asset quality tend to exhibit better financial performance, which in turn supports

stability (Sayani et al., 2017; Barakat et al., 2024). There is a significant positive relationship between ROE and asset quality, indicating that riskier assets can return higher profitability. However, the relationship between ROE and capital adequacy ratio (CAR) is insignificant, suggesting that while asset quality impacts ROE, capital adequacy does not directly influence it (Sayani et al., 2017). Higher capital ratios (CPTL) are associated with decreased profitability (ROE), which could imply a trade-off between maintaining high capital buffers and achieving higher returns on equity (Elmahgop, 2024). Different business models in banking can affect both ROE and stability. For instance, profit-sharing banks tend to be more stable and have higher ROA, while customer banks maintain higher ROE but are less stable (Nadhilah and Sudrajad, 2022). Following Berger et al. (2014), Acero and Alcalde (2020), and De Moraes and Costa (2022), this study includes return on equity (ROE) as a control variable. ROE is calculated by dividing net income by shareholders' equity and represents the rate of return earned on shareholders' equity.

3.1.5.7. Islamic versus conventional banks

Islamic banks tend to hold more cash reserves compared to conventional banks, which helps cushion the effects of liquidity squeezes during financial shocks, this contributes to their stability (Tekdogan and Atasoy, 2021). Studies using z-scores indicate that Islamic banks generally exhibit higher financial stability compared to conventional banks. For instance, Islamic banks in Turkey and Malaysia have shown higher stability metrics (Elbadri and Bektaş, 2017; Sulaiman@ Mohamad et al., 2018; Nosheen and Rashid, 2021). However, some studies state that large Islamic banks show less stability than large conventional banks, but when it comes to small banks then small Islamic banks exhibit higher stability than their conventional counterparts (Wahid and Dar, 2016; Elbadri and Bektaş, 2017; Alaeddin et al., 2019). The presence of Islamic banks in a dual banking system (where both Islamic and conventional banks coexist) has been found to enhance overall financial stability, even during financial crises (Tekdogan and Atasoy, 2021; Nosheen and Rashid, 2021; Hassan et al., 2021). Some studies found that Islamic banks are less stable due to lower competitiveness (Salma and Younes, 2014). Islamic banks are less sensitive to domestic interest rates and exhibit different responses to macroeconomic variables like inflation compared to conventional banks (Abedifar et al., 2013; Nugroho et al., 2020). The Islamic banking sector in the GCC constitutes a significant portion of the global Islamic banking industry. In 2016, it accounted for 34% of the total assets in the GCC banking sector, with an annual growth rate of 17.34% from 2007 to 2016 (Gazdar et al., 2019).

3.1.5.8. GDP growth rate

To account for the influence of country-level economic factors on banks' financial stability, we include GDP as a control variable. GDP growth represents the rate of real Gross Domestic Product (GDP) expansion. Several studies indicate that higher GDP growth rates contribute positively to bank stability. For instance, in Ethiopia, GDP growth was found to enhance bank financial stability significantly (Yitayaw et al., 2023). Similarly, in Vietnam, GDP growth positively impacted bank stability during the 2008-2019 period (Chi and Nguyen, 2021). A study on OECD countries also found a positive link between banking sector stability and real output growth, particularly during periods of instability (Jokipii and Monnin, 2013). Conversely, low GDP growth rates are associated with increased risks of banking crises. For example, a study covering developing countries found that low GDP growth was a major determinant of banking crises (Zarrouk and Ayachi, 2009). Additionally, in the Organization for Economic Co-operation and Development countries (OECD), low GDP growth rates were linked to banking crises (Pereira Pedro et al., 2018). In China, while GDP growth generally supports bank stability, significant GDP growth shocks can have a profound negative effect, indicating potential losses for the banking system (Jiang et al., 2018). The relationship between GDP growth and bank stability can also be influenced by other factors such as inflation, exchange rates, and institutional quality (Apau et al., 2023; Yen and Huy, 2023).

3.1.5.9. Inflation

High inflation rates can harm bank financial stability by increasing credit risk and deteriorating overall financial health. This is particularly evident in the MENA region, where high inflation negatively impacts banks unless mitigated by factors like better capitalization, higher liquidity, and political stability (Awdeh et al., 2024). Effective inflation targeting, combined with strong banking supervision, can enhance banking stability. Price stability and accountability, along with robust supervision, contribute positively to the resilience of systematically important banks (Tabak et al., 2016). While stabilizing inflation and output generally supports financial stability, additional stabilization of asset prices and credit growth can have mixed effects. For instance, while it may reduce asset price volatility, it can also lead to higher interest rate volatility, which can undermine financial stability (Akram and Eitrheim, 2008). There is evidence suggesting that the relationship between inflation and economic growth is non-linear, with high inflation rates being detrimental to growth and stability. This implies that maintaining inflation below a certain threshold is crucial for economic and financial stability (Seleteng et al., 2013). The quality of institutions plays a significant role in how inflation targeting affects financial stability. In countries with poor institutional quality, inflation targeting alone may not suffice to ensure financial stability without the support of macroprudential policies (Owoundi et al., 2021).

3.1.5.10. Oil rents

Oil rents are defined as the difference between the value of crude oil production at regional prices and the total production costs (World Bank). Annual oil rents (Oil) were used as an indicator of an economy's reliance on the oil sector, with the oil rent variable representing the net contribution of oil revenues to the country's GDP. In the MENA region, both conventional and Islamic banks' stability is influenced by oil price fluctuations. Positive oil price shocks tend to enhance banking stability, while negative shocks have the opposite effect. Conventional banks exhibit slightly better stability compared to Islamic banks in this context (Mohammad and Aliyu, 2023). In oil-dependent emerging markets, geopolitical risks negatively impact banking sector profitability. However, oil rents can moderate this negative impact, suggesting that oil rents

provide a buffer against geopolitical risks (Alsagr and Hemmen, 2020). Albulescu (2022) found that in Russia, an oil-dependent country, increases in oil prices positively affect the stability of public banks in the long run. Conversely, negative oil price shocks destabilize banks, although no significant short-term effects are observed. Haque (2020) found that oil rents do not negatively impact long-term economic growth, indicating resilience to oil price fluctuations in Saudi Arabia. This resilience can indirectly support banking stability by maintaining economic growth. Lee et al. (2015) suggested that oil production is positively related to bank deposits, suggesting that higher oil rents can enhance financial stability through increased deposits. Katırcıoglu et al. (2020) found that oil price changes affect banking sector profitability indirectly through inflation. Higher oil prices lead to increased inflation, which in turn reduces bank profitability in Turkish banks. Al-Wesabi et al. (2020) found a positive relationship between fluctuations in oil prices and the stability of banks in the GCC.

Table 1: Descriptive statistics

Variable	Mean	Std. Dev.
Zscorew	18.484	33.446
STDVROA	0.217	0.243
ESGw	26.939	11.784
QOGA	0.161	0.48
Sizew	17.094	0.967
lLDw	0.806	0.087
SOLw	0.875	0.031
EQw	0.001	0.001
Conw	87.601	10.057
ROEw	10.191	6.012
GDPw	3.147	4.095
INFw	1.964	1.913
ORw	19.69	16.664

3.2. The Predictive Model

Our first regression model examines the impact of ESG on the financial stability measured by Z-score, and it is mathematically expressed as the below:

$$Z-score_{ijt} = a_0 + a_1 Z-score_{ijt-1} + \beta_1 ESG_{ijt} + \beta_2 Size_{ijt} + \beta_3 ILD_{ijt} + \beta_4 SOL_{ijt} + \beta_5 EQ_{ijt} + \beta_6 CON_{ijt} + \beta_7 ROE_{ijt} + \beta_8 IS_{COV\,ijt} + \beta_9 GDP_{it} + \beta_{10} INF_{it} + \beta_{11} OR_{it} + \gamma_{k+1} d_k + \gamma_T d_T + \varepsilon_{it}$$

where $Z\text{-}score_{i,t}$ is bank stability measure for bank i during year t. $ESG_{i,t}$ represents the main independent variable of ESG scores. Variables $Size_{i,t}$, $ILD_{i,t}$, $SOL_{i,t}$, $EQ_{i,t}$, $CON_{i,t}$, $ROE_{i,t}$ represent the bank specific variables. $IS_{COV\,i,t}$ is a dummy variable that equals 1 for an Islamic bank and zero otherwise (Conventional). $GDP_{i,t}$, $INF_{i,t}$, $OR_{i,t}$ represent the macro variables. $\varepsilon_{i,t}$ express the idiosyncratic component of the error term, respectively.

Table 2: Regression results for the effect of ESG scores on bank stability measured by Z-score

Variables	(10th)	(20th)	(30th)	(40th)	(50th)	(60th)	(70th)	(80th)	(90th)	(95th)
	Zscorew	Zscorew	Zscorew	Zscorew	Zscorew	Zscorew	Zscorew	Zscorew	Zscorew	Zscorew
lZscorew	0.142***	0.173***	0.212***	0.272***	0.317***	0.384***	0.398***	0.619***	0.836***	1.855***
	(0.003)	(0.0015)	(0.002)	(0.005)	(0.007)	(0.003)	(0.004)	(0.004)	(0.013)	(0.069)
ESGw	0.016***	−0.006	0.001	−0.060***	−0.053***	0.054***	0.076***	0.229***	0.093***	0.769***
	(0.002)	(0.007)	(0.007)	(0.011)	(0.019)	(0.012)	(0.009)	(0.005)	(0.014)	(0.157)
Sizew	−0.047	−0.62***	−0.199***	−0.250*	−0.086	−0.460***	0.238	1.242***	−0.890***	5.714***
	(0.108)	(0.059)	(0.072)	(0.152)	(0.147)	(0.108)	(0.169)	(0.044)	(0.118)	(0.556)
lLDw	−4.012***	−3.917***	−3.736***	−11.335***	−6.436***	−3.897***	0.219	−2.225**	−15.4***	−7.453
	(0.462)	(1.022)	(0.878)	(1.375)	(1.428)	(0.831)	(1.185)	(0.938)	(2.808)	(12.597)
SOLw	−0.4856***	−0.459***	−0.461***	−0.315***	−0.181***	−0.157***	0.152**	0.141***	1.379***	0.026
	(0.023)	(0.029)	(0.027)	(0.084)	(0.068)	(0.053)	(0.076)	(0.024)	(0.084)	(0.365)
EQw	4.842***	7.232***	9.956***	15.279***	18.56***	13.808***	32.55***	−28.091***	1.102	3.662
	(1.23)	(0.421)	(1.02)	(2.077)	(3.382)	(2.487)	(2.693)	(0.424)	(2.628)	(8.857)
Conw	0.119***	0.118***	0.123***	0.015	0.095***	0.177***	0.223***	0.157***	0.19***	−0.93***
	(0.012)	(0.012)	(0.014)	(0.036)	(0.016)	(0.015)	(0.02)	(0.008)	(0.029)	(0.203)
ROEw	0.385***	0.373***	0.279***	0.271***	0.202***	0.226***	0.13***	−0.012	0.377***	−0.319*
	(0.011)	(0.013)	(0.007)	(0.024)	(0.036)	(0.03)	(0.021)	(0.012)	(0.03)	(0.186)
Dummy_	0.354*	−0.492***	0.284*	0.9***	0.95***	1.28***	2.28***	8.436***	7.181***	−0.13
Islamic	(0.214)	(0.13)	(0.158)	(0.256)	(0.349)	(0.183)	(0.173)	(0.078)	(0.295)	(4.047)
GDPw	−0.017	0.1***	0.164***	0.338***	0.343***	0.414***	0.613***	0.902***	0.898***	2.176***
	(0.033)	(0.019)	(0.023)	(0.042)	(0.017)	(0.036)	(0.032)	(0.0143)	(0.052)	(0.195)
INFw	0.221***	0.042	−0.102***	0.037	−0.093	0.03	−0.123*	−0.052**	0.42***	−1.118***
	(0.017)	(0.037)	(0.023)	(0.056)	(0.067)	(0.032)	(0.067)	(0.023)	(0.079)	(0.368)
ORw	−0.045***	−0.02**	−0.005	0.051***	0.064***	0.052***	−0.058***	−0.227***	−0.304***	0.259***
	(0.003)	(0.003)	(0.008)	(0.014)	(0.011)	(0.016)	(0.015)	(0.004)	(0.018)	(0.056)
Year	−0.305***	−0.326***	−0.616***	−0.242***	−0.634***	−0.95***	−1.453***	−2.197***	−3.092***	−2.025***
	(0.013)	(0.022)	(0.042)	(0.074)	(0.086)	(0.134)	(0.05)	(0.0157)	(0.1)	(0.41)
NO	0.049***	0.035***	−0.006	−0.066**	−0.053***	−0.01	−0.11***	−0.414***	−0.071***	−0.875***
	(0.012)	(0.007)	(0.008)	(0.03)	(0.012)	(0.012)	(0.018)	(0.004)	(0.016)	(0.11)
Constant	6.4819***	6.991***	12.797***	5.308***	12.976***	19.269***	29.02***	44.046***	61.492***	40.947***
	(0.28)	(0.4285)	(0.87)	(1.508)	(1.7483)	(2.697)	(0.991)	(0.330)	(1.985)	(8.392)
Observations	253	253	253	253	253	253	253	253	253	253

Standard errors in parentheses

***P<0.01, **P<0.05, *P<0.1

Table 3: Regression results for the effect of ESG scores on bank risk-taking measured by the standard deviation of return on assets

Variables	(10th)	(20th)	(30th)	(40th)	(50th)	(60th)	(70th)	(80th)	(90th)	(95th)
	STDVROA	STDVROA	STDVROA	STDVROA	STDVROA	STDVROA	STDVROA	STDVROA	STDVROA	STDVROA
lSTDVROA	0.196***	0.329***	0.473***	0.553***	0.64***	0.662***	0.689***	0.699***	0.664***	0.733***
	(0.002)	(0.004)	(0.004)	(0.004)	(0.014)	(0.013)	(0.007)	(0.006)	(0.004)	(0.000)
ESGw	−0.000***	−0.000	−0.000**	0.001***	0.001***	0.002***	0.000***	−0.002***	−0.002***	−0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sizew	0.019***	0.023***	0.023***	0.004*	0.004	0.01***	0.02***	0.027***	0.048***	0.002***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.005)	(0.002)	(0.002)	(0.001)	(0.001)	(0.000)
lLDw	0.079***	0.1***	0.161***	0.171***	0.116***	0.228***	0.327***	0.478***	0.625***	0.163***
	(0.012)	(0.008)	(0.01)	(0.024)	(0.015)	(0.018)	(0.011)	(0.011)	(0.012)	(0.001)
SOLw	0.321***	0.504***	0.504***	0.434***	0.417***	0.224***	0.358***	0.859***	0.571***	2.98***
	(0.019)	(0.036)	(0.028)	(0.112)	(0.066)	(0.041)	(0.062)	(0.042)	(0.027)	(0.001)
EQw	−0.035***	−0.044***	−0.073***	−0.152***	−0.215***	−0.289***	−0.359***	−0.322***	−0.349***	0.082***
	(0.006)	(0.015)	(0.019)	(0.013)	(0.0192)	(0.027)	(0.011)	(0.001)	(0.009)	(0.001)
Conw	−0.002***	−0.002***	−0.001***	0.000*	−0.001***	−0.000**	−0.001***	−0.003***	−0.004***	−0.007***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ROEw	−0.008***	−0.009***	−0.009***	−0.008***	−0.007***	−0.008***	−0.01***	−0.014***	−0.019***	−0.028***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Dummy_Islamic	−0.001	−0.002*	−0.013***	−0.008**	0.011**	0.014***	0.022***	0.022***	0.036***	0.060***
	(0.001)	(0.001)	(0.002)	(0.003)	(0.004)	(0.002)	(0.005)	(0.002)	(0.001)	(0.000)
GDPw	−0.003***	−0.006***	−0.007***	−0.007***	−0.004***	−0.005***	−0.005***	−0.003***	−0.004***	−0.008***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
INFw	0.003***	0.001	0.003***	0.001	0.005***	0.002**	0.003***	−0.014***	−0.022***	−0.023***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)
ORw	−0.002***	−0.002***	−0.002***	−0.001***	−0.001***	−0.002***	−0.002***	−0.002***	−0.003***	0.004***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Year	0.002***	0.007***	0.008***	0.004***	0.009***	0.004**	0.005***	0.004***	−0.005***	−0.018***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.000)	(0.000)
NO	−0.000	−0.000***	−0.000	0.001***	0.001***	0.001***	0.000	−0.000	−0.002***	−0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	−0.035***	−0.13***	−0.164***	−0.081***	−0.185***	−0.086**	−0.102***	−0.081***	0.090***	0.354***
	(0.007)	(0.016)	(0.019)	(0.012)	(0.019)	(0.041)	(0.015)	(0.01)	(0.007)	(0.002)
Observations	256	256	256	256	256	256	256	256	256	256
Standard errors in parentheses										

***P<0.01, **P<0.05, * P<0.1

Table 4: Regression results for the effect of institutional quality on bank stability measured by Z-score

Variables	(10th)	(20th)	(30th)	(40th)	(50th)	(60th)	(70th)	(80th)	(90th)	(95th)
	Zscorew	Zscorew	Zscorew	Zscorew	Zscorew	Zscorew	Zscorew	Zscorew	Zscorew	Zscorew
lZscorew	0.14***	0.189***	0.251***	0.264***	0.351***	0.381***	0.392***	0.484***	0.624***	1.187***
	(0.002)	(0.002)	(0.006)	(0.002)	(0.006)	(0.01)	(0.007)	(0.004)	(0.012)	(0.018)
QOGA	−1.067***	−1.285***	−0.545	−0.829***	−0.32	1.426***	−0.071	−0.014	0.317	−5.149***
	(0.102)	(0.236)	(0.342)	(0.305)	(0.411)	(0.436)	(0.504)	(1.07)	(1.115)	(1.729)
Sizew	0.03	−0.417***	−0.7***	−0.355**	−0.201	−0.342**	0.084	0.915***	−2.152***	1.86***
	(0.042)	(0.099)	(0.071)	(0.159)	(0.146)	(0.146)	(0.209)	(0.267)	(0.268)	(0.508)
lLDw	−0.111***	−0.082***	−0.077***	−0.146***	−0.112***	−0.023***	−0.086***	0.0297***	−0.1***	−0.234***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.02)	(0.011)	(0.019)	(0.026)
SOLw	−0.585***	−0.616***	−0.533***	−0.773***	−0.502***	−0.212***	−0.028***	−0.568***	−1.86***	−1.4***
	(0.013)	(0.037)	(0.043)	(0.039)	(0.070)	(0.047)	(0.058)	(0.086)	(0.131)	(0.142)
EQw	3.256***	5.09***	7.695***	5.26***	6.988***	9.95***	31.145***	38.827***	−11.477***	−39.018***
	(0.469)	(0.533)	(1.006)	(0.982)	(1.445)	(1.46)	(1.707)	(2.379)	(4.235)	(9.377)
Conw	0.11***	0.146***	0.134***	0.074***	0.078***	0.117***	0.083***	0.191***	−0.116**	−0.443***
	(0.01)	(0.007)	(0.018)	(0.019)	(0.025)	(0.022)	(0.015)	(0.037)	(0.051)	(0.036)
ROEw	0.332***	0.378***	0.453***	0.397***	0.308***	0.301***	0.138***	0.151***	0.956***	0.27***
	(0.007)	(0.011)	(0.028)	(0.026)	(0.046)	(0.032)	(0.04)	(0.042)	(0.042)	(0.076)
Dummy_ Islamic	0.394***	−0.125	−0.526***	0.594***	0.858***	0.862***	1.096***	2.336***	4.314***	9.546***
	(0.138)	(0.117)	(0.183)	(0.19)	(0.236)	(0.25)	(0.259)	(0.571)	(0.446)	(0.932)
GDPw	0.114***	0.179***	0.119***	0.184***	0.309***	0.428***	0.614***	0.675***	0.372***	0.377***
	(0.006)	(0.018)	(0.028)	(0.024)	(0.031)	(0.051)	(0.048)	(0.09)	(0.11)	(0.111)
INFw	0.145***	0.085***	−0.037	−0.177***	−0.035	0.173***	−0.151*	0.406***	−0.885***	0.283**
	(0.016)	(0.033)	(0.053)	(0.057)	(0.06)	(0.064)	(0.083)	(0.124)	(0.185)	(0.137)
ORw	−0.073***	−0.048***	0.029***	0.013**	0.0499**	0.041***	−0.036*	−0.199***	0.046	0.04
	(0.003)	(0.007)	(0.011)	(0.006)	(0.021)	(0.011)	(0.018)	(0.033)	(0.037)	(0.046)
Year	−0.42***	−0.317***	−0.29***	−0.52***	−0.55***	−0.683***	−1.158***	−1.684***	−1.873***	−2.4***
	(0.019)	(0.02)	(0.042)	(0.064)	(0.052)	(0.058)	(0.088)	(0.112)	(0.217)	(0.194)
NO	0.048***	0.064***	0.048***	−0.044**	−0.043*	−0.087***	−0.189***	−0.346***	−0.188***	−0.413***
	(0.006)	(0.007)	(0.018)	(0.017)	(0.023)	(0.021)	(0.018)	(0.035)	(0.032)	(0.052)
Constant	8.947***	6.81***	6.343***	11.29***	11.596***	13.966***	23.475***	33.36***	36.93***	47.81***
	(0.372)	(0.402)	(0.833)	(1.314)	(1.059)	(1.15)	(1.76)	(2.224)	(4.247)	(3.925)
Observations	264	264	264	264	264	264	264	264	264	264
Standard errors in parentheses										

***P<0.01, **P<0.05, *P<0.1

The second regression model examines the impact of ESG on the financial stability measured by standard deviation of ROA and it is mathematically expressed as the below:

$$SDROA_{ijt} = a_0 + a_1 SDROA_{ijt-1} + \beta_1 ESG_{ijt} + \beta_2 Size_{ijt} + \beta_3 ILD_{ijt} + \beta_4 SOL_{ijt} + \beta_5 EQ_{ijt} + \beta_6 CON_{ijt} + \beta_7 ROE_{ijt} + \beta_8 IS_{COV\,ijt} + \beta_9 GDP_{it} + \beta_{10} INF_{it} + \beta_{11} OR_{it} + \gamma_{k+1} d_k + \gamma_T d_T + \varepsilon_{it}$$

where $SDROA_{ijt}$ is bank risk taking measure for bank i during year t.

Our third regression model examines the Impact of institutional quality (QOGA) on the financial stability measured by Z-score and can be mathematically expressed as the below:

$$Z-score_{ijt} = a_0 + a_1 Z-score_{ijt-1} + \beta_1 QOGA_{ijt} + \beta_2 Size_{ijt} + \beta_3 ILD_{ijt} + \beta_4 SOL_{ijt} + \beta_5 EQ_{ijt} + \beta_6 CON_{ijt} + \beta_7 ROE_{ijt} + \beta_8 IS_{COV\,ijt} + \beta_9 GDP_{it} + \beta_{10} INF_{it} + \beta_{11} OR_{it} + \gamma_{k+1} d_k + \gamma_T d_T + \varepsilon_{it}$$

$QOGA_{ijt}$ represents the main independent variable of institutional quality.

The fourth regression model examines the impact of institutional quality (QOGA) on the financial stability measured by standard deviation of ROA and can be mathematically expressed as the below:

$$SDROA_{ijt} = a_0 + a_1 SDROA_{ijt-1} + \beta_1 QOGA_{ijt} + \beta_2 Size_{ijt} + \beta_3 ILD_{ijt} + \beta_4 SOL_{ijt} + \beta_5 EQ_{ijt} + \beta_6 CON_{ijt} + \beta_7 ROE_{ijt} + \beta_8 IS_{COV\,ijt} + \beta_9 GDP_{it} + \beta_{10} INF_{it} + \beta_{11} OR_{it} + \gamma_{k+1} d_k + \gamma_T d_T + \varepsilon_{it}$$

3.3. Descriptive Statistics

Table 1 presents the descriptive statistics of the variables. The mean of Z-score is positive at 18.484 percent with high volatility, as indicated by the standard deviation. The mean of standard deviation of ROA is positive with low volatility.

4. RESULTS AND DISCUSSION

Table 2 presents the results of the effect of ESG on financial stability measured by Z-score, the results show that ESG score is positively correlated with Z-score especially in the upper quantiles. Table 3 presents the results of the effect of ESG on bank risk taking measured by standard deviation of ROA, the results indicate that decrease in the ESG score leads to increase in the standard deviation of ROA which reflects an increase in bank risk taking. Both tables support our hypothesis that ESG score is positively associated with banks' financial stability. This is in line with the

Table 5: Regression results for the effect of institutional quality on bank risk-taking measured by the standard deviation of return on assets

Variables	(10th)	(20th)	(30th)	(40th)	(50th)	(60th)	(70th)	(80th)	(90th)	(95th)
	STDVROA	STDVROA	STDVROA	STDVROA	STDVROA	STDVROA	STDVROA	STDVROA	STDVROA	STDVROA
lSTDVROA	0.194***	0.325***	0.504***	0.589***	0.67***	0.719***	0.693***	0.748***	0.713***	0.689***
	(0.007)	(0.004)	(0.01)	(0.007)	(0.01)	(0.01)	(0.01)	(0.01)	(0.002)	(0.01)
QOGA	−0.004	0.005	0.024***	0.06***	0.084***	0.097***	0.087***	0.148***	0.019***	−0.078***
	(0.007)	(0.004)	(0.003)	(0.008)	(0.008)	(0.005)	(0.006)	(0.011)	(0.005)	(0.012)
Sizew	0.017***	0.022***	0.022***	0.014***	0.018***	0.022***	0.022***	0.022***	0.018***	−0.024***
	(0.001)	(0.001)	(0.002)	(0.003)	(0.002)	(0.002)	(0.004)	(0.005)	(0.002)	(0.005)
lLDw	0.054***	0.131***	0.162***	0.232***	0.27***	0.378***	0.34***	0.829***	0.52***	0.335***
	(0.012)	(0.007)	(0.013)	(0.028)	(0.026)	(0.031)	(0.04)	(0.023)	(0.009)	(0.043)
SOLw	0.159***	0.596***	0.489***	0.591***	0.536***	0.469***	0.281*	1.111***	1.309***	2.26***
	(0.031)	(0.026)	(0.09)	(0.051)	(0.108)	(0.054)	(0.164)	(0.126)	(0.026)	(0.125)
EQw	−0.022	−0.059***	−0.081***	−0.151***	−0.205***	−0.243***	−0.358***	−0.279***	−0.41***	−0.047*
	(0.027)	(0.006)	(0.0185)	(0.023)	(0.0316)	(0.029)	(0.018)	(0.027)	(0.012)	(0.025)
Conw	−0.002***	−0.002***	−0.002***	−0.003***	−0.004***	−0.003***	−0.003***	−0.004***	−0.004***	−0.005***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
ROEw	−0.006***	−0.009***	−0.01***	−0.01***	−0.008***	−0.01***	−0.01***	−0.02***	−0.02***	−0.03***
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)
Dummy_Islamic	0.000	0.001	−0.003	0.004	0.017***	0.022***	0.019***	−−0.007	0.028***	0.023***
	(0.002)	(0.002)	(0.003)	(0.006)	(0.006)	(0.004)	(0.006)	(0.007)	(0.005)	(0.008)
GDPw	−0.003***	−0.004***	−0.007***	−0.006***	−0.007***	−0.004***	−0.005***	−0.005***	−0.005***	−0.007***
	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)
INFw	0.001	0.000	0.002***	0.001	0.003***	0.003***	0.002	−0.012***	−0.02***	−0.025***
	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)
ORw	−0.002***	−0.002***	−0.001***	−0.001**	−0.001**	−0.001***	−0.001***	0.001***	−0.001***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
Year	0.002*	0.007***	0.005***	0.008***	0.007***	0.01***	0.007***	0.007***	−0.003***	−0.016***
	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.000)	(0.001)
NO	−0.000	−0.001***	−0.001***	−0.002***	−0.003***	−0.003***	−0.002***	−0.003***	−0.001**	−0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
Constant	−0.043**	−0.143***	−0.108***	−0.159***	−0.143***	−0.196***	−0.154***	−0.145***	0.053***	0.31***
	(0.021)	(0.009)	(0.028)	(0.016)	(0.03)	(0.026)	(0.037)	(0.02)	(0.006)	(0.024)
Observations	272	272	272	272	272	272	272	272	272	272

Standard errors in parentheses

***P<0.01, **P<0.05, *P<0.1

findings of Tóth et al. (2021), Chiaramonte et al. (2022), Li et al. (2023), Asimakopoulos et al. (2023), Gupta and Kashiramka (2024), and Gangwani and Kashiramka (2024). Tables 4 and 5 show the effect of institutional quality (QOGA) on bank stability and risk-taking represented by Z-score and standard deviation of ROA respectively. The results of Table 4 indicate that institutional quality is negatively associated with bank stability, Table 5 shows similar results where increase in institutional quality (QOGA) results in an increase in the bank risk-taking. Our results are similar to those of Bermpei et al. (2018), Fazio et al. (2018), Canh et al. (2021), and Nguyen (2023) who found positive association between institutional quality or a certain component of it with bank fragility. Regarding control variables, size does not seem to have a correlation with bank stability when the latest is measured by Z-score. However, size is positively correlated with standard deviation of ROA which indicates that larger banks tend to take more risk. This is similar to the findings of Kim et al. (2016) and Mazumder and Piccotti (2023). Deposits seem to have a negative association with bank stability.

Tables 2 and 4 suggest that decrease in deposits is positively correlated with Z-score, Tables 3 and 5 show that increase in deposits is likely to increase bank risk-taking measured by standard deviation of ROA. Our findings are consistent of those of Nafula (2003) and Dietrich and Wanzenried (2011). Tables 2 and 4 show that solvency has a negative association with Z-score till the 60th quantile. The results of Tables 3 and 5 show that solvency is positively correlated with the standard deviation of ROA which reflects negative association between solvency and stability. This indicates that solvent banks are willing to take higher risk, this is in line with the findings of Akram and Hushmat (2024) who stated that as banks create more liquidity, their solvency risk increases, which can destabilize the bank. Equity has a positive relationship with bank stability, Table 2 and 4 show that increase in equity improves the Z-score, Table 3 and 5 show that decrease in equity leads to increase in risk-taking. Our findings are consistent with those of Limpaphayom and Polwitoon (2004), Toader (2015) and Peleg-Lazar and Raviv (2017). Table 2 and 4 suggest that decrease in competition leads to improved stability measured by Z-score. Tables 3 and 5 show that banks in less concentrated markets tend to take higher risk. This indicates that increase in competition has a negative impact on bank stability. This supports the competition-fragility hypothesis which states that the increase in competition leads to higher risk-taking and bank fragility (Phan et al., 2019; López-Penabad et al., 2021; Ferreira, 2023). The results of ROE are consistent in all models, in Tables 2 and 4, increase in ROE leads to increase in the Z-score. In Tables 3 and 5, decrease in ROE leads to increase in bank risk-taking. These results indicate that ROE is positively correlated with stability.

Our results are similar to Adusei (2015), Sayani et al. (2017), Albaity et al. (2019), and Barakat et al. (2024) who found that ROE contribute towards maintaining financial stability of banks. In Table 2 we found evidence that Islamic banks are more stable than conventional banks when we measured stability by Z-score. The same is supported in Table 4 where we found that bank being Islamic would increase the Z-score. These results are similar to Elbadri and Bektaş (2017), Sulaiman@ Mohamad et al. (2018), and Nosheen and Rashid (2021). However, we got contradicting results when we measured bank risk taking by standard deviation of ROA as bank being Islamic leads to higher risk-taking. This is similar to the findings of Salma and Younes (2014). Our results indicate that GDP growth has a positive association with banks stability, Tables 2 and 4 show that increase in GDP growth enhances Z-score, Tables 3 and 5 shows that drop in GDP growth is more likely to increase standard deviation of ROA which destabilize the bank. Our findings are similar to the findings of Adusei (2015), Chi and Nguyen (2021), and Yitayaw et al. (2023) who found a positive association between GDP growth and bank stability. Regarding inflation, we could not find a significant relationship between inflation and banks stability in all the models. Oil rents does not seem to have a correlation with Z-score as per the results of Table 2 and 4. However, we found a positive association between oil rents and stability as drop in oil rents seems to increase bank risk-taking represented by standard deviation of ROA. This is consistent with the findings of Lee et al. (2015), Alsagr and Hemmen (2020), and Albulescu (2022). From a theoretical point of view, our findings are consistent with stakeholder theory, demonstrating a positive relationship that aligns with its principles. Specifically, the results suggest that higher ESG scores contribute to enhanced bank stability by addressing and aligning with stakeholder interests. These findings are in line with those of Do et al. (2024) and Tóth et al. (2021). Furthermore, our results support the agency theory, highlighting a positive connection between management actions and shareholder interests, as reflected in improved financial stability. This aligns with the findings of Menicucci and Paolucci (2023). Lastly, consistent with the Efficient Market Hypothesis, our study suggests that ESG preferences can influence market efficiency, which, in turn, may impact financial stability. As outlined in the results section, our findings reveal a negative relationship between institutional quality and bank financial stability.

5. CONCLUSION AND POLICY IMPLICATIONS

This paper examines the effects of ESG and institutional quality on bank stability in the GCC. Our sample consists of 33 banks from six countries in GCC for the period 2010-2023. Detailed information regarding the variables and data sources is provided in Appendix 1. Our findings indicate a positive effect of ESG score and a negative effect of institutional quality on bank stability. From the control variables we used, we found evidence that Equity and ROE has a positive association with bank stability. Macro variables GDP and oil rent enhance stability. We found evidence that larger banks tend to take higher risk. Deposits and solvency are negatively associated with bank stability, this indicates that solvent banks tend to accept more risk. Our results indicate that high competition leads to higher risk taking by banks. We got contradicting results regarding the effect of bank being Islamic on bank stability.

Our findings have several significant policy implications. First, given the positive effect of strong ESG performance on financial stability of banks, regulatory bodies must consider incorporating ESG metrics in the existing financial stability frameworks. This

can involve establishing guidelines which encourage banks to adopt ESG practices or even mandating ESG reporting to enhance transparency. Second, in order to support banks achieving higher ESG scores, governments may offer tax incentives, subsidies, or lower capital requirements for investments aligned with ESG principles. This could strengthen banks' financial resilience and appeal to socially conscious investors, fostering long-term stability. The absence of consistent metrics for evaluating ESG performance and institutional quality across banks can hinder accurate assessments of stability. Policymakers could work with industry bodies to standardize ESG and institutional quality metrics, enabling more accurate cross-bank comparisons and more effective regulatory assessments. Since institutional quality significantly affects bank stability, reforms should align with broader ESG objectives to ensure that legal, regulatory, and financial systems support sustainable practices. This alignment can create a mutually reinforcing effect where robust institutions and sustainable practices together drive stability. A mean institutional quality of 0.161 suggests a relatively low score on the scale (likely normalized). This could indicate that the institutional frameworks in the GCC, while improving, might still be in the developmental stages. Banks in such environments may face inefficiencies or inconsistent enforcement of rules, which can create instability. Moreover, countries transitioning to higher institutional quality might face short-term instability as institutions and banks adapt to new rules, practices, and enforcement mechanisms. Nevertheless, Institutional quality measures may not fully align with the structural characteristics or specific needs of the GCC banking sector, possibly creating misalignments.

This study has some limitations that should be considered for a more balanced perspective. One key limitation is the relatively limited number of banks included in the analysis. Future research could address this by expanding the sample to include a greater number of banks from the Gulf Cooperation Council (GCC) region, offering a broader view of banking trends and practices in this economically significant area. Additionally, to further enhance the findings and their applicability, future studies could extend the focus to include banks from the broader Middle East and North Africa (MENA) region. This would provide valuable insights into the banking sector across a more diverse set of economies and regulatory frameworks, contributing to a more comprehensive understanding of the regional banking landscape.

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APPENDIX

Appendix 1: Description of the variables

Variable	Definition	Source
$Z\text{-}score_{i,t}$	Z-score is calculated by adding the return on assets means and the equity to total assets ratio then dividing the sum by the return on assets standard deviation.	BankFocus
$SDROA_{i,t}$	Standard deviation of return on assets	BankFocus
ESG_{ijt}	ESG score	BankFocus
$QOGA_{ijt}$	Normal average of the 6 institutional quality components	World Bank
$Bank\ Size_{i,t}$	Log of total asset.	BankFocus
$ILD_{i,t}$	Lagged value of total customer deposits over total liability (%)	BankFocus
$SOL_{i,t}$	Total liability over total assets (%)	BankFocus
$EQ_{i,t}$	Equity growth by gross domestic product (GDP) deflator	BankFocus
$CON_{i,t}$	Market shares of the three largest banks.	World Bank
$ROE_{i,t}$	Net income divided by the ratio of shareholders' equity; ROE denotes the rate of return on shareholders' equity.	BankFocus
IS_COV	A dummy variable that equals 1 in case of Islamic banks and 0 otherwise.	BankFocus
GDP	GDP growth is the rate of real Gross Domestic Product (GDP) growth.	World Bank
INF	Log of annual change in inflation rate.	World Bank
OR	Contribution of oil to GDP	World Bank